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DIFFERENTIATED INSTRUCTION: THE EFFECT ON STUDENT ACHIEVEMENT IN AN ELEMENTARY SCHOOL

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Dissertation

Submitted to the Department of Leadership and Counseling

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ABSTRACT

The purpose of this study was to determine if differentiated instruction had an effect on student achievement. The researcher sought to answer two research questions "Does differentiated instruction have an impact on student achievement?" and "Are there components of differentiated instruction that have a greater impact on student achievement than others?"

The study followed a mixed method design and consisted of two parts. First, a quantitative analysis of test scores from the Michigan Education Assessment Program (MEAP) and teacher and student survey results were analyzed as a means to outline broad relationships from the data. Results from the quantitative findings directed the researcher on how to frame the qualitative design. Second, a qualitative analysis of classroom observations and interviews with teachers was conducted. The qualitative portion of this study followed a social interactionism orientation adopted by social interactionism theorist (Blumer, 1969). This approach allowed the researcher to analyze relationships between the differentiation variables.

The quantitative data methods of surveys and test scores, qualitative techniques of classroom observations, and teacher interviews were triangulated. Triangulation of data was used to support research findings through independent measures to point to the same conclusions (Webb et al., 1965). The conceptual framework (Hall, 2004) served as the foundation in the identification of the differentiation variables to be studied.

The research findings supported the work of learning styles theorists (Dunn, Griggs, Olsen, Beasley, and Gormann, 1995). Findings also suggested that the differentiation strategies of choice and interest play a vital role in achievement and student satisfaction

in learning. Findings suggested that teachers just beginning differentiation should first administer a learning styles inventory to their students. The administration of this inventory will provide the teacher with the necessary information to differentiate for choice and interest, two manageable techniques with which to begin differentiation.

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CHAPTER I: INTRODUCTION

The stakes have risen for public school systems across the United States. When President Bush signed the No Child Left Behind (NCLB) legislation into law in January of 2001, the meaning of student achievement took on a broader definition. Not only were schools expected to show improvement in test scores overall, schools were also expected to show documented improvement for every child testing within the system. Under NCLB, disaggregated data must be included for the following subgroups within a population of 30 or more students testing at the grade level: disadvantaged (socio-economic), disabled (special education), limited English speaking, migrant, gender, and ethnicity. This type of data disaggregation made many districts realize that certain populations of their students were underperforming.

In essence, schools always knew there were certain populations of students not making as much achievement growth as others. This has been documented with disadvantaged students for years. According to Lee (2002), "Since the Coleman Report in the 1960's brought attention to racial inequity in student outcomes, the achievement gap between white and minority students has raised a multitude of concerns and resulted in a significant body of empirical research. This achievement gap is argued to have lifetime consequences limiting opportunities for minority students in higher education" (p. 3).

School districts were also aware that students at the high end of the spectrum continued to show less achievement gains than those students in the middle of the achievement spectrum. This research indicated that most classrooms have taken on the role of teaching to this "on grade level" student population, leaving the learning needs of the challenged and under-challenged groups unmet.

According to Westburg, Archambault, et al. (as cited in Gubbins, 1992):

Despite several years of advocacy and efforts to meet the needs of gifted students in this country, the results of this observational study indicate that little differentiation in the instructional and curricular practices is provided to gifted and talented students in the regular classroom. This is of particular concern because special programs for gifted learners outside of the regular classroom are being eliminated in many parts of the country due to economic cutbacks. When this occurs, the needs of gifted and talented students must be addressed in regular classrooms. (p. 5)

Educators who view classrooms as whole entities and do not account for the variances in the levels of readiness with which students enter the room may either over-challenge or under-challenge the learners. According to Vygotsky, 1962; Howard, 1994, as cited in Tomlinson (2001), "We know that learning happens best when a learning experience pushes the learner a bit beyond his or her independent level. When a student continues to work on understandings and skills already mastered, little if any new learning takes place. On the other hand, if tasks are far ahead of a student's current point of mastery, frustration results and learning does not" (p. 8). Vygotsky (1962) hypothesized that children should be stimulated through a sequence of goals that increase in difficulty. A child who is not challenged in this way fails to reach the highest stages of thinking or reaches them with great delay.

No Child Left Behind has forced districts to view students as individuals, not as a classroom of students as a whole. In classrooms where one lesson is designed for all learners, limits are placed on students' achievement. Students who are advanced academically are left behind because they are under-challenged, and students who may be struggling are left frustrated and confused. Classrooms in which differentiation is taking place may help to close the achievement gap that has been prevalent for years in American schools. According to Tomlinson (1999), teachers in differentiated classrooms use time flexibly, call upon a range of instructional strategies, and become partners with their students. Educators are diagnosticians, prescribing the best possible instruction for their students. Differentiation suggests that all learners can achieve and be appropriately challenged within any classroom. One knows that children have basic needs that must be met before learning can occur. According to Prince and Howard (2002), children need not only to survive but also to thrive. In a differentiated classroom, fear is removed and children are free to take risks in their learning. By developing lessons appropriate to students' readiness levels, interest, and learning profiles, teachers will be able to draw upon prior knowledge and student experiences outside of the school environment which will empower students to ask questions and share their opinions because they already have knowledge or interest in the topic. With modifications made to lessons, students are challenged at appropriate levels to eliminate frustration and boredom. Maslow (1998) emphasized that before higher level needs are even perceived, lower level needs must be satisfied.

The need to differentiate instruction is supported by practitioners who recognize that the two ends of the achievement spectrum are not being appropriately challenged within heterogeneous classrooms. According to Tomlinson (2001), "Differentiation calls on a teacher to realize that classrooms must be places where teachers pursue our best understandings of teaching and learning everyday, and also to recall daily that no practice is truly best practice unless it works for the individual learner" (p. 17). Classrooms are currently filled with students who have enormous differences in their readiness, interests, cultural backgrounds, prior knowledge, and learning profiles. Looking at a typical classroom and the ability levels within it, one can conclude that teachers who do not differentiate teach only a fraction of their students. We know that is not the intent of any teacher; however, without the proper tools, differentiation does not take place.

It has been documented that mentor teachers guide new teachers to teaching to the middle as a means of management of the curriculum. According to Tomlinson (1999), novice teachers were almost never encouraged to actively differentiate instruction by education professors, university supervisors, or master teachers. They were often discouraged from differentiation, particularly by master teachers who encouraged them to keep everything together. With the No Child Left Behind legislation, schools have been forced to look at students differently. Instructional strategies that are the components of a differentiated classroom may help with this transition. In some cases teachers have begun to analyze their students and see the different readiness levels, interests, and learning profiles and act accordingly. It is these differentiated classrooms that need to be studied to provide empirical data to the field of education to make this reform happen nationwide.

There are many ways to accomplish differentiation within a classroom. For the purposes of this study, differentiation will be defined according to Tomlinson (1999),

who said, "In a differentiated classroom, the teacher plans and carries out varied approaches to content, process, and product in anticipation of and response to student differences in readiness, interest, and learning needs" (p. 10). Hall (On-line, 2004) stated, "To differentiate instruction is to recognize students' varying background knowledge, readiness, language, preference in learning, interests, and to react responsively" (p. 1). Differentiation suggests that teachers can design lessons to tap into the interests and readiness of their students. According to Tomlinson (2000), "You can challenge all learners by providing materials and tasks on the standard at varying degrees of scaffolding, through multiple instructional groups, and with time variations. Further, differentiation suggests that teachers can craft lessons in ways that tap into multiple student interests to promote heightened learner interest in the standard" (p. 123). Differentiation allows teachers to vary the ways in which students work, alone or in groups, auditory or visual means, or creatively to further enhance student learning. This is in stark contrast to ability grouping in which students are placed in learning groups based solely on their academic standing.

A differentiated classroom differs from a traditional classroom in many ways. Most importantly, in a differentiated classroom more than one way to complete a lesson exists for any given topic. These lessons are designed around the needs of the students. A lesson plan is not created for each student; rather, lesson plans are tiered keeping in mind the readiness, interests, and learning profiles of the group. Pre-assessments play an important role in the development of the lessons. Pre-assessments not only alert the teacher to the readiness of the child but also the interests and prior experiences he or she may have upon entering the classroom. Based on the results of the pre-assessments, lessons are created to best match the needs of the learners. At times, students may be grouped according to readiness; at other times they may be grouped according to interest. The important point is that any time a student is placed in a group, the decision on where to place that child is based on the student's learning profile, readiness, or interests. The teacher decides what type of group, if any, will best meet the need of the child. Since differentiation is based on pre-assessment data, these groups change frequently as students' strengths become prevalent in areas to which they bring prior knowledge or expertise with them.

The traditional classroom, in which one lesson is designed to meet the needs of all learners, is failing our students, as are classrooms where teachers think they are using differentiation strategies but are not. According to Tomlinson and McTighe (2006): Teachers attempt to differentiate instruction by giving struggling learners less to do than other students and by giving more advanced students more to do than other learners. It is not helpful to struggling learners to do less of what they do not grasp. Nor is it helpful to advanced students to do more of what they already understood before they began the task. It is likely that the "more" or "less" approach to differentiation occurs when we lack clarity about essential outcomes and thus meaningful basis from which to differentiate. (p. 41)

As educators, one must insist on changes that will benefit all learners. This study will examine classroom practices that support differentiation with the purpose of determining if differentiated instructional strategies have an effect on student achievement. There are three components of the curriculum that can be differentiated to meet students' needs: content, process, and product. The content is what the teacher wants each student to know by the end of the unit. The process is the way in which the teacher designs activities to ensure the students learn the content. Products are what the students create to demonstrate their understanding of the content. Products vary as students are given choices on how to demonstrate their mastery of the content.

A lesson can be differentiated in many ways to best meet the needs of all learners. The most prevalent ways that differentiation occurs is by readiness, interest, and learning profile of each student. If based on student readiness, lessons would be designed to challenge students at all levels of the achievement spectrum - the high, low, and middle. It is important to note that students' readiness levels are fluid as they may have different levels of readiness for varying content areas and topics within the content. Tomlinson (1999) defined readiness as the student's entry point relative to a particular understanding or skill. A student's readiness is determined through pre-assessments. Advanced students are allowed to excel past the standard curriculum to perform application activities to the standards. Renzulli (1999) stated:

Human judgment should be exercised in the way we provide services to a child who has a high degree of creativity and interest, even if "the scores" are below some arbitrary set cutoff point. Flexibility should be exercised in the way we identify youngsters using observations and dynamic assessment related to interests and how the regular curriculum can be modified to create and develop interests. Both flexibility and human judgment are required in considering related factors, such as family and language background, community and environmental support, and a young person's desire to do something that is challenging and personally satisfying." (p. 6)

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At the opposite end of the achievement spectrum, students are held accountable for the grade level standards and are allowed to master them through appropriate activities geared to their readiness level and interests.

A lesson organized around interest gives students a choice in how they learn the lesson. Students may be placed into groups based on a variety of ways including learning styles, interests, or choice, or they may work independently to complete the assignment. For example, if the concept of photosynthesis were being taught, some students may be interested in writing a report or drawing a diagram explaining the concepts. Other students may be interested in designing an experiment to see what types of conditions are best for photosynthesis to occur. Students would have choices as to how to demonstrate their knowledge of the concept. The teacher can control the choices by creating a choice chart where students select their preferred way to demonstrate understanding of the topic.

A lesson designed to meet the learning profile of students would take into consideration the way in which the students best process information and ideas, and ways in which learning style, gender, culture, and intelligence preference influence the students. Teachers need to recognize and understand if a student is a whole-to-part, partto-whole learner; likes to work in silence, groups, independently; through written expression, speaking, and so on. It is important that students also understand their learning strengths so they can make the appropriate choices within the classroom. The take place. According to Merrill (2002), most effective learning environments start with a meaningful problem that provides the focus for four phases of instruction: activation of

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existing knowledge (including skills), demonstration of new knowledge, application of new knowledge, and integration of new knowledge into the learner's world.

Conceptual Framework

Many instructional strategies comprise a differentiated classroom. Differentiation should not be examined as an instructional strategy by itself; it is a climate of learning created in a classroom by using best practices in teaching, learning, and lesson design. By breaking down the term "differentiation" and understanding the components of what comprises a good lesson design, the misinterpretations will be removed so teachers can develop a clear understanding of what differentiated instruction is. This understanding of the concepts of differentiation will allow educators to recognize how best practices tie together and are key functions in a successful differentiated classroom.

Differentiation is the compilation of the best practices in teaching and student learning theories and practices that support student achievement. Figure 1 shows the conceptual framework for differentiation. Pre-assessment is an important tool to assess students' readiness. Pre-assessment data allows the teacher to create lessons and activities that are appropriate for the students, no matter what level they are performing. As Figure 1 shows, the curriculum can be differentiated by content, process, and product to adapt to the readiness level of the student. The content is what the teacher plans on teaching, what the students need to learn about the topic. The process is the "how" the teacher decides to design the lesson. Student background data are taken into consideration when planning. Teachers need to understand that the prior knowledge with which students enter their classroom is based on many factors such as cultural background and family opportunities. The "how" must be based on best practices in instruction and student learning such as readiness, interest, learning profile, choice, and learning styles of the students. The product, which is some form of assessment of the content, also revolves around the readiness, interests, and learning profile of the student.



Figure 1. Conceptual framework of differentiation. (adapted from Hall, 2004)

Sample Differentiated Reading Lesson

The following is a sample fourth grade reading lesson illustrating the six variables outlined in the conceptual framework by which a lesson can be differentiated. All of the six ways are dependent on some type of formal or informal pre-assessment of the students. These six variables, along with pre-assessment, became the independent variables studied in this research.

Pre-assessment: It is important to do ongoing assessments of the students' reading ability so as to not always place them in the same groups if differentiating by readiness. Pre-assessment informs the teacher of the students' readiness, interests, and background knowledge they bring to the topic.

Readiness: If the reading lesson was differentiated by readiness, students would be arranged into groups so they receive lessons that are an appropriate challenge to their reading level. Students who have scored above grade level could be placed in a group and use materials such as novels instead of the story the class will read together since they already tested out of this material. Students on grade level would work with the basal story, which is appropriate to their level of learning. Students who are below grade level will work out of leveled readers. The leveled readers are written at a lower reading level, but the theme for the story is the same as the basal reader and the novel. All students will be able to answer questions related to the same theme.

Interest: If the reading lesson was differentiated for interest, the teacher looks for ways to engage students in the learning by allowing students to study a topic that they want to know more about. For example, if the story students read was about animals and the environment, students could rewrite the ending of the story in a different way, write an

extension to the story, research on animal habitats and overpopulation, and so on. Whatever it is that students would like to learn more about, differentiation for interest would allow them to do this.

Learning Profile: To differentiate in response to learning profile, the teacher could address many things including learning styles, student talents, and intelligence profiles. A student's learning profile takes into account his or her innate strengths (Multiple Intelligences), how he/she learns best with external stimuli (Learning Styles), and how he/she intakes new information, such as needing to see the big picture or taking in new information in small chunks. To differentiate this reading lesson by learning profiles, the teacher could create a learning environment with flexible spaces for students to work. Some students could read at their desks, some on the floor; some may want to work alone, others with peers. Learning profile also takes into account how a student learns, such as part to whole or whole to part. In this reading lesson, the teacher may need to present the lesson in two different ways to help students draw meaning to what they are reading. Some students need to see the big picture and what the meaning of the story is before they begin reading, while others need to take it part by part and develop their own meaning. Either way it is presented, the students can draw conclusions to their reading and develop a better understanding of the author's intent.

Flexible Grouping: Flexible grouping allows for the movement of students between groups, which is unlike ability grouping, where students remain in fixed groups based on their ability. Flexible grouping is not based only on readiness. A flexible group for reading could include the teacher placing students in groups in a variety of ways. For instruction, the teacher could place, in a group, students who are having trouble with one

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particular skill in reading, such as decoding, so they could receive extra help in that area. For projects, students could be grouped based on learning style as to how they want to complete an assignment, such as demonstrating understanding of the story. Some may want to create a poster, others an oral presentation. The intent of the flexible grouping is to give students a wide range of experiences based on their learning needs, not only their abilities.

Choice: Providing students with choices can be highly motivational. In this reading lesson the teacher could differentiate by choice using a choice chart. After students complete the reading, at the appropriate level, they go to the choice chart and select one way that they would like to demonstrate their understanding of the reading. Usually choices are related to the learning styles or preferences of the students. Some choices may include creating a poster retelling the main points of the story, creating a skit by yourself or with a group to present to the class, writing an article about the main points of the story, or taking a paper/ pencil quiz about what you have just read.

Learning Style: Learning style is very important in a differentiated classroom and fits into many aspects of teaching and learning. Besides having students choose how they want to complete an assignment based on the learning styles (written, report, poster, diagram, etc.), a lesson may be presented using a variety of learning styles. For our reading lesson, students may read independently or listen to the story on tape, work in groups or alone. The teacher may use the overhead, read with the lights dim, or play music in the background. For tactile and visual learners the teacher may pass props around that are related to the story for the students to see and touch. By using multiple

instructional techniques, a teacher can connect better with the student's preferred way of learning, bringing about greater engagement and active participation in the lesson.

Purpose of the Study

The purpose of this study was to determine if teachers who were using differentiated instructional strategies were producing higher achievement results with their students than teachers not using differentiation strategies. Specifically, this study focused on the following research questions:

- Does differentiated instruction lead to increased student achievement?
- Are there any components of differentiated instruction that have a greater impact on student achievement than others?

These two questions directed the researcher to synthesize the quantitative and qualitative data in Chapter VI. In responding to the last question, the researcher was able to analyze information around the variables studied to determine any causal relationships between the variables and student achievement.

Significance of the Study

Students are being taught in a "one size fits all" approach classroom. This type of approach has been proven to be an ineffective means of instruction due to the fact that two extremes of students, the high and the low, are not appropriately challenged. Differentiation is based upon the best practices in teaching; however, there is no empirical validation to support this method. According to Hall (2004), differentiation is recognized to be a compilation of many theories and practices. Based on this review of the literature of differentiated instruction, the "package" itself is lacking empirical validation. "There is an acknowledged and decided gap in the literature in this area and future research is warranted" (p. 4).

Research is needed to determine if differentiated instruction increases student achievement. While some educators feel it is a necessity for their students, others do not feel like the extra work and preparation is worth the time. The findings of this study will be a foundation for future studies as to the achievement effects of differentiation. If achievement data are statistically different between the classrooms that are showing evidence of differentiation and those that are not, this may change the way teachers teach and the way universities prepare students to become educators.

Overview and Setting

In order to conduct the type of research needed to gather appropriate data, it was essential for the researcher to work closely with the school and become a non-intrusive observer in the classrooms. Because the researcher was employed by the school district as the assistant superintendent of instruction, the role of the researcher had to be thoroughly explained to the teacher participants. The setting for this study was a rural 4th and 5th grade elementary building in Michigan. All of the 4th and 5th grade classrooms in the entire district were housed in one building, eliminating the differences in instructional leadership and norms that may be evident between multiple buildings. The 4th grade classrooms became the foundation for this study for several reasons. First, MEAP English Language Arts and Math assessments were given at this grade level. These assessments became the comparisons for differences of achievement between classrooms.

The MEAP tests were a common, non-subjective comparison on how students were doing in each of the classrooms. Second, all of the 4th grade teachers had the option of receiving four days professional development in differentiated instruction and implementing the strategies in their classroom as they deemed appropriate. Last, the principal in this building supported differentiation but did not require training for all staff. This set the groundwork for the comparisons of classrooms to take place. The principal also supported the research as a means to help determine what works best within the school setting and created a climate that encouraged staff participation and expressed willingness to open up the school for observation. Once the researcher's role was clearly defined as that for strictly research and not evaluatory, seven of the nine teachers volunteered to participate.

Research Design

Review of research supported the fact that both qualitative and quantitative research methods were suited to this study. Quantitative research methods allowed the researcher to analyze achievement data for significant variations between classrooms. Given the scope of this study, neither qualitative nor quantitative means of data collection alone would have been sufficient to determine if differentiated instruction did or did not affect student achievement. According to Filstead (1979), the more one has multiple impact measures qualitatively understood and linked to qualitative measures, the greater the probability of understanding.

Qualitative techniques allowed the researcher to collect data through observations and interviews. Triangulation of data was used to validate the findings. Qualitative research

is descriptive in nature and therefore will emphasize the processes that occurred within the classrooms that were components of differentiation. "The qualitative emphasis on process has been particularly beneficial in educational research in clarifying the selffulfilling prophecy, the idea that students' cognitive performance in school is affected by teachers' expectations of them" (Rosenthal and Jacobson, 1968). Quantitative techniques have been able to show by means of pre- and post-testing that changes occur to a set level of statistical significance. Qualitative strategies have suggested just how the expectations are translated into daily activities, procedures, and interactions. In order for qualitative research techniques to be valid, the researcher must establish the framework as to how and what type of data will be collected.

Limitations

This study was limited in several ways. Because this study was double-blind, the researcher made an assumption that classes were heterogeneous to begin with. This assumption was based on the fact that classroom composition was created by the building administrator using data on achievement, discipline, SES, gender, and special education. Prior to the start of the 2004-2005 school year, class lists were created to balance these subgroups in an attempt to create classrooms of equal status within the building. Classroom composition had been organized in this manner for the past ten years.

This study had a sample size consisting of seven classrooms, making the teacher sample 7 and the student sample approximately 160 nine- and ten-year-old students. It was assumed that all participants could understand the survey questions and that the respondents answered truthfully to the best of their knowledge.

Definition of Terms

Some terms are used in this study in a very specific way. These terms are defined as follows:

- Differentiation: A process of lesson design where the teacher varies approaches to content, process, and product in anticipation of and response to student differences in readiness, interest, and learning needs.
- 2. MEAP: Michigan Education Assessment Program.
- Readiness: The academic level of appropriate challenge to a student in any given topic. A child's readiness level is determined through some type of preassessment.
- 4. Interest: The area in which the student has the most curiosity for learning.
- 5. Learning Profile: The way in which the student best processes information. This includes their multiple intelligences, learning styles, cultural background, and any other characteristic unique to that child in learning.
- 6. Pre-assessment: A formal (pre-test) or informal way (observation, student selfreporting) of determining the readiness level of a student.
- Learning Style: The way in which a student prefers to study and present information to others, such as written, auditory, kinesthetic (acting out), visually, alone, in a group, and so on.

Summary

The term "differentiation" is used widely in education. Many educators have their own ideas of it means. This study sought to clarify what differentiated instruction consists of by developing a conceptual framework for differentiation based on research and best practice in education. By fully understanding and defining the components of a differentiated classroom, one can determine which strategies of differentiation affect student achievement. The six differentiation variables were taken from the conceptual framework and analyzed in practice to determine if any of the variables either together or alone had an impact on student achievement. These variables included pre-assessment, readiness, interests, learning profile, choice, and learning style. Qualitative data in the form of classroom observations and teacher interviews were collected to verify findings from the quantitative data and help to explain what was actually occurring in each of the classrooms that may have had an impact on student achievement.

Organization of the Study

The remainder of this study is divided into five major parts. Chapter II contains a review of the literature related to differentiated instruction. The topics selected for this literature review were the components and the research supporting differentiated instruction outlined in the conceptual framework (p. 10). The purpose of this review was to clearly define the components of differentiation and the research supporting improved student achievement related to each component individually.

Chapter III outlines and explains in detail the methodology used for this study. After a careful review of the literature on study design, both qualitative and quantitative data

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measures were found to be appropriate. A mixed-method design was then developed. Statistical analysis and data collection methods are described.

Chapter IV presents the quantitative findings from the regression analysis and T-tests. Student and teacher survey results are also presented.

Chapter V presents the qualitative data from teacher interviews and classroom observations. A theme analysis is presented in this chapter.

Chapter VI presents the findings from the quantitative and qualitative methods and explains actual occurrences in the classrooms that may have affected the student achievement data. The implications for practice, theory, and further research are also proposed in this chapter.

CHAPTER II: LITERATURE REVIEW

Introduction

This chapter presents a summary of the relevant literature and the research supporting differentiated instructional strategies. The components of the conceptual framework (Figure 1, p. 10) were included in this review. They included 1) relevant information on creating a brain-based classroom, 2) an understanding of how concept-based teaching aides student learning, 3) how student grouping effects achievement, 4) how understanding the multiple intelligences theory and students' learning needs can improve student learning, and 5) a review on student motivation.

A Review of Brain-Based Learning

The practice of differentiation is firmly grounded in brain research. In a differentiated classroom, teachers who tier their lessons to match the readiness levels of their students eliminated both boredom and frustration in the learning process. Brain research confirms that the human brain functions by paying attention to meaningful information. This attention to meaningful detail has allowed for the survival of the human species. Wolfe (2001) wrote, "Consider students in a classroom confronted with information that doesn't match anything they've previously stored. Their brains look for an appropriate network to help them make sense or meaning of this information. If nothing can be found, the information is discarded as meaningless" (p. 86). This information has major implications to the classroom teacher. A teacher can create a lesson that is exciting and entertaining, but if the neural circuit or network was never activated in the first place, the lesson will have no meaning to the student and the information will be discarded as

useless. A teacher who differentiates by student readiness is meeting the need of the human brain and adjusting to what we currently know and understand from the brain research. This, in turn, enhances student learning.

When students experience continued frustration due to tasks that are too difficult, no learning occurs. When one feels stressed, his or her adrenal glands release a peptide called cortisol. Chronically high cortisol levels lead to death of brain cells in the hippocampus, which is imperative to memory formation. According to Tomlinson (2000), students whose skills were under-challenged demonstrated low involvement in learning activities and lessening of concentration. Conversely, students whose skills were inadequate for the level of challenge demonstrated both low achievement and a plummeting of self-worth. Wolfe (2001) described how rats raised in enriched environments showed heavier branching of dendrites and larger synapses. Increases of up to 20% more synapses per neuron were found in the rats from the enriched environments. Strategies such as cooperative learning groups and appropriate enrichment activities relating student learning to real life experiences create this type of growth in the human brain. "Truly amazing changes take place in the neural connections in our brains, and the methods used to structure learning experiences for our students affect the strength and duration of those changes" (Wolfe, p. 119).

Differentiation of instruction could allow for appropriate challenges and engaging lessons for students based on their interests, ability, and learning needs According to Jensen (1998), "Our brain is highly effective and adaptive. What ensures our survival is adapting and creating options. A typical classroom narrows our thinking strategies and answer options. Educators who insist on singular approaches and the 'right answer' are

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ignoring what's kept our species around for centuries" (p. 16). Without an understanding of the basic brain research, differentiation will not work in any classroom. According to Kaufeldt (1999):

The goal is to create a climate that balances low threat with evidences of challenge for a wide range of students' interests and abilities. The environment must still have tasks, projects, displays, symbols, and clues that will instigate students' intrinsic motivation and attract their interests, attention, and curiosity. If they feel comfortable, then they will not put barriers up and therefore will be open to possibilities of reflection and engagement. (p.15)

A brain compatible environment ensures that learning takes place. A differentiated classroom is organized in a manner to alleviate student stress and increase student interest in their learning by developing lessons according to the needs of the students. According to Reigeluth & Beatty (2003):

Brain research shows that learning is developmental, that each brain is uniquely organized, and that children experience windows of opportunity for learning at different ages. This finding reports the need for performance-based progression through a curriculum, rather than the traditional time-based progression that currently predominates. Finally, brain research shows that fear, threat, and fatigue contribute to "down-shifting"--a sense of helplessness that impedes learning by producing a rushed, programmed response stimuli rather than a thoughtful (higher-order) approach. (p. 27)

When students take an interest in their own learning and are not fearful of failure, they are willing to attempt and can accomplish greater challenges. According to Jensen (1995), "Research now tells us that threatening learners may foster more of the same behavior that we are trying to avoid. A threat is any stimulus that causes the brain to trigger defensiveness or a sense of helplessness to the learner" (p. 222). Jensen offered the following action steps when setting up a classroom climate:

- Identify substandard learning behaviors. Identify areas of threats, both implied and explicit. Avoid reliance on extrinsic rewards. As much as possible, remove threats from the learning environment and introduce alternative forms of motivation, such as novelty, curiosity, positive social bonding, and relevant content.
- 2. Make the learning environment a safe, relaxed environment. Avoid calling on learners unless they volunteer. Eliminate discipline policies that work by threat, score keeping, or embarrassment. Give more time for class work. Reduce the threat of grades by providing more frequent feedback. Make the assessments genuine and meaningful.
- 3. Insure that learners have the following conditions met: 1) they perceive a solution is possible; 2) they have the resources to solve a problem; 3) they have control over the situation; 4) they have sufficient time to do the learning; 5) they have the knowledge and skills to recognize and manage their own stress levels.
- Increase support and encouragement. Make the testing or other assessment times less stressful by encouraging partner work, allowing stretch breaks, giving immediate successes followed by engaging complex projects and giving verbal encouragement.

Give students a sense of self-worth, a feeling of importance and uniqueness.
Teach them that they are not helpless. Help the learner to discover what areas of life can be controlled so that the "victim" mentality is never cultivated (p 233).

In a differentiated classroom, Jensen's action steps are the teacher's basis when established a learning environment. The pre-assessments are used to identify any substandard learning, learning strengths, and interests that students may have already created. Lessons are then designed and students are placed in a learning condition designed to eliminate threat, boredom, and frustration. By building a lesson around a student's strengths and interests, a feeling of self-worth is created and students perceive there is a solution that is attainable by them. Advanced learners realize that the teacher takes into account their strengths and wants to challenge them further. Students are given assessments that are relevant to their abilities and that demonstrate learning has occurred at every readiness level.

While the term "differentiated instruction" may be ambiguous to teachers, the practice itself should not be. All teachers realize that their students are different in many ways. There is not a classroom in this country where all students are identical and learn the same way. According to Stevenson (1992)

In order for all students to experience successes that matter to them, schoolwork must accommodate individual differences of talent and development. Students are developmentally unequal. Therefore, educators must ensure that for a substantial portion of their school lives, students will be able to see their success along a variety of paths. Teachers' expectations must reflect an understanding of differences. (p. 122)

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A Review of Concept-based Teaching

Students enter the classroom with prior knowledge and experiences in life. These experiences are what students use to categorize new information presented to them. Students will place new information in a context that is most meaningful to their lives. This is why there can be so many interpretations of the same story by a variety of readers. According to Callahan (1999):

A curriculum should be structured around big ideas. If teachers are to provide different levels of instruction and address varying learner profiles, they must organize the curriculum around the concepts, principles, and generalizations of the disciplines. Standards should be the core for generating those ideas and the particular examples of the ideas, rather than as disconnected segments of instruction. (p. 6)

New information is processed according to how it fits into these rules, which learning theorists call schema. According to Price and Driscoll (1997), schema are important not just in interpreting information but also in decoding how that information is presented. Schema Theory also has implications to how a lesson is delivered. By first focusing in on a broad concept, such as classification, and slowly reducing to facts relative to that topic, such as invertebrates, students can broaden the schema and learn the material under the context the teacher has established for them.

Concept-based teaching focuses on broad themes, not minute details or facts. According to Reigeluth and Beatty (2003), to build schemata effectively, the curriculum should progress from broader, more inclusive ideas to narrower, more detailed ideas.
Concept-based teaching has been shown to have a positive effect on student retention of material. Teachers who teach to broad themes, not isolated standards, can increase student retention of the topic. According to Novak and Musonda (1991):

Students in early primary grades were divided into two statistically significant groups to test the effectiveness of concept-based curriculum in science. The treatment group was instructed for a period of several months using a concept-based curriculum, while the control group was taught a conventional, fact-based curriculum. With no other treatments, both groups were tested for scientific understanding and problem-solving ability every two years until graduation from high school. Even after twelve years, the treatment group showed significantly better retention, depth of understanding, problem- solving ability and classroom performance. (p. 1)

Concept-based teaching allows for students to make cross-curricular connections to the content standards. These connections allow students to understand how standards are related instead of teaching standards in isolation. This is important due to the fact that brain research supports instruction that is presented in a meaningful way that allows students to see the information as useful to them. According to Tomlinson and Eidson (2003), "Concept-based teaching uses the essential concepts and key principles of a discipline as the primary way of organizing curriculum content" (p. 234). Concepts allow for the integration of the curriculum by allowing the teacher to teach many content standards under one theme. For example, the theme decided by the teacher may be "change." By teaching to the theme of change instead of content standards in isolation, many subjects could be integrated into the unit. Physical changes could be taught in science or in the seasons. In math, temperature changes between Celsius and Fahrenheit

or elapsed time could be taught. How characters change in a story could be the integration into language arts. The possibilities are limitless. The integration of standards under a theme also helps students build cross-content connections. When a teacher bases his or her instruction on a concept, students are expected to learn more than just facts. They are expected to see the "big picture" of how subjects are related to one another. Facts are no longer taught in isolation. Students gain an understanding of how their learning fits into the real world. By teaching to a conceptual theme, students are forced to think and develop an understanding beyond the topic in isolation. Students also begin to see the relationships of major themes in everyday life. Today's heterogeneous classrooms present teachers with the challenge of meeting the needs of all learners. With a concept-based curriculum, all students can focus on the same concept, but to varying depths, with different approaches and with diverse topics. This can be accomplished in a differentiated classroom by creating tiered lessons that match the readiness levels of the students. A concept-based approach to organizing curriculum can be a powerful tool in today's standards-based, high tech, information rich environment. No Child Left Behind (NCLB) has made requirements for states to develop grade level standards. This focused approach to content standards may have a limiting effect on learning if they are taught in isolation. With this narrow focus come many concerns, the greatest being that many teachers have adopted these standards as the curriculum itself. Standard-based teaching leaves students in an environment where they can retell the facts for mastery in isolation of each other; however, the depth and application of the skill may have been eliminated.

A Review of Student Grouping

A differentiated classroom allows for fluid groups that are continually reorganized due to the fact that ability is not the only means of placing students. In a differentiated classroom, the teacher may group not only for readiness but a variety of other means, such as interests and learning profiles. According to Callahan (1999):

Varied grouping arrangements range from whole group to flexible small groups to individual task assignments. There are times when large group instruction to introduce a topic, provide amplification or explanation to the whole group, or explore values issues around a topic are very much warranted. However, differentiated instruction requires students to work in small groups at times and individually at times to address varied aspects of learner profiles. (p. 6)

According to Winebrenner (1992), tracking and ability grouping are not the same thing. Tracking places students into fixed groups of learners where they remain either in a fast, average, or slow track. Ability grouping, referred to as grouping for readiness in a differentiated classroom, creates fluid groups where students move about depending on the way the teacher chooses to structure a group for a given topic. According to Kulik (1992), grouping programs that entail a more substantial adjustment of curriculum to ability had clear and positive effects on students. Slavin (1990) identified ability grouping as any school or classroom organization plan that intended to reduce the heterogeneity of instructional groups. One must understand that differentiation is not a means of ability grouping. Differentiation is a way to maintain a heterogeneous classroom that allows for levels of difficulty to be addressed through tiered lesson design. Ability grouping, sometimes inaccurately referred to as tracking, has been regarded as

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damaging by researchers in this field. Regardless of the title, in most classrooms where students are grouped, no curricular or instructional changes occur. By simply regrouping students by ability and making no instructional adjustments, the purpose of regrouping has no effect on student achievement and has removed the presence of positive role models for many.

Differentiation allows for fluid groups within a classroom as groups are constantly restructured based on student readiness, interest, and learning profile. According to Oakes and Lipton (1992), "One of the most logistically difficult and politically volatile aspects of tracking reform is whether and how heterogeneous schools and classrooms serve students with special needs – including those identified as intellectually gifted. Schools that are detracking successfully make sure that the special needs of these children are adequately addressed – even when they are members of heterogeneous classes" (p. 450). The key in differentiation is not to place students into rigid groups of learners but to accommodate their needs in the heterogeneous classroom.

The differentiated classroom also allows for students to be challenged at the appropriate levels by organizing readiness groups within the same room. By grouping students within a heterogeneous classroom, they are allowed to work to their readiness but also benefit from working with and observing students in the other groups. Kulik (1992) referred to ability grouped classrooms as XYZ classrooms, where X may be the low group, Y the middle, and Z the high achievers. In this type of classroom, teachers divide the students into rigid groups based solely on ability. Kulik stated:

Grouping programs usually have smaller effects on middle and lower aptitude learners. XYZ classes, for example, have virtually no effect on the achievement of

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such students. Test scores of middle and lower aptitude students learning in XYZ classes are indistinguishable from those of similar students in mixed-ability-classes. Cross- grade and with-in class programs, however, usually raise test scores of middle and lower aptitude pupils by between 0.2 and 0.3 standard deviations. The clear adjustment of curriculum to pupil ability in within-class and cross-grade programs may be the key to their effectiveness. (p. 60-61)

Placing students into rigid groups based on one assessment has not been proven to help most children, yet this is the way children have been placed into instruction groups. Through flexible grouping, students move throughout different groups because they are regularly assessed and move up or down based on their readiness in a certain topic or skill.

A Review of Multiple Intelligences/Learning Style

The term "learning profile" refers to how a student learns best and takes into account a student's learning style, multiple intelligences cultural background, and environmental factors that affect student learning. Learner profiles such as learning styles allow the teacher to understand how a student learns best: by doing, by listening, by working alone, in a space other than a desk, in bright light, dim light, and so on. Multiple Intelligence theory helps the teacher to understand the innate strengths the child brings into the classroom, such as verbal/linguistic or bodily/kinesthetic. A student's cultural background brings into the classroom behaviors, actions, and customs that may be very different from those of the teacher. It is important for the teacher to understand these differences so students are understood and not punished for certain actions or behaviors from the upbringing. By understanding the diversity within a classroom and how cultural differences may impact learning, a teacher can complement his or her instruction to a students preferred way of learning.

Teaching to children's strengths is supported by the work of Dunn et al. (1995), who reported increased academic achievement for students whose learning styles were accommodated within classrooms. Different learners can benefit most from varied forms of instruction due to the fact that all individuals possess different strengths in different areas. How a student learns best makes up his or her learning profile. To differentiate in response to student learning profile, a teacher addresses learning styles, student talent, or intelligence profiles. What innate strengths and interests children are born with make up their multiple intelligences. Although the two have distinct meanings, they are placed together in this literature review because of their relationship to a student's preferred way of learning. Since the term "differentiation" has become the expectation in education, many educators have used these terms interchangeably since they have overlap in their definitions. Combining them in this literature review will help the reader to compare and contrast the two terms and help clear some of this confusion between the two.

In a differentiated classroom, teachers adjust their teaching style to the learning strengths of the students. Research conducted by Dunn, Griggs, Olsen, Beasley, and Gormann (1995) revealed that instructional interventions designed to meet the learning needs of the students showed a statistically significant difference in achievement over those students not being accommodated. The longer the instructional interventions were practiced, the greater gains the students made. Harvard professor Howard Gardner first introduced the theory of multiple intelligences in the early 1980s. According to Armstrong (2003), "Gardner argues that traditional ideas about intelligence employed in

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educational and psychological circles for almost a hundred years require reform. In particular, he suggests that the concept of a "pure" intelligence that can be measured by a single I.Q. score is seriously flawed" (p. 12). Gardner has identified nine intelligences and has indicated there may be many more that people possess at varying levels. Gardner's theory is that the variability to which people possess a certain intelligence determines how they learn and interact best with other people.

Through these nine intelligences, students take in information in varying degrees. When a lesson is a match to a student's innate strengths, the student can better learn the information and make applications. When students learn new and difficult information through their strongest learning styles, scores and attitudes will greatly be improved. Students can concentrate longer and absorb and retain information best if skills are introduced in their best strength. In a differentiated classroom, the teacher takes the multiple intelligences into account when designing lessons and activities that go along with the lessons. The learning needs of the students are met through the variation in content delivery and group structure. According to Beck (2001):

As teachers become aware of their students' learning style preferences, they are more likely to make an effort to accommodate these differences. This effort is likely to produce more effective instruction and higher student achievement for several reasons. First, the students are more apt to respond favorably to the subject matter if it is presented in a manner that accommodates their learning preferences. Second, in addition to higher achievement levels, the students' positive attitudes are likely to lesson the amount of indifference and behavioral problems. Third, when teachers employ a variety of strategies to address various learning styles, they broaden their own instructional versatility and creativity. (p. 4)

It is important that both the teacher and student understand the importance of multiple intelligences and learning styles. When both the teacher and student understand the learning strengths of the child, appropriate choices can be given on how best to design and complete a lesson. Most teachers design lessons and instruction to their own predominant intelligences. If the student does not possess the same strengths as his or her teacher, he/she will not be acquiring the information as easily as he/she could if the instructional method was adjusted to him or her. Gardner (2003) summarized the first eight intelligences as follows:

- Linguistic Intelligence. The understanding of the phonology, syntax, and semantics of language, and its pragmatic uses to convince others of a course of action, help one to remember information, explain or communicate knowledge, or reflect upon language itself.
- Bodily-Kinesthetic Intelligence. The ability to control one's bodily motions and the capacity to handle objects skillfully.
- Spatial Intelligence. The ability to perceive the visual world accurately, to perform transformations and modifications upon one's initial perceptions, and to be able to re-create aspects of one's visual experience (even in the absence of the relevant physical stimuli).
- 4. Musical Intelligence. The ability to understand and express components of music, including melodic and rhythmic patterns through figural or intuitive means (the natural musician) or through formal analytic means (the professional musician).

- Logical Mathematical Intelligence. The understanding and use of logical structures, including patterns and relationships, and statements and propositions, through experimentation, quantification, conceptualization, and classification.
- 6. Intrapersonal Intelligence. The ability to access one's emotional life through awareness of inner moods, intentions, motivations, potentials, temperaments, and desires, and the capacity to symbolize these inner experiences, and to apply these understandings to help one's own life.
- 7. Interpersonal Intelligence. The ability to notice and make distinctions among other individuals with respect to moods, temperaments, motivations, intentions, and to use this information in pragmatic ways, such as to persuade, influence, manipulate, mediate, or counsel individuals or groups of individuals toward some purpose.
- 8. Naturalist Intelligence. The capacity to recognize and classify the numerous species of flora and fauna in one's environment (as well as natural phenomena such as mountains and clouds), and the ability to care for, tame, or interact subtly with living creatures, or with whole ecosystems. (p.13-14)

The most recently discovered intelligence is the Existential Intelligence. A student who is very sensitive and has the capacity to tackle deep questions about human existence holds this intelligence. This type of student reflects on concepts and applies them to the human existence, such as the meaning of life, why do we die, and how did we get here.

A Review of Student Motivation

Student motivation plays a key role in student learning and willingness to learn. Torrence (1962) demonstrated that students who are given the opportunity to learn what they want to learn, instead of what they have to learn, fall in love with their topics, go beyond the level of interests or hobbies, and develop passions. Allowing choices is one way to increase student motivation. In a differentiated classroom, contracts can be written between the teacher and the student, allowing the student to create an individualized learning option related to the standard being addressed. By developing learning contracts, students are given an opportunity to pursue a topic of interest to them, or a topic in a way that is interesting to them. They still learn the same information as the rest of the class but in a way that matches their interests and learning needs. According to Uresti et al. (2002), students who were given a choice in their learning and whose instruction met their learning needs showed significant improvement on standardized tests.

Keller (1987) has identified four major aspects of motivation that schools can influence: attention, relevance, confidence, and satisfaction. One knows that different children have different interests. Adjusting a learning situation to best meet the interests of the learners may be necessary to effectively engage students in the lesson and to increase their motivation. Flowerday and Bryant (2004) concluded that giving students a choice increases positive emotions, is important because it teaches decision making, increases their interest in learning, and increases learning. When products are differentiated, students are given a choice on how they demonstrate mastery of the standards. By giving students a choice, the teacher is developing responsibility and ownership in the students. Students take a greater responsibility in their learning because they have a vested interest in what they are producing. Student readiness and learning profiles also fit into their final product. Choices in learning give students the opportunity to create a product that is a reflection of their interests and readiness. Brooks reported that learning styles are a primary component of the choices students make. Products that students choose to show their learning will also be a direct reflection of their learning profiles. When given a choice, students will work hard to showcase their accomplishments. Greenwood (2002) concluded that for academic motivation to remain high, students must be successful and challenged. Whole-class instruction provides neither success nor challenge for about two-thirds of any heterogeneous classroom. Learning contracts and choices reverse this situation by giving the students the ability to study a topic in a way that best matches their individual profile. When this is allowed to happen, true learning can take place.

Summary

This literature review provided the necessary information to understand what a true differentiated classroom consists of. Many practices are part of a differentiated classroom. By developing an understanding of these practices, the researcher was able to develop a clear picture of what information to include on survey instruments and what to look for during classroom observations. This information, along with the components of the conceptual framework, became the foundation of this study design.

CHAPTER III: RESEARCH DESIGN AND METHODS

Introduction

According to O'Sullivan (1994), accommodating one's learning style through complementary teaching or counseling interventions resulted in significant academic and attitude gains from children of all cultural groups. Sternberg, Torff, & Grigorenko (1998) concluded that when students are matched to instruction suited to their learning patterns (e.g, analytic, creative, practical), they achieve significantly better than comparable students whose instruction is not matched to their learning patterns. Sternberg and his colleagues concluded:

...learning profile adds to our understanding of student performance and should be taken into account in classrooms in both instruction and assessment. The diversity of styles among students implies that students need a variety of means and assessments to maximize and show to an optimal extent, their talents and achievements. (p. 310)

According to Campbell and Campbell (1999), a multiple intelligence focus on instruction increased test scores for students in six schools with very different demographics. Campbell and Campbell also noted that students from varied cultural and economic groups all seemed to flourish in this type of setting. Tomlinson & Allan (2000) suggested that no single approach works best with all students. Classrooms work best when students and teachers collaborate to develop multiple avenues to learning.

Purpose of the Study

Differentiated instruction is a compilation of the best research and instructional strategies for teaching and learning. These practices have been organized in the conceptual framework (Figure 1, p. 10). The components of this framework help to establish a student's learning profile. The purpose of this study was to answer the research questions:

- Does differentiated instruction lead to increased student achievement and does this depend on gender or poverty?
- 2. Are there any components of differentiated instruction that have a greater impact on student achievement than others?

Due to the fact that differentiation is a compilation of best practices discussed in Chapter II, it was hypothesized that the more differentiated strategies the teacher used, the greater the academic achievement of the student.

As stated in Chapter I, the problem under study was to determine if differentiated instruction would lead to increased student achievement and if there was a relationship between the amount of differentiation taking place and student achievement. A wellorganized investigation was needed to determine if differentiation was taking place at all and to what degree in each of the classrooms, and what components of differentiation could be articulated by the students and observed by the researcher. Careful data collection through classroom observations either substantiated how the teachers responded to the survey or refuted their answers.

This chapter describes the quantitative and qualitative research procedures and the selection of an appropriate methodology design for this research.

Methodology

Review of research supported the fact that both quantitative and qualitative research methods were suited to this study. Quantitative data collection was first conducted as a means to outline broad relationships from the data. Results from the quantitative findings guided the researcher on how to structure the qualitative design. From the broad relationships discovered through quantitative measures, qualitative methods were used to explore these broad relationships further and search for explanations that could be unveiled only by classroom observations and interviews. According to Rossman and Wilson (1991), a combination of qualitative and quantitative study methods allows the researcher to confirm or collaborate findings via triangulation. According to Bogdan and Biklen (1982), qualitative research has the following characteristics:

- 1. The natural setting is the direct source of data and the researcher is the key instrument.
- 2. Is descriptive in nature.
- 3. Is done by those who are concerned with process rather than simply the outcomes or products.
- 4. Requires the researcher to analyze his or her data inductively.
- 5. States that meaning is essential. (pp. 27-30)

Findings borne out by statistical analysis can be enriched in their detail by the stories of the participants. Using a combination of qualitative and quantitative data allowed the researcher to discover new insights in the study. Quantitative research methods allowed the researcher to analyze achievement data for significant variations between classrooms. Given the scope of this study, neither qualitative nor quantitative means of data collection alone would have been sufficient to determine if differentiated instruction did or did not affect student achievement. According to Filstead (1979), the more one has multiple impact measures qualitatively understood and linked to qualitative measures the greater the probability of understanding.

Qualitative techniques allowed the researcher to understand the relationships between the students' attitudes towards school and perceived abilities between their actual achievement scores. Qualitative research will be descriptive in nature and will emphasize the processes that occur within the classroom that aid in shaping students' attitudes and beliefs. Quantitative techniques have been able to show by means of pre and post testing that changes occur to a set level of statistical significance. Qualitative strategies have suggested just how the expectations are translated into daily activities, procedures, and interactions. In order for qualitative research techniques to be valid, the researcher must establish the framework as to the how and what type of data will be collected. A mixedmethod design was selected to allow for multiple measures of data analysis. Cook and Reichardt (1979) stated three reasons in support of the use of a dual approach to research:

- 1. Comprehensive research should include both process and outcome analysis.
- 2. Use of both types allows each method to build upon the other.
- 3. Use of multiple techniques provides triangulation of the "underlying truth" separating the wheat from the chaff. (pp. 21-23)

Quantitative Design

A correlation analysis was conducted for each independent variable to determine if the number of occurrences of differentiation had an effect on student achievement. Student achievement was measured by the students scale score on the Michigan Educational Assessment Program (MEAP) for math, reading, writing, and the combined English Language Arts scores (reading and writing combined). Scaled scores were collected because they take into account the differences in difficulty of items and are calculated to provide a more precise measure of knowledge or skills.

T-Tests were used to reduce the variability of the data. To check for any significant differences that were inherent between the differentiated and non-differentiated classrooms, t–Tests were run. The t-Tests were used to compare the means of the outcome variables for the differentiated and non-differentiated classrooms and to determine if differentiated classrooms had higher levels of achievement on the Michigan Educational Assessment Program scores in math, reading, and writing, and combined ELA scores.

The t-Test was run twelve times total: once each to compare the means of the four student achievement variables (reading, writing, ELA, and math) between groups based on gender, SES (poverty vs. no poverty), differentiated, and non-differentiated classrooms.

The null hypothesis for each was as followed:

Reading

Mf = MmMp = MnpMd = MndWritingMf = MmMp = Mnp

Md = Mnd

ELA

Mf = Mm

Mp = Mnp

Md = Mnd

Math

Mf = Mm

Mp = Mnp

Md = Mnd

Where:

M = mean

f = female

m = male

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P = poverty
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np = no poverty
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d = differentiation
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nd = no differentiation

The seven outcome variables are defined as follows:

- Pre-Assessment (PA): A formal (pre-test) or informal way (observation, student self-reporting) of determining the readiness level of a student.
- Readiness: The academic level of a student in any given topic at a given time.
- Interest: The area in which the student has the most curiosity for learning.
- Learning Profile: The way in which a student best processes information.

• Learning Style: The preferred way of learning such as bodily kinestic, tactile, linguistic, visual, auditory, and spatial.

To determine if there were causal relationships between the differentiation taking place in each classroom and the impact that differentiation had on student learning, a regression analysis was run. Since student data were categorized as continuous in terms of student test scores and because the researcher dummy coded the differentiation data, a regression analysis was the appropriate statistical technique to use because it is designed to show any causal relationships that exist.

Regression Analysis Formula is:

Y = A1X1 = A2X2 = A3X3 = A4X4 = A5X5 = A6X6 = A7X7 + B

where:

Y = test score

X1 = PA X2 = DR X3 = DI X4 = DLP X5 = FG X6 = CL X7 = LS A1 = effect of PA on Y A2 = effect of DA on Y A3 = effect of DI on YA4 = effect of DLP on Y A5 = effect of FG on Y

A6 = effect of CL on Y

A7 = effect of LS on Y

B = Y intercept; test score where no differentiation occurs

The regression analysis was run for each of the test scores (math, reading, writing, ELA) to each independent variable. Results are shown in detail in Chapter IV, Tables 2-5. The SPSS statistical program was used to analyze all data.

The hypothesis was that the higher level of x occurring, the higher the level of achievement would be.

The components of differentiation were coded in an effort to make data collection manageable. Each time an occurrence of differentiation was observed or responded on the teacher and student survey, it was recorded on the coding sheet (See Appendix A). This coding sheet was also used by the researcher for classroom observations. The development of this type of recording instrument made the triangulation of data easier to analyze. Table 1 is a summary of the codes that were used to determine the frequency and what type of differentiation, if any, occurred.

Table 1

Codes Assigned To Differentiated Instructional Strategies

Description of Differentiation Indicator	Code
Pre-assessment Administered	РА
Differentiation by Readiness	DA
Differentiation by Interest	DI
Differentiation by Learning Profile	DLP
Flexible Grouping	FG
Student Choice in Learning	CL
Assignment Based on Learning Styles	LS

Each code represented in Table 1 was treated as an independent variable. A regression analysis was conducted to determine if the frequency of any of the variables, and variables occurring in combination, had an effect on student achievement as represented in the MEAP scores. MEAP scores were treated as continuous and were considered the dependent variable. Since the researcher was looking at continuous data in terms of MEAP scores and because the researcher dummy-coded the differentiation data, a regression analysis was the appropriate statistical technique because it is designed to show any causal relationships that exist.

Qualitative Design

This study provided a descriptive account of seven classrooms and the relationships to differentiated instruction and student achievement. This study was considered a double

blind study because the researcher had no knowledge of which classrooms were receiving differentiated instructional strategies prior to initial data collection, and no pre-test data for the students was available.

According to Denzin (1988), triangulation of data allows for the application and combination of several research methodologies in the study of the same phenomenon.

To allow for triangulation, three types of data were collected: teacher surveys, student surveys, and researcher observations (see Appendix A). A researcher rating sheet (see Appendix A) was also developed to easily record occurrences of differentiation.

Sample Selection

The school for this study was chosen by a preplanned method. The intent was to keep the sample within one building to eliminate as many extraneous variables as possible. The researcher had easy access to the building as an employee of the district. Permission was first granted by the building principal to conduct the research within the building. Due to the fact that this building was an upper elementary building, all participant teachers were housed together. There were nine fourth grade classrooms within the school. Seven of the classrooms voluntarily agreed to be part of the study. The teachers signed a consent form (Appendix B) that explained the parameters of the study. Seven of the nine teachers volunteered. One of the classrooms was a fourth/fifth split.

After the identification of the classrooms was established, voluntary student consent forms (Appendix B) were mailed to the parents of these students. The parents of the students within the split classroom also received the consent form due to the researcher's presence within the room. None of the fifth grade data was included in the research. Students returned the consent forms to their teachers, either consenting or opting out of the study. The teachers were instrumental in keeping track of the forms and reminding students to return them. This school and the seven classroom teachers were selected for this study based on the following criteria: All teacher participants taught fourth grade within the same elementary school.

- 1. All teachers taught fourth grade within the same elementary school building.
- All teacher participants were given the option of participating in four days of differentiated instructional strategies during the 2004-2005 school year.
- 3. All teacher participants were given the option of participating in this study.
- 4. All teacher participants willingly and fully allowed the researcher into their classrooms.
- 5. All student participants were given the option of participating in this study.
- 6. The building principal assigned students to each of the classrooms prior to the start of the school year in an effort to create heterogeneous room assignments.
- Teacher participants were responsible for the instruction of every content area. No tracking or rearrangement of students to different classrooms occurred because of ability.
- The researcher was an employee of the district who already had access to academic data.
- 9. The researcher had established a trusting relationship with the participants through previous and ongoing working relationships.

Qualitative Data Collection Methods

A review of the literature on best practices in education helped the researcher to determine what instructional strategies to look for in each of the classrooms and to develop the questions for the student and teacher survey instruments. The literature review also helped determine what differentiation variables would be measured in the quantitative piece of this study.

An initial visit with the principal was conducted to discuss the procedures that would be used to gain access to the classrooms and to create a schedule for observations. At this initial visit, a schedule was established for the observations of each participant room. The observations took place over a five-week period, which allowed the researcher to gain entrance to each of the classrooms two times. The teacher participants were aware of the schedule. The schedule was established so each visit would occur during a core subject of either math or language arts instruction. The duration of each observation was approximately one hour.

Interviews with the teacher participants occurred after the analysis of the teacher surveys, student surveys, and classroom observations were completed. This helped the researcher to determine what types of questions would be asked of the teacher participants.

Quantitative Data Collection Methods

Since the average sample size was n= 27, it was necessary to consolidate data to increase the sample size. This was accomplished by combining classroom data in which the teachers had voluntarily received differentiation training and those who did not.

Instead of analyzing seven sets of classroom data, two groups were established: classrooms whose teachers received differentiation training vs. classrooms whose teachers did not receive the training. Quantitative data collection involved the student and teacher survey documents and the collection of MEAP scores that were administered in late January, early February of the 2004-2005 school year.

Prior to any observations, the teacher and student survey documents were distributed to each participant. Both surveys were left in the teacher mailboxes with directions for how to fill out the survey and how they would be collected. The teacher surveys were collected by the researcher the following week. Student surveys were administered in each participant classroom on the same day. The researcher collected the student survey documents at the end of that day. Students who were absent the day the survey was administered were allowed to take it during the first observation day of the researcher. The teachers were told not to define any words for the students on their survey documents. If differentiation were occurring in the classrooms, students would know what these terms meant, such as learning styles, multiple intelligences, and flexible grouping.

Reliability

According to Miles and Huberman (1994), reliability is defined as the consistency of scores or responses obtained by the same individuals on different occasions on different sets of equivalent items. To achieve reliable results from the survey documents and data collected, the researcher organized data in the following manner:

• In order to develop questions for the survey documents, the researcher needed to gather background information on how differentiation was being used in the

classrooms. After meeting with the principal, it was determined that students in classrooms that were receiving differentiated instruction would understand what the term differentiation meant and that this term would not be defined for the students.

- Upon initial data collection from the survey instruments, cross classroom comparisons were made to check the students' understanding of the questions. It was determined that the students in classrooms that were receiving some form of differentiation knew exactly what the term meant. Part of the teacher training involved informing the students of the strategies that were being used, including the term "differentiation."
- Data quality checks were made for bias.
- The triangulation of data allowed the researcher to compare answers from different perspectives.
- The researcher was cognizant of both internal and external validity.
- The role of the researcher needed to be clearly defined. As Assistant Superintendent for the district in which the study was occurring, the researcher had to make the participants understand her role in this study.

Validity

According to Gay (1981), "validity is the degree to which the test measures what it is supposed to measure" (p. 137). In this study, data were triangulated as a means to validate research findings. Webb et al. (1965) coined the term "triangulation" as used to support research findings through independent measures that point to the same conclusions. According to Cook and Reichardt, "The theoretical and practical

development of qualitative measures, which can be integrated with quantitative approaches is essential" (p. 97). Findings from the teacher surveys, student surveys, and researcher observations were triangulated. In this study, construct validity was established by the triangulation of multiple data sources. The triangulation of data from interviews, surveys, and observations was used to establish construct validity. External validity asks the researcher if the results of the study would be similar if done with another similar population. Internal validity seeks to identify the credibility of the conclusions drawn from experimental treatments under certain, well-defined circumstances (Eisenhart & Howe, 1992). External validity was established through the sampling model chosen. The fact that all study participants were in one school building eliminated any between-school differences.

Two visits were made to each classroom with the intention of observing any of the seven variables of differentiation that might be present. Each observation lasted between forty-five minutes and one hour. When evidence of the differentiation variables was observed, it was recorded on a data sheet. The data sheet was then compared to results of what the students answered on their surveys and the teachers on their surveys. This triangulation of data resulted in a qualitative analysis, which is presented in detail in Chapter V.

Summary

The purpose of this study was to determine if differentiated instruction, or any component thereof, has a positive effect on student achievement. This study used a mixed method design. It was determined that neither quantitative nor qualitative data alone could produce the results necessary for evaluation or determination whether

differentiated instruction increases student achievement. Through the use of teacher surveys, students' surveys, and classroom observations, data were triangulated and summarized in Chapter V. The triangulation of data was used to help explain why certain variables seemed to be a common thread throughout the data analysis. Through a regression analysis, casual relationships were discovered between MEAP test scores and the differentiation variables. Chapter IV reports the analysis and results of the quantitative data.

CHAPTER IV: ANALYSIS AND RESULTS OF QUANTITATIVE DATA

Introduction

This study was conducted to help the researcher identify the components of differentiation that had the greatest impact on student learning. The components, or independent variables, were pre-assessment, differentiation for readiness, interest, learning profile, flexible grouping, choice, and learning style. At the time of this study, eight teachers were assigned to the fourth grade level; seven volunteered to participate. Intensive differentiation training occurred during the 2003-2004 school year. The training was voluntary and consisted of four full days spread throughout the school year. Of the seven voluntary teacher participants in this study, five attended the four-day training. The findings of this study were collected to answer the following research questions:

- 1. Does differentiated instruction lead to increased student achievement, and does this depend on gender or poverty?
- 2. Are there any components of differentiated instruction that have a greater impact on student achievement than others?

The first question could be answered by using only quantitative data but without an understanding of what really occurred in each of the classrooms to impact student achievement. The qualitative data analysis presented in Chapter V will be used to help explain what occurred in these classrooms relative to this achievement. As described in Chapter III, two statistical analyses, t-Tests and a regression analysis, were conducted to the 95% confidence level on the student achievement data.

t-Test Results

Tables 2-4 show the results for the t-Tests analysis. The null hypothesis was:

There will be no achievement differences between the means of each group:

differentiated vs. non-differentiated classrooms, poverty vs. no poverty, and female vs. male.

Table 2

Results of t-Test for Differentiated vs. Non-Differentiated Classrooms

Content Area	N	Mean Differentiated	Mean Non- Differentiated	Standard Deviation	t	Sig.
Reading	113	568.58	561.69	29.213	-1.049	.298
Writing	113	519.78	519.33	17.619	143	.886
ELA	113	544.19	540.53	18.323	941	.350
Math	113	555.59	562.98	24.937	1.431	.157

Table 2 summarizes the t-Test data for differentiated vs. non-differentiated classrooms. The results of this t-Test indicated that there were no significant differences in student achievement scores between the differentiated vs. non-differentiated classrooms to the .05 level. The null hypothesis was accepted as no achievement differences with found between the two groups in this instance.

Table 3

Content		Mean	Mean Non-	Standard		
Area	Ν	Differentiated	Differentiated	Deviation	t	Sig
Reading	30	551.10	580.05	33.193	-2.875	.005
Writing	30	514.50	520.84	18.678	-1.852	.066
ELA	30	532.80	545.46	21.185	-3.179	.002
Math	30	548.57	559.93	23.304	-2.069	.040

Results of t-Test for Poverty vs. No Poverty

Table 3 summarizes the t-Test data for poverty vs. no poverty. The results of this t-Test indicated that there were significant differences in student achievement scores between the students with poverty vs. students without poverty in the areas of reading, ELA, and math scores to the .05 level of significance. The null hypothesis was rejected for these instances.

Table 4

Content		Mean	Mean Non-	Standard		
Area	Ν	Differentiated	Differentiated	Deviation	t	Sig
Reading	87	567.72	562.79	38.296	881	.380
Writing	87	521.38	517.60	17.214	-1.420	.158
ELA	87	544.552	540.21	22.4475	-1.303	.195
Math	87	554.64	561.54	30.860	1.648	.101

Results of t-Test for Female vs. Male

Table 4 summarizes the t-Test data for gender. The results of this t-Test indicated that there were no significant differences in student achievement scores between female and male students to the .05 level of significance. The null hypothesis was accepted for these instances.

Survey Results

Student and teacher survey results are presented in Figures 1-7. Student and teacher survey instruments are located in Appendices D and E, respectively. Survey results for each classroom are reported by individual student. Reporting the survey results by individual student allowed the researcher to further investigate student achievement in relationship to classroom observations and teacher interviews in the qualitative analysis in Chapter V.

Classroom 1, represented in Figure 1, was the split classroom. Only survey results for the fourth graders within that room were shared. The student surveys sought to gather information concerning the seven differentiation variables under study. Each time a student reported on his or her survey that an occurrence of a differentiated variable occurred, it was tallied by the researcher using the Coding Sheet (See Appendix A). Every student was then entered onto an excel spreadsheet, which contained the following information in each cell:

- Teacher number
- Student number
- Gender
- Free/Reduced Lunch
- Reading Score on MEAP

- Writing Score on MEAP
- ELA Score on MEAP
- Math score on MEAP
- One additional cell for each of the differentiation variables: PA, DR, DI, DLP, FG, CL, and LS

Figures 2-8 represent student responses on the survey instruments. Figure 9 represents the teacher survey results. The survey results will be discussed further in Chapter V as they were used for triangulation of data and to help frame the discussion of the qualitative analysis. To make meaning from the graphs, it was important to know which teachers attended the differentiation training and which ones did not.

Teachers who attended the training were:

1 2

- 3
- 5
- 7

Teachers who did not attend the training were:

4

6



Classroom 1 Student Survey Results

Figure 2: Student survey results for Classroom 1

The teacher in Classroom 1 participated in the differentiated instruction training. Students in this classroom reported the highest levels of differentiation around learning styles. Differentiation for readiness, interest, and choice were also seen as frequent strategies used in this classroom. The fact that the students felt that there was a significant amount of differentiation for readiness but low pre-assessment will be discussed in the next chapter.



Classroom 2 Student Survey Results

Figure 3: Student survey results for Classroom 2

The teacher in Classroom 2 participated in the differentiated instruction training. Students in this classroom reported frequent differentiation in the areas of readiness, interest, flexible grouping, choice, and learning styles. Pre-assessment strategies were also evidenced from the student surveys.



Classroom 3 Student Survey Results

Figure 4: Student survey results for Classroom 3

The teacher in Classroom 3 participated in the differentiation training. The students in classroom 3 reported high levels of differentiation for readiness, flexible grouping, choice and learning styles. Pre-assessment strategies were also evidenced from the student surveys.



Classroom 4 Student Survey Results

Figure 5: Student survey results for Classroom 4

The teacher in Classroom 4 did not participate in differentiated instruction training. Student survey results indicated high levels of choice and moderate levels of differentiation for learning styles. However, although most students sensed there was some form of choice occurring, the teacher survey did not indicate that choice was an option in assignments. Students did not report any kind of pre-assessment, which would help to explain minimal occurrences of flexible grouping. Answers were so inconsistent on the survey that the researcher determined that the students in this classroom did not understand the definitions of the differentiation terms. Because the teacher had not participated in the differentiation training, the students in this classroom were not likely to be familiar with many of these terms; and the survey results from this classroom may not be reliable.


Classroom 5 Student Survey

Figure 6: Student survey results for Classroom 5

The teacher in Classroom 5 participated in differentiated instruction training. The students in Classroom 5 reported more occurrences of pre-assessment than any other classroom. This would support the data that showed that flexible grouping was a common strategy used by teacher 5. Pre-assessment data would drive the organization of these grouping arrangements. Students also indicated strongly that differentiation for choice and learning styles was a strategy used often in this classroom.



Classroom 6 Student Survey Results

Figure 7: Student survey results for Classroom 6

The teacher in Classroom 6 did not participate in differentiated instruction training. In Classroom 6, as in Classroom 4, no form of pre-assessment was reported by the students. Pre-assessment data drives the instruction in a differentiated classroom. To organize flexible grouping, pre-assessment data would be needed. The teacher in this classroom likely allowed the students to, at times, choose their own groups. This would explain why students reported occurrences of choice and flexible grouping. Teacher 6 did not report using flexible grouping as an instructional strategy, so the students must have seen choosing their own groups as a form of flexible grouping.



Classroom 7 Student Survey Results

Figure 8: Student survey results for Classroom 7

The teacher in Classroom 7 participated in the differentiation training. All but one student in Classroom 7 indicated that some form of pre-assessment was taking place. All students in this classroom indicated that the differentiation variables of readiness, interest, flexible grouping, choice, and learning styles were used regularly.

Teacher Survey Responses





The teachers self-reported instructional strategies that they were using on an openended survey. Figure 8 represents their answers. These findings were consistent with student survey results for each classroom. Teachers who reported using differentiation strategies had students who reported using the same strategies. It is important to note that teachers 4 and 6, who did not attend the differentiation training, self-reported using few of the variables of differentiation in their classrooms, including the use of flexible grouping, which is common in most classrooms regardless of differentiation training. Knowing that teachers 4 and 6 did not frequently use the differentiation variables validates that the students' answers to the survey may have shown lack of understanding of the differentiation terms.

Regression Analysis Results

Results of the regression analysis are shown in tables 5-8. A regression analysis is valid and reliable if it meets three underlying assumptions:

1. The variables used in the analysis are normally distributed.

2. There are low inter-correlations among predictors.

3. The residuals from the regression are homescedastic.

The distribution of the variables, as shown in Appendix F, are normally distributed. Therefore, the first underlying assumption was met. Moderate to low correlations were found between predictor variables and, therefore, the second assumption was met (Appendix G). The scatter plots in Appendix H indicate that residuals are homoscedastic. Thus, the third assumption was also met and the regression analysis was valid.

The following tables show the multiple regression impact of the seven differentiated variables to achievement on the MEAP test scores in the content area of reading, writing, English language arts, and math. This analysis was done to the 95% confidence level. The null hypothesis was:

The regression coefficients for each content area— reading, writing, English Language Arts, and math— would be 0.

Table 5

X	А	SIGNIFICANCE
РА	.819	.848
DR	901	.690
DI	-6.580	.056
DLP	5.833	.286
FG	1.366	.529
CL	.944	.731
LS	8.694	.003

Multiple Regression Impact of Differentiation Variables to Reading Achievement

Table 5 shows the results of the regression analysis of all predictor variables to reading achievement. When all insignificant factors were removed; one differentiation variable remained. This is shown in Table 6. For all other independent variables, the null hypothesis was accepted.

Table 6

Multiple Regression Impact of Learning Style to Reading Achievement

X	А	SIGNIFICANCE
LS	1.399	.007

Table 6 shows the results of the predictor variable LS to reading achievement. After all insignificant factors were removed; Learning Styles was the only independent variable that remained. In this instance, the null hypothesis was rejected.

Table 7

Х	Α	SIGNIFICANCE
PA	-1.183	.602
DR	1.218	.312
DI	1.025	.573
DLP	1.925	.507
FG	.230	.842
CL	-3.515	.017
LS	.673	.673

Multiple Regression Impact of Differentiation Variables to Writing Achievement

Table 7 shows the results of the regression analysis of all predictor variables to writing achievement. When all insignificant factors were removed, nothing remained and the null hypothesis was accepted.

Table 8

Multiple Regression Impact of Differentiation Variables to English Language

Х	А	SIGNIFICANCE
РА	177.945	.945
DR	.154	.911
DI	-2.767	.185
DLP	3.911	.240
FG	.792	.549
CL	-1.294	.440
LS	3.910	.219

Arts Achievement

Table 8 shows the results of the regression analysis of all predictor variables to English language Arts achievement. When all insignificant factors were removed, nothing remained and the null hypothesis was accepted.

Table 9

Х	А	SIGNIFICANCE.
РА	1.244	.729
DR	-1.204	.528
DI	-6.345	.029
DLP	-2.318	.614
FG	3.113	.090
CL	307	.894
LS	2.504	.268

Multiple Regression Impact of Differentiation Variables to Mathematics Achievement

Table 9 shows the results of the regression analysis of all predictor variables to Math achievement. When all insignificant factors were removed; nothing remained and the null hypothesis was accepted.

Summary

The analysis of the quantitative data supported the fact that one independent variable, learning style, was statistically significant to reading achievement; when all other variables were removed, learning style remained. The results from the surveys supported the fact that teachers who had differentiation training had students who responded positively to the independent differentiation variables. Although achievement was not statistically increased with the use of the other variables, the students in the differentiated classrooms seemed to have a better learning experience than those who were not and were more excited about their work.

Teachers who did not have the differentiation training may have sporadically used the differentiation variables, as evidenced in the student surveys, but the intention was not there, and these random uses of the strategies did not carry over to increased student achievement.

The results in Chapter IV will be discussed further in Chapter VI through interview responses from the teachers and classroom observations. From the qualitative techniques, certain themes emerged that helped to explain what occurred in some classrooms to support these quantitative findings.

CHAPTER V: ANALYSIS AND RESULTS OF QUALITATIVE DATA

Introduction

A qualitative analysis helped to explain what was happening instructionally in each of the seven classrooms that may have had an impact on test data. Quantitative survey results shown in Chapter IV revealed several differentiated independent variables that were found to be consistent in the differentiated classrooms, as reported by both the teachers and the students. These variables were used in the development of questions for the teacher interviews as a means of understanding how and whether the teacher intentionally planned for differentiation around these variables and of understanding how the students and teachers defined these terms. Evidence of these same variables in practice was looked for during classroom observations. While t-Test results presented in Chapter IV showed only the variable of Learning Style to be significant to reading achievement on the MEAP test, the qualitative component explained the observable and documented findings from each of the classrooms that helped to explain what actually occurred in relationship to each of the independent variables. It was important for the researcher to gather this qualitative data, as it will be used in this chapter to explain probable relationships to the quantitative data that was presented in Chapter IV.

The philosophical orientation used to interpret this data was symbolic interactionism. According to Blumer (1969), symbolic interactionism is based on three simple premises:

The first premise is that human beings act toward things on the basis of the meanings that the things have for them. Such things include everything that the human being may note in his physical world—physical bjects, such as trees or chairs; other human beings, such as a mother or a store clerk; categories of human

beings, such as friends or enemies; institutions, as a school or a government; guiding ideals, such as individual independence or honesty; activities of others, such as their commands or requests; and such situations as an individual encounters in his daily life.

The second premise is that the meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows.

The third premise is that these meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he encounters (p. 2).

Symbolic interactionism is the appropriate philosophical and interpretive orientation for this study, because it sees meaning as evolving in the process of interaction between people. It became apparent during the teacher interviews that people had several meanings for the same phenomenon, depending who the respondent was. Often, words were used interchangeably and the teachers reported at times that they did not see a difference in instructional strategies, such as multiple intelligences and learning styles. The words *choice* and *interest* were also used as one. During one interview, the teacher referred to the use of choice charts as a way to differentiate. The teacher's experience of planning for the choices led her to respond that she was differentiating for choice; but in fact, the differentiation was framed around learning styles. This was a familiar activity for the teacher to prepare, as this teacher had differentiation training and knew the choices were framed around learning styles. Students saw the same activity based on interest because they got the opportunity to choose the activity of most interest to them. Each choice on the chart touched one of the learning preferences in the classroom. As an outside observer, it appeared the differentiation was around learning styles. Study participants created meanings based on their experiences and interactions with others. According to Blumer (1969):

The meaning of a thing for a person grows out of the ways in which other persons act toward the person with regard to the thing. Their actions operate to define the thing for the person. Thus, symbolic interactionism sees meanings as social products, and creations that are formed in and through the defining activities of people as they interact (p. 4-5).

The same type of phenomena was present in the non-differentiated classrooms. Teachers based their instructional methods on practices in which they may have had training many years earlier. The non-differentiated teachers explained that the way they placed students into groups was based on how the students scored on previous tests. In the teachers' minds, this was their way of pre-assessing. When teachers are allowed time to collaborate and discuss what works best with students, not only in their classroom but also throughout the school, new meanings of understanding best practices can be cultivated in a school. This collaborative time is important to break the isolation, so teachers can develop real understanding of the best instructional practices. Symbolic interactionism, fostered through the use of constructive conversations between teachers, can lead to new, precise meanings and understandings of instructional strategies and better implementation of these strategies at the classroom level. If all a teacher sees and understands is his or her own delivery of instruction, he or she cannot develop meaning and a clear picture of what should be occurring to benefit their students.

Seven classrooms participated voluntarily in this study. Qualitative data that were gathered consisted of the following:

- Researcher observations of classrooms
- Teacher interviews

Through the qualitative methods of classroom observations and teacher interviews, several themes became apparent, as the interactions of students to students and students to teachers were observed. The differentiation variables of choice and interest were used interchangeably throughout many lessons, and learning styles, although present in many lessons, were not mentioned to most of the students by the teachers. Developing an understanding of how the differentiation variables were perceived by the teachers and how the teachers explained the variables to their students will have an impact on the quantitative findings in Chapter IV. The ways that the students and teachers made meanings of the variables will help to explain why students answered the survey in the manner they did. The theme analysis and a discussion of the interpretation were used, in part, to determine which differentiation variables had the most impact on the student data.

Flexible grouping was reported frequently by students, as indicated on their survey responses, but, based on the data collected in Chapter IV, it was not proven to be a significant differentiation variable. The questions created for the teacher interviews focused around the variables that showed some level of significance in Chapter IV. The variables of choice and interest did show significance prior to the removal of all insignificant variables. This researcher was led to investigate these variables further to understand how choice and interest were used in a differentiated classroom.

Theme Analysis of Teacher Interviews

The teacher interviews were transcribed as a means of searching for themes occurring across each of the classrooms studied. The triangulation of data from the teacher interviews, classroom observations, and survey results will be discussed in Chapter VI. Several themes became apparent after reviewing the transcripts of the teachers' interviews: pre-assessment, both formal and informal, and the convergence of choice and interest in relationship to learning styles. Each theme is discussed in the next section of this chapter.

Multiple Uses of Pre-Assessment Data

Pre-assessment techniques were used frequently by the teachers who received differentiation training. Pre-assessment can be a formal (test) or informal (observation, student self-reporting) way of determining the readiness level, interest, prior knowledge and experiences of a student. Pre-assessment is the foundation of all differentiated classrooms and can take place in different ways. Two types of pre-assessments, formal and informal, became clear from this study. Each will be described in the next section of this chapter.

Formal Pre-Assessments Determine Readiness

Formal pre-assessment is what most practitioners would consider a paper/pencil assessment to determine a student's readiness. Knowing the child's readiness level helps the teacher plan for differentiation. According to Callahan (2005), proactive planning incorporates attention to accommodating the differences among students as part of the process of determining what will be taught and how it will be taught before a unit begins. Pre-assessment is the foundation for differentiation. Without pre-assessment strategies, the teacher would not have the knowledge of what or how to plan for differentiated instruction.

A formal pre-assessment theme became apparent during the teacher interviews. Teachers who demonstrated the most frequent and intentional differentiation techniques within their classroom all reported the use of formal pre-assessment strategies. The teacher survey data from Chapter IV showed that five out of the seven teachers—1, 2, 3, 5, and 7—regularly used formal pre-assessment methods to determine the readiness of their students.

Teacher 2 responded that pretests were used to see where they (students) fit into groups. This same response was also noted on the teacher survey sheet. Observations of this classroom revealed the use of differentiation by readiness to place students into flexible reading groups. During this lesson the teacher referred to the groups as readiness groups. Some students were observed reading novels and reading independently about the same theme as the rest of the class. Students needing more assistance were placed in leveled readers and worked frequently with the teacher, while students on grade level worked from the basal. Formal pre-assessments are needed when students are to be placed in groups by readiness and when teachers are looking for materials to appropriately challenge their students. Teacher 2, who was observed grouping students by readiness levels, reported:

All students thought they were doing something special and fun. The materials were written at a level of interest to them. I guess they felt unique because the lesson was tailored to their needs.

During a follow-up interview with Teacher 2, a discussion took place about the students' attitudes towards the readiness groups. Teacher 2 talked at length about how the students understand that sometimes they may be in a certain group based on their knowledge of the content. Students do not get locked into rigid grouping patterns, because the pre-assessment informs the teacher about where to place the students. As a student's skill level changes, which may increase due to his or her interest in a story, so does the grouping arrangement.

Teacher 5 self-reported using the most differentiation strategies on the teacher survey instrument. Two classroom observations supported the teacher survey results. During a spelling lesson, students administered the spelling words to a partner as a means of a formal pre-assessment. Students then created their own spelling lists based on the words they missed from the master list. No student in the class had an identical spelling list to study. Teacher 5 indicated that pre-tests, interest inventories, reading grades, and knowledge demonstrated on pre-tests were all used to determine the readiness of the students in classroom 5. Teacher 5 stated:

For math I also differentiate by readiness where I pretest the students. Anyone who wants to try out can take the pretest, and if they score 80% or higher they go into a challenge group.

Pre-assessment is crucial in instructional planning. According to Tomlinson and McTighe (2006), attending to a student's readiness allows for academic growth. Our learning expands when the work we do is a little too difficult for us and when a support system exists to get us past the difficulty (p. 19). This is consistent with findings from studies on brain-based learning. According to Kaufelt (1999), the goal (of a brain-

compatible classroom) is to create a climate that balances low threat with evidences of challenge for a wide range of students' interests and abilities. A brain-compatible environment ensures that learning is taking place. The use of pre-assessment ensures that students are placed at the correct readiness level helping to eliminate fear which causes downshifting in learning.

The theme of pre-assessment was only apparent with the five teachers who had taken the differentiation training. In classrooms where differentiation was not occurring, it was common for students to be placed into groups for readiness based on scores of previous end-of-unit tests. It was interesting to note that Teacher 4, who did not attend the differentiation training and had the lowest occurrence of the differentiation variables on the self-survey and student survey, reported the following when asked how student readiness was determined:

...my prior knowledge about them and grades on previous tests.

Teacher 1, who had the split classroom, reported:

Teaching could not occur in this diverse classroom if I didn't differentiate. I am constantly assessing where my students are and mixing 4th graders with 5th graders based on what they know about the topic. My 5th graders learn leadership skills by working with the 4th graders, and my 4th graders gain confidence working with older students.

Teachers 1, 2, 3, 5, and 7 consistently used the term *pre-assessment* during the interviews. In some of these classrooms, a formal paper/pencil pre-assessment was a choice for students, and they could try to challenge out if they wanted to; in other classrooms pre-assessment was mandatory in the area of spelling. All five of these

teachers used several methods for pre-assessing their students and also reported that most students were excited about the possibility of testing out of a topic, which raised their motivation in the classroom. This finding is consistent with the research of Tomlinson and McTighe (2006) that attending to the learning environment builds a context for learning. When students feel affirmation, affiliation, a sense of contribution, growing autonomy, accomplishment, and shared responsibility for the welfare of the group, the climate for learning is good (p. 18). Teacher participants also reported that it was not always the same students who were able to pass the pre-test, which reinforced the need of ongoing formal and informal ways of assessing student readiness to ensure that they were being appropriately challenged for each topic of study.

Informal Pre-Assessments are Ongoing and Diverse

Informal pre-assessment methods proved to be powerful tools to the differentiated classroom. Informal assessment techniques were used frequently both before and during the lessons. The use of informal pre-assessments allowed the teachers to constantly re-assess where their students were academically and to adjust the instruction accordingly. Currently in most classrooms, there is no adjustment period. Teachers teach and move on and spend a large portion of their time re-teaching those students who didn't get the skill the first time. Unfortunately for those students, the re-teaching is delivered in the same manner and the student still doesn't get it. Informal methods of assessment during lessons allowed the teachers in this study to discover additional information beyond readiness that is vital to planning a lesson. Informal pre-assessments helped the teachers to uncover unique interests of their students and find what really excites them about learning. Informal assessments were used frequently by the teachers who differentiated,

often times without the teachers realizing that they were gathering assessment data. To an outside observer, the use of informal assessments was clearly a strategy that was prevalent in the differentiated classrooms. Types of informal assessments included journal writing as a reflection piece, thumbs up or down to check for understanding and to find background information, and informal questioning during read-alouds. Teacher 5 was observed asking the students the following question:

How many of you have ever visited an aquarium? Although this information is not important to determine the readiness of the students as they prepare to read a book, it does inform the teacher that some students may need more information about aquariums and ocean life before they began reading. It also informs the teacher of who may need assistance in processing information from the book. The background information with which a student enters school is an important factor as to whether or not that child succeeds. When teachers understand where students come from in regard to their backgrounds, they are better prepared to set the stage for learning. Informal pre-assessment methods worked well in these types of situations. When teachers gathered information by informal means, it was not business as usual. Informal pre-assessment often changed the direction the teacher was heading. Teachers need to understand that this is an accepted method of lesson planning, and although it may seem more time-consuming, informal pre-assessment will save re-teaching after the unit is completed.

Journal writing is not often looked at as an informal way of assessing students, but it became apparent that this strategy worked for many of the teachers in this study. The journals also enlightened the teachers about special interests and whether the students

were developing an understanding of the work. Information taken from journals was used later to plan choice charts for class projects. Interviews conducted with teacher 7 indicated the use of pre-assessment for a variety of factors:

I use pretests to determine what my students already know about a topic. Preassessments are easy for me to do for math because the students either know how to do it or not. Pre-assessments in areas like reading and history tell me what each student is interested in and the knowledge they bring in to my classroom from home and other events.

When teachers understand what interests their students, lessons can be created that foster high interest and increase student motivation. Teacher 1 self-reported that student readiness was determined by informal discussions and conversations with the students. This is consistent with the instructional strategies of a differentiated classroom. Without ongoing pre-assessment techniques in place, students can be locked into rigid ability groups based on nothing more than the teacher's perceptions of the child. Teacher 5 reported:

Before I learned these instructional strategies I had placed students into groups incorrectly, sometimes for the wrong reasons.

Unfortunately, the above statement rings true for most classrooms. How often are students grouped inappropriately because they don't pay attention, are likely to interrupt with outbursts, or are placed into accelerated groups simply because they turn in all of their work on time? According to Callahan (1999):

Proactive planning incorporates attention to accommodating the differences among students as part of the process of determining what will be taught and how it

will be taught before a unit begins. Teachers are prone to reactive planning. In reactive planning, the teacher responds when the learner fails to answer questions (p. 3).

The more information a teacher can gather on his or her students, the more likely there is to be a match for the learning. When used properly, pre-assessment techniques will guide educators to make informed decisions about student learning. This in turn will create a brain-compatible classroom where students feel safe and learning flourishes.

Convergence of Choice and Interest in Relationship to Learning Styles

During the teacher interviews, it became evident to the researcher that the words *choice* and *interest* were used interchangeably, especially in relationship to differentiating for learning styles. This study sought to answer the following research questions:

- 1. Does differentiated instruction lead to increased student achievement?
- 2. Are there any differentiation variables that lead to higher student achievement than others?

Because the differentiation variables, choice and interest, and learning styles were used interchangeably by the participants in this study, it would be insufficient to only use the quantitative survey data to find the answers to these questions. One must look further for relationships between the variables to understand what really took place within these classrooms.

Research on learning styles confirms that when accommodated for in the classroom, there is a positive effect on student achievement. Whereas differentiated instruction focuses on whom we teach, where we teach, and how we teach, knowing students' learning styles allows the teacher to understand when, where, and how to teach. A learning style is a preferred way in which a student takes in information and completes tasks. According to Dunn et al., instructional strategies designed to meet the needs of students resulted in a statistically significant difference in achievement by those students over those students not being accommodated. This finding is consistent with the data in Chapter IV in regard to learning style and reading achievement.

The teachers observed in this study sought to meet their students' needs in one major way, choice charts. Choice charts were the most frequently used strategy for the implementation of differentiation and, according to the teachers, were the easiest of the differentiation variables to implement. The teacher participants who did not administer any type of learning styles inventory thought that choice alone would direct the students to the learning style preference. Regardless of whether this statement can be proven, students repeatedly demonstrated consistent choices on the selection of assignment types from the choice charts. Students were not observed selecting an assignment just because they had not used that type of project before. According to the teachers, the students' selection of choices remained consistent throughout the year. Determining if students selected choices that were a match to their learning style was not part of this study, but would be beneficial to know in order to validate the teacher participants' beliefs about this topic.

During the interview with Teacher 3, the following was noted:

The more choices I give my students, the more motivated they are to learn. They enjoy picking an activity that piques their interest.

Choice charts were created by these teachers to allow students to choose a project that was a match to his or her learning style. Regardless of whether students took a learning styles inventory in their classroom, the teachers felt that the choice charts allowed students to select an activity that was a best match to their preferred way of learning. Having students select an activity based on their interests and learning strengths gave them greater motivation to demonstrate their knowledge. Teachers 1, 5, and 7 selfreported on their survey instruments that they administered a learning styles inventory to the students in their classroom. Teacher 7 also indicated that student groups are sometimes formed intentionally by student learning style.

During an observation in Classroom 7, students chose from a learning style choice chart how they wanted to complete an assignment. Having Teacher 7 call this a "choice chart" of learning styles made the students think they were choosing an activity that was of interest to them. They were, but it was also a match to their learning style. The interchanging of the terms *learning style, choice*, and *interest*, was apparent in all of the classrooms. Each time students were given a choice as to how to complete an assignment based on learning styles, the teachers called the assignment "free choice," or students were told to pick the one that they were most interested in. When Teacher 7 was asked how differentiation is developed for learning styles, the response was as follows:

I give the students choices as how they want to complete the assignment, sometimes from a choice chart or they can pick their own way if I think it will work with the lesson.

The follow-up question was asked to determine how the teacher thought the students selected an option. To determine if learning style had an effect on student achievement, it was important to conclude that students really were selecting options that matched their learning profile. Teacher 7 was asked if the students chose a task based on what their

friends picked or if they chose what their learning style strength really was. The response was as follows:

At first the students wanted to be with their friends, but as time went on they realized that was not necessarily the way to go. I now see students truly choosing an assignment based on their learning style strength because that is the most interesting and creative way for them to work.

Teacher 3 had similar views on assignments based on learning styles.

With the novel unit, I've created an activity chart that they can choose from, so again it is based on their interests, on how they want to demonstrate they understood the contents of a certain chapter.

During the interviews the teachers were asked to tell what they thought was the definition of *learning styles*, and whether they saw any difference between learning styles and multiple intelligences. Most of the teachers thought there should be a difference but really could not articulate what difference. This made it clear to the researcher that differentiation terms that have different meanings were often used interchangeably within the classrooms. The terms *learning styles*, *multiple intelligences*, *choice*, and *interest* were included. Teacher 5 responded to the above question in the following way:

I would define *learning styles* according to the multiple intelligences, which for example... we just finished reading this one book and I gave them a choice chart of nine different choices. It was according to the learning styles, so my musical people always chose to write a song that goes along with this and explain why because that was the most interesting to them.

Teacher 3 answered the same question as follows:

I guess I have to be honest and say I have not really separated the two. I look at them as one and the same.

Although it was apparent that four of the seven teachers (1, 3, 5, and 7) intentionally designed lessons around learning styles, the explanation to the students of what they were doing could have been vastly confused because the teachers had so many different names for differentiating by learning style. Student survey data from classrooms 1, 3, 5, and 7 indicated that these students felt like they were getting both high levels of differentiation by choice and learning style. Interest was slightly less but ranked higher than the other differentiation variables self-reported by the students.

In this study, learning style was proven to be statistically significant to reading achievement as reported in Chapter IV. This was an area into which the researcher wanted to look further, using qualitative methods of data gathering to help explain why and how this was occurring. Teachers were asked specifically how they differentiate for reading. The teacher interviews indicated that differentiation in reading was based on learning styles, including students making choices as to how they could demonstrate their knowledge of the reading (choice charts). Each of Teacher 5's students passed the MEAP test in the area of reading; she was the only teacher in the building who accomplished this. When asked specifically how reading lessons were planned, the response was:

For reading I have a choice chart, and we have reading groups that are based on readiness, and we meet separately, so it's really based on readiness Then afterwards, when they do activities, I try to incorporate more. Like with the choice chart, I can see that some people want to write, want to make a recording and play it for the class. I even had one student write an advertisement and act it out for the class.

This response indicated that many of the variables investigated in this research were incorporated into this one lesson. During this particular reading lesson, Teacher 5 pre-tested to determine readiness, placed students into groups, created activities based on learning styles, and gave students choices that were interesting to them.

During the interviews with the teachers, it became apparent that other teachers went to Teacher 5 for ideas and help with differentiating their lessons. Several responses included soliciting advice or help from this teacher. Teacher 3 was asked how lessons were developed for learning styles. The response was as follows:

I try to give the students as many choices as possible. I get a lot of the activities from Teacher 5. The choice charts are helpful but I do adjust them to activities I want my class to do. Whenever I have a question, I ask Teacher 5 for help.

Classroom 5 was the only room where all of the students passed the MEAP test in the area of reading, and all but two passed the math. That this teacher differentiated reading instruction using most of the differentiation variables and had established differentiated lessons for math helped to answer the following research question: Does differentiated instruction lead to increased student achievement?

Classroom 5 was interesting to observe because of the established routine and independence on the part of the students for their learning. Although other classrooms had differentiated activities, differentiation was not embedded into the culture of the rooms. Classroom 5 appeared to be a room truly dedicated to differentiation. During an observation of this class, students were observed working in a challenge math group.

Part of this classroom routine was that students in the challenge group could not interrupt the teacher when the rest of the class was receiving instruction. The students in this room signed a social contract, which described the routine and expectations of being part of a challenge group. Students were observed solving their own problems or seeking help from other students before going to the teacher. Although, when they had a question with which they needed help, they worked this out as a team. One of the students was heard saying that they couldn't bother the teacher right then, as she was helping someone else. Anchor activities were also in place to keep the students on task after the completion of an assignment. It was apparent that the students knew to select an anchor activity instead of going to the teacher and asking what to do next.

Instructional strategies observed for accommodating students learning styles were perceived as choices by both the students and the teachers even though the teachers knew they were differentiation by learning styles. The word *choice* was used repeatedly, both when the researcher was in the classroom observing and during the teacher interviews. During an observation in Classroom 7, the teacher asked the students more than once to choose the activity that was the most interesting to them. Some students worked alone, some in groups. The interesting part of the observation was that the students' choices of how to demonstrate their knowledge were based on their learning preference, which took into account their interest and learning styles. In this particular classroom, the students completed a learning styles inventory and appeared to have a good grasp on where their strengths were. Teacher 7 responded to the question "How do you differentiate for reading?" by saying the following: Student SRI (pre-assessment) scores tell me their reading level. I have leveled readers to accommodate all types of reading levels, so I let my students choose what books they want to read out of the leveled readers that match their ability. Some students are interested in different types of stories, so they are more likely to enjoy reading if I let them pick a book that is interesting to them.

During an interview with Teacher 7, the themes of choice and interest seemed to dominate the conversation. Student choice and interest played a key role in the planning of instruction for this teacher. It seemed that every aspect of the students' needs was considered in the planning process, supporting the idea that proactive planning benefits the students academically. According to Tomlinson and McTighe (2006):

Building an awareness of what works for students is critical to their academic success. Teachers in effective classrooms should garner information on students' interests, dreams, and aspirations, and work to understand each student's profile of academic strengths and weaknesses. (p. 47)

The differentiation variables of learning style, choice, and interest all appeared as major strategies identified by the students. Throughout this study, these variables seemed to converge into one. The teachers did not distinguish between these variables and often explained them as one strategy they used. This may have had an impact on how the students answered their surveys. Whereas teachers found differentiating for choice the easiest way to begin differentiation through the use of choice charts, and whereas learning styles were defined as choice and interest in a lesson, teachers, if they do nothing else, should create choice charts to increase motivation for learning. Choice seemed to be a key indicator of success in these classrooms.

Summary

The qualitative analysis was conducted as a means to help explain the quantitative findings presented in Chapter IV. The qualitative analysis revealed three major themes around differentiation. Pre-assessment was broken down into two themes: formal and informal. Both formal and informal pre-assessment techniques were proven to be extremely relevant in the differentiated classrooms. Formal pre-assessments were used mainly for determining the readiness levels of the students in order to place them into proper groups. Formal pre-assessments ensure that students are placed into the correct readiness groups. Informal pre-assessments also informed the teachers of readiness but, most important, gave them information that is not often used in most classrooms. Informal pre-assessments informed the teachers of the students' interests and prior life experiences, which are important indicators of a student's success. Teachers used informal pre-assessments to gauge where their students were, not only prior to the unit but many times throughout the unit as a means to ensure that students were progressing. If students were not progressing, instruction was adjusted. Informal assessments helped the teacher to decide what types of choices to include on the choice charts. It is not enough to get to know one's students; teachers need to know about the students and be proactive in filling in the gaps with which their students enter the classroom. Preassessment is a great tool to accomplish this.

The third theme was the convergence of choice and interest in relationship to learning styles. This was an important finding, because it helped to explain why students selected the answers they did on their surveys. Choice, interest, and learning style became one and the same in the differentiated classrooms. Because of this, both the teachers and students often used these words interchangeably. It would not be uncommon for students of this age to confuse these answers on the surveys and skew the results of the quantitative findings. Based on the qualitative data, any of the three—choice, interest, or learning styles—could have played a part in increased reading achievement. This finding led to the conclusion that differentiating for choice would be the quickest and easiest way to begin differentiation, even if a learning styles inventory was not being administered. This was also the most frequent way that study participants were found to differentiate.

CHAPTER VI: SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS Introduction

As the United States continues to become more diverse and competitive in a flat world, schools will be called upon more than ever to challenge and prepare all of our students. No longer can it be decided that some students just will not make it. I recently heard an educator say, "We can tell who won't make it in high school by first grade." Although this statement is shocking and dismal, it is true and has been happening for decades. Something is dreadfully wrong with this. Analyzing this statement, one would conclude that many aspects of education, public or private, need revamping. This can not be something that is accomplished outside of the classroom; it needs to come from within. Do we know and understand what is happening in our classrooms? Are all students being challenged? Is it acceptable that some students are allowed to fail year after year? The answer to all of these questions is a definite no. The question should be: What are we doing about it?

This study was designed to determine if differentiated instruction has an impact on student achievement. The intent of this study was to investigate the best practices of teaching and learning and to get into the classroom to see what was really happening that promoted student learning. This study examined seven fourth grade classrooms. The teacher participants allowed the researcher entrance into their classrooms to look for differentiated instructional practices and to see if any of these practices had a greater impact on student achievement than others. This study addressed two specific research questions:

1. Does differentiated instruction lead to increased student achievement?

2. Are there any components of differentiated instruction that have a greater impact on student achievement than others?

Through the use of quantitative and qualitative data gathering, patterns emerged in support of the differentiation variables that had a positive relationship to student achievement. For the researcher, this study clarified the components of differentiation that enhanced both student learning and satisfaction in the classroom. The findings from this study are important as teachers plan lessons for the purpose of increasing achievement for all their students. Until it is an expectation that all students achieve, not all students will. We have to change the mind-set that there are some students for whom it is all right if they do not get it; we do not expect them to. The craft of effective teaching must be made explicit and expected. In order to increase student achievement, the focus must be on the instructional strategies occurring in the classrooms. Instructional strategies that have been researched and proven to be effective must be expected in all of our classrooms, and accountability measures must be in place to ensure that all students do indeed show growth each year in school.

Summary of Findings

Findings from this study indicated that there were many different interpretations of differentiation, even for the teachers who attended professional development in this area. This finding solidified the idea that using a mixed method approach to data collection and interpreting the qualitative data through the philosophical and interpretive orientation of symbolic interactionism was the appropriate methodology for this study. The quantitative data informed the findings that were statistically relevant, and the qualitative data helped to define the "why."

Question 1: Does differentiated instruction lead to increased student achievement?

The regression analysis indicated that differentiating in reading according to learning styles had a .007 level of significance on student achievement scores. Qualitative data informed the researcher that learning style was seen synonymously with choice and interest. This study concluded that teachers who differentiated by the use of choice charts increased achievement in reading. Most of the students in the participating classrooms had never taken a learning styles inventory, as reported on their surveys. If they did not know what learning styles were and simply picked choices that were most interesting to them, then one would conclude that both choice and interest also affected the reading scores of these students. This fact would indicate that differentiated instruction does lead to increased student achievement in this circumstance. The concept of learning styles was also identified as a theme in the qualitative analysis of this study. Classroom observations and discussions with teachers revealed that the idea of learning styles included the components of choice and interest. According to Tomlinson and Allen (2000), differentiation is a response to a learner's needs. Teachers can differentiate by content, process, and product, according to a student's readiness, interests, and learning profile. In the classrooms observed, the teachers and students saw learning styles as the umbrella to differentiation. Learning styles were accommodated by offering the students choices that were interesting to them. Interviews and observations concluded that the concept of learning styles was used as a choice in product and processes within these classrooms on a frequent basis.

Accommodating instruction to match a student's learning style has been a researched method in increasing student achievement. According to Shaughnessy (1998):

A meta-analysis of forty-two experimental studies conducted with the Dunn and Dunn model between 1980 and 1990 by thirteen different institutions of higher education revealed that students whose characteristics were accommodated by educational interventions responsive to their learning styles could be expected to achieve 75 percent of a standard deviation higher than students whose styles were not accommodated. In addition, practitioners throughout the United States have reported statistically higher test scores and/or grade point averages for students whose teachers changed from traditional teaching to learning style teaching at all levels. (p. 1)

The findings of Shaughnessy are consistent with the findings in Chapter IV. Students who reported differentiation for learning styles had increased achievement in reading. Also discovered through the qualitative analysis was that choice, interest, and learning styles all had an impact on the students' interests and motivation in class.

Question 2: Are there components of differentiated instruction that have a greater impact on student achievement than others?

Results from this study indicated that there were components of differentiation that led to higher student achievement than others. However, it became increasingly evident through the qualitative analysis that these components were not so easily distinguishable. The teachers interchanged the terms *learning styles, choice*, and *interest* during their interviews. Convergence of these terms is also indicated by moderate intercorrelations by the predictor variables in the correlation analysis. It appeared that half of the time they see these terms as overlapping. The variables that were found to have the greatest impact on student achievement were choice, interest, learning styles, and pre-assessment, both formal and informal. Student survey results indicated moderate forms of preassessments occurring. Through classroom observations and teacher interviews, it became clear that the ongoing informal assessments truly directed the instruction in these classrooms. Informal types of pre-assessments were more than likely not recognized by the students. Furthermore, many teachers did not recognize the informal questioning as a means of pre-assessment. For these classrooms, informal assessing occurred on a regular basis. It is important that teachers understand these questioning techniques as a form of pre-assessment, so this information can be intentionally used to create the choice charts and provide needed information to fill information gaps inherent in all classrooms.

Throughout the study, students and teachers used the terms *choice, interest*, and *learning style* interchangeably. Furthermore, learning styles, which when differentiated for students increased reading achievement, is an instructional strategy in itself. This finding helps to explain the quantitative data that indicates that differentiating for learning style has a positive effect on student achievement. Because teachers and students used these terms as one, differentiating for choice, interest, and learning styles all likely have an impact on student achievement.

Differentiation does not occur by doing only one of the variables analyzed in this study. It is important for educators to understand the relationships between the differentiation variables and how to prepare lessons that allow for students' individual needs, but not creating a lesson for each child in the classroom. If the variables operated in isolation of the others, it would be a strategy in itself, such as the concept of learning
styles is currently understood. Because the definitions of choice, interest, and learning styles converged, all three variables have merit in improving student achievement. When lessons are carefully planned using pre-assessment data and keeping the students' learning profile in mind, a teacher can say he or she is differentiating. Adapting for learning styles alone is not differentiated instruction as defined in this study.

The thematic analysis in Chapter V showed three prevalent themes: (a) formal preassessment, (b) informal pre-assessment, and (c) the convergence of choice and interest in relationship to learning styles. While the quantitative results indicated that learning style was the only differentiation variable that had an effect on student achievement, the way in which the students and teachers defined learning styles involved choice and interest. The teachers who frequently used learning styles as way to differentiate often used choice charts so students could select the best method for them to show understanding. The students did not see this strategy as differentiating for learning styles but rather as an assignment based on choice and interest. They often selected the activity that was most interesting to them, not understanding that this was a match to their learning style. Although most of the student participants in this study did not complete a learning styles inventory, this would be expected. Pre-assessment was another theme that emerged and is the basis for differentiating. Without knowing where a child is to begin with, there is no need to differentiate. Pre-assessment results drive the differentiation. Pre-assessment informs the teacher not only of the student's readiness but also his or her interests, which helps the teacher plan the choice charts, select instructional materials, and place students into flexible groups.

Implications for Practice

Practitioners need to understand the components of differentiation in order to design lessons around students' needs. Although some educational consultants are trying to coin differentiation as strategy in itself, it is not. Differentiation is a framework used to implement the best practices in teaching and learning that already exist and have been researched to be effective. Teachers should not receive training in differentiation that does not make it clear that differentiation is based on the current, best practices in education. It is no wonder that educators feel overwhelmed with professional development. It is difficult to understand how these strategies all tie together. Far too often professional development teaches the differentiation variables in isolation of one another, such as learning styles, brain-compatible classrooms, and multiple intelligences. Differentiation training allows the teachers to see how these all fit together and complement each other into one package. Therefore, differentiated instruction is a process, not an instructional strategy itself.

Perhaps the most important component of differentiation is the one that has received the least amount of attention. Results from this study confirmed the importance of using pre-assessments, both formal and informal, to plan for instruction. Pre-assessment may seem too simple a concept in which to provide training, but when connected to differentiation, it becomes the foundation of an effective classroom, and its importance cannot be overlooked. Effective classroom planning occurs through pre-assessment datagathering techniques.

Results from this study indicated that choice was the easiest and most effective way for teachers to begin differentiation. For teachers new to differentiation, choice would be

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a great starting point, because it is manageable and easy to implement. However, preassessment data are needed to properly create the choices unique to the students in a particular classroom.

This study found that teachers used pre-assessment techniques frequently, but only Teacher 1 created tiered lessons to accommodate low, middle, and high achievers. Tiered lessons are a higher level of differentiation that require more time and training. Because teacher 1 worked with a split fourth/fifth classroom, tiered lessons were a necessity. To develop differentiated lessons that truly accommodate the differences in readiness levels, ongoing training in flexible grouping and tiered lesson design are needed. Differentiation takes time and support to implement. Teachers must be given both administrative support and time to implement all of these strategies effectively in their classrooms.

Teachers must become savvy to the differences in students' academic levels, cultures, and interests to become responsive to students' needs. Pre-assessment techniques can advise the teacher of the differences with which the students enter the classroom, but in order to differentiate instruction, the teacher must understand and apply best practices in the classroom. One may ask why best practices have been researched but not implemented. Part of the problem is creating a manageable way to structure a classroom.

The complexity of what actually goes into preparing a lesson and what happens in the classroom as the lesson is delivered is difficult to understand, especially for someone outside of education. There is no prescribed way to teach, and it is customary for the teachers to decide how to do things within their own classroom, as well as they can, without consulting with fellow teachers and administrators. This is in drastic contrast

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with other professions, where best practices are discussed and practiced routinely as a team. Physicians, for example, stay current by attending seminars and work in teams to update best procedures. Not many patients would choose to see a physician who just wanted to do things the old way, knowing that a better procedure exists. Should classrooms be any different? Yet in classrooms right next door to each other, drastically different approaches to instruction are occurring, even though research tells us there is a better way of doing things that will benefit our students.

Differentiation is a framework that can be used to intentionally build a lesson using best practice. Since differentiation involves student pre-assessment data, no two classrooms would be exactly the same, although the framework could be. The conceptual framework (see Figure 1) is a generic overview of differentiation, but for teachers who want to differentiate, it is not easy to follow. A simplified version, using results from this study, has been created as a means for teachers to follow when beginning differentiation. Figure 10 proposes a new framework of differentiation, which will help teachers focus on the important components when creating a proactive lesson. The first step to planning a lesson is based on pre-assessment data. The pre-assessments provide teachers with important information about their students prior to lesson planning, including readiness, learning styles, interests, prior knowledge, and experiences. The data gathered becomes a compilation of information referred to as the students' learning profiles. Several important events occur in a differentiated classroom that distinguishes it from a nondifferentiated classroom. First, the teacher gathers information about students from preassessments. Although pre-assessments occur in a traditional classroom, in a differentiated classroom the teacher reacts and proactively plans for differences. Second,

lessons are developed using this information. This includes planning projects around the students learning preferences, creating flexible groups based on interest or readiness, and giving students choices in how they demonstrate proficiency. Components of differentiation already occur in most classrooms whether or not teachers realize it. By intentional planning based around the framework in Figure 10, differentiation can become systematic. The conceptual framework in Figure 10 represents a simplified way to begin differentiation. Once this process is in place, a more detailed framework, including tiered lessons, which take more time to develop, can be added to the teachers' repertoire.

In essence, teachers have been reactive for years. If a student didn't get it the first time, he or she did more of work just completed in hopes that the second, third, or fourth time, he or she would get it. A proactive approach to instruction will actually save time in the long run, but it is a very different way of designing a lesson. By developing lessons based on readiness and interests, all students can end with mastery of the same standard, some at grade level, and some above. According to Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover, and Reynolds (2003):

Research has suggested clearly that, while such an argument for differentiation may be promising, there is considerable distance to span before the argument translates into pervasive practice. It is the case that, currently, few teachers make significant changes to teaching and learning routines in response to learner variance. Research and theory on change in schools indicates that such a scope of change is profoundly difficult, calling for persistent, sustained leadership and support for the change. (p. 10)

Educators who want success for all students need to change their current practices. Understanding the importance of pre-assessment is the first step to accomplishing this change. Pre-assessment can be as simple as observations of students or an actual pre-test. Teachers should also become familiar with the different types of learning styles inventories and find one that works best in their classroom. Accommodating for learning styles is a proven method to raise student achievement, yet most classrooms do not address this at all. Teacher training programs should make certain that preservice teachers have the knowledge and tools to administer a learning styles inventory to all students. Teachers often design lessons to their own preferred learning style, teaching to their own strengths, even though their learning style may not be a match for all students. Intentionality in lesson design can correct this problem by having teachers intentionally teach to multiple learning styles or vary their delivery of instruction. By administering a learning styles inventory at the beginning of each school year, teachers can become cognizant of their students' strengths and make modifications to lessons to ensure that learning takes place for all students.



Figure 10. Conceptual framework for differentiated instruction

In a standards-based world, teachers often feel like they need to rush through the material to cover the content. When this occurs, teachers do not have an opportunity to identify the readiness or interests of their students. By taking time up front and pre-assessing students' readiness levels and interests, lessons can be created that appropriately challenge students and allow for choices that increase interest in the topic.

This is fundamentally different to current practices in most classrooms today. According to Callahan (1999):

Teachers should give equal attention to the process of learning and the way in which learning will be demonstrated. In the process and product dimensions even further differentiating according to interests, learning style, intelligence strength, and cultural differences can be addressed. ...developing the range of instructional strategies and curricular approaches necessary to respond to student differences should be conceived as one of adding strings to and fine tuning the teacher's instrument instead of finding a new instrument. (p. 5)

When students are interested in what they are learning and see the relevance to the real world, they will be motivated and want to achieve more. Differentiation can bring back to learning the love that has been lost for many students in our highly accountable society. No Child Left Behind legislation requires that all students achieve, regardless of ethnicity and socio-economic status. Our past practices have not accomplished this goal. By differentiating appropriately we can accomplish this.

It would be unfair and irresponsible not to mention that what occurs in the classrooms needs to be both monitored and supported by the administration. It is no longer acceptable for individual teachers to decide what and how they are going to teach. This researcher is not suggesting that we lose the creative aspect of teaching; instead educators need to stop using methods that have not been proven to be of benefit to our students. It is the administrator's job to ensure that all teachers have access to best practices and to provide the training and support when these practices are void from a

classroom. It is this balance of expectation and support that will bring about instructional improvements for our students.

Five of the seven teachers in this study voluntarily received training in differentiation. Data collected in Chapter IV supported the fact that students who received differentiation for learning styles outperformed students where differentiation was not taking place in the area of reading. As previously reported, this is consistent with research findings conducted earlier on learning styles. Given this information, why is it that learning styles inventories and training is not common in every classroom? Schools that begin the implementation of these strategies around the framework of differentiation will begin to see the improvements in student achievement. It would not be fair if some districts, schools, or individual teachers decided to ignore the research and continue down the path that had not worked before. Other professions would not allow this, so why would we in education? All educators, including teachers, administrators, and parents, must develop the capacity and courage to insist on these changes, so no child will truly be left behind.

Implications for Further Research

This study contained a relatively small sample size. A larger scale study may help to determine the extent to which differentiation can impact student achievement in additional content areas. This study goes beyond the learning styles research in the sense that learning style was identified as a technique used to differentiate. By simplifying the framework for differentiation, exact practices can be narrowed, so the researcher can focus to see which practices work best for different cultures, disabilities, and economic statuses. Because the research on best practices has been reviewed, a road map to differentiate, similar to Figure 10 and similar to Madeline Hunter's ITIP Model, should

be created. This model should be researched in various areas to determine if a structured lesson, created around best practices, based on student pre-assessment data, promotes increased student achievement. This research should also focus on the need for teachers to work collaboratively in supporting this model and one another. Without support and accountability from outside of the classroom, implementation may be sporadic or misinterpreted.

Along with a model of a differentiated lesson design comes the complexity of innate differences of the teachers. These differences have an intricate role in the attitude and biases that are incorporated into a lesson. These biases are not intentional but need to be made known prior to designing lessons. Teacher bias may limit choices that are presented to the students. Classroom instruction has not seen sustained changes in decades. Teacher bias, or the attitude of "this is how we do things around here," may place limits on creativity and learning. Further research should be conducted as a means to measure this bias and determine ways to overcome assumptions that teachers inadvertently place on learning.

Implications for Theory

If differentiation is to become the norm in education, then the theories of teaching and learning must be reviewed and implemented by teachers. Differentiation is not a new theory in itself and should not be treated as one. To understand differentiation, one must understand the theories of teaching and learning that are already researched. Differentiation supports a brain-compatible classroom by eliminating frustration that occurs when assignments are either too easy or too difficult for a student. When assignments are not at a student's level, downshifting of the brain occurs and learning cannot take place. By pre-assessing a student's readiness and interests, the teacher can be proactive and increase learning and satisfaction in the classroom.

By implementing choice into a classroom, students become more motivated and excited to learn. Differentiation is not about letting the students choose whatever it is they want to do; it is about knowing the students and planning assignments accordingly. Differentiation is a process of how to implement these best practices into a classroom. Because pre-assessment plays a vital role in lesson design, it should be a required component of teacher preparation. Teachers must be given the time to review best practice and self-evaluate the practices that they use with their students.

This study supported the fact that differentiating for learning styles increases student achievement. Research conducted by Dunn et al. (1995), revealed that instructional interventions designed to meet the learning needs of the students led to a statistically significant difference in achievement for those students over others not being accommodated. Learning styles inventories should be administered to all students at the beginning of each school year to inform the teacher of this important information. It is research-based and should no longer be an option.

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APPENDICES

APPENDIX A

Classroom Observations/Differentiated Variables Coding Sheet

Pre-Assessment

Differentiation for Readiness

Differentiation by Interest

Differentiation by Learning Profile

Flexible Grouping

Student Choice in Learning

Assignment Based on Learning Styles

APPENDIX B

Staff Consent For Study Participation

Dear Teachers:

I am in the process of completing a dissertation study under the guidance of Dr. David Anderson at Eastern Michigan University. For this dissertation I will be collecting information on teaching strategies commonly used in many schools. I will then be analyzing this information to see if certain methods equate to higher student achievement. This research is for a doctoral dissertation and will also help us directly determine which strategies work best for our students. Upon completion, this information will be shared with the educational community at large through a published dissertation. To ensure confidentiality of our students, no one will be identified by name including the school district, the location of the district, and the name of the school. I plan to begin collecting this data in April and be completed by mid-May.

As part of this research, I will be asking the students to complete a survey, conducting interviews, and possibly observing their classrooms to gather information as to the instructional methods they are receiving. There will be no disruption to what is currently happening in each of the classrooms. While there are no inherent risks for participating in this study, I do need to inform you of the purpose and expected outcomes. I am hoping this research will identify sound, instructional methods that can raise student achievement.

In order to complete this study I need your permission to come in and observe your students. I do not anticipate observing all classrooms. I will select classrooms based on student and teacher survey results. Please sign below and return this form to your building principal no later than March 30, 2005. Thank you for your help in allowing me to collect this information. If you have any questions I can be reached at 795-5522 or you may contact Dr. David Anderson at Eastern Michigan University at (734) 487-7120 ext. 2689.

Sincerely,

Patricia Koeze Assistant Superintendent Eastern Michigan University Student I, ______ would like to participate in this study. I understand that I will not be penalized in any way for not participating and may opt out of the study at any time.

Signed_____

Date_____

cc: Principal

This research protocol has been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee and if you have any questions on the approval process, please call either Dr. Patrick Melia or Dr. Steven Pernecky at (734) 487-0379.

APPENDIX C

Parental Consent For Student Participation

March 23, 2005

Dear Parents and Guardians:

As a graduate project I will be collecting information on teaching strategies commonly used in many schools. I will then be analyzing this information to see if certain methods equate to higher student achievement. This research is for a doctoral dissertation and will also help us directly to determine which strategies work best for our students. Upon completion, this information will be shared with the educational community at large through a published dissertation. To ensure confidentiality of our students, no one will be identified by name including the school district, the location of the district, and the name of the school. I plan to begin to collect this data in April and be completed by mid-May.

As part of this research, I will be asking the students to complete a survey, conducting interviews, and possibly observing their classroom to gather information as to the instructional methods they are receiving. There will be no disruption to what is currently happening in each of the classrooms. While there are no inherent risks for participating in this study, I do need to inform you of the purpose and expected outcomes. I am hoping that benefits will be brought to our students by identified sound, instructional methods that can raise student achievement.

If you would not like your child to participate in this study, please sign below and return this form to your child's teacher no later than March 30, 2005. Thank you for your help in allowing me to collect this information. If you have any questions I can be reached at 795-5522.

Sincerely,

Patricia Koeze Assistant Superintendent Eastern Michigan University Student

I wish my child ______ to not participate in this study. I understand that my child will not be penalized in any way for not participating.

Signed_____

Date_____

cc: Principal

This research protocol has been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee and if you have any questions on the approval process, please call either Dr. Patrick Melia or Dr. Steven Pernecky at (734) 487-0379.

APPENDIX D

Student Survey Document

Name

Teacher

Student Survey

1.	Do you like school? Circle One						
	All of the time Most of	of the time	Some	of the time	Almost never	Never	
2.	Rate the work you do in s	chool. Circle O	ne				
	Too easy Sometimes ea	asy Just rig	ght	Sometimes dif	ficult Too di	fficult	
3.	Have you discussed in cla	ss how you lea	rn best?	Circle one	Yes	No	
4.	In the following subject an	reas, rate the w	ork that	you have been	involved in		
	Language Arts	Too easy	Sometimes easy Just Right				
		Sometimes di	fficult	Too difficult			
	Math	Too easy	Somet	imes easy	Just right		
		Sometimes di	fficult	Too difficult			
	Social studies	Too easy	Somet	imes easy	Just right		
		Sometimes di	fficult	Too difficult			
	Science	Too easy	Sometimes easy Just right				
		Sometimes di	fficult	Too difficult			

5. How often are ye	ou given choices in pro	pjects or class assignme	ent? Circle one	
All of the time	Most of the time	Some of the time	Almost never Never	

instruction) in your classroom? Circle One All of the time Most of the time Some of the time Almost never Never 7. Has it been discussed in your classroom that some students in your room may be completing assignments like spelling, math, and language arts that may be different than other students? Circle One All of the time Most of the time Some of the time Almost never Never 8. How often do you work in groups? Circle one Some of the time All of the time Most of the time Almost never Never 9. How often do members of your group change? Circle one Some of the time Almost never Never All of the time Most of the time 10. How often have assignments been adjusted for you due to your learning needs in the following subjects? Circle one for Each Subject

6. How often has it been discussed that students learn at different levels (differentiated

Language Arts	Once a week More than once a week
	Once or twice a month Never
Math	Once a week More than once a week
	Once or twice a month Never
Science	Once a week More than once a week
	Once or twice a month Never
Social Studies	Once a week More than once a week
	Once or twice a month Never

APPENDIX E

Staff Survey Document

Name

Staff Survey

1. Please list any strategies that you use frequently to challenge your students.

2. How often do your students work in groups? (Circle one)

All of the time Most of the time Some of the time Almost never Never

3. If your students do work in groups, how are the groups organized? (Circle all that apply)

Randomly Ability Interests Let students choose Learning styles

How often do groups change? (Circle all that apply)

Learning groups are chosen and stay the same each time when students request When behavior warrants with a new unit by project

4. Have your students taken a learning styles inventory this year? (Circle one)

Yes No

5. Please use any resources that you use to determine your students' readiness.

6. How often are students given choices in how they complete their assignments or projects? (please explain your answer if needed)

All of the time Mo	ost of the time S	Some of the time	Almost never	Never
All of the time with	ost of the time of	some of the time	Annost nevel	INEVEL

APPENDIX F

Normally Distributed Variables





DRT2



DIT2



DLPT2







PAR2

0.00

Frequency

20-

0

















LSR2,

APPENDIX H

Residuals

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	551.73	580.81	566.59	8.289	157
Residual	-99.00	99.00	.00	32.333	157
Std. Predicted Value	-1.794	1.715	.000	1.000	157
Std. Residual	-3.052	3.052	.000	.997	157

a. Dependent Variable: READ

Charts

Scatterplot



Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	· N
Predicted Value	551.73	580.81	566.59	8.289	157
Residual	-99.00	99.00	.00	32.333	157
Std. Predicted Value	-1.794	1.715	.000	1.000	157
Std. Residual	-3.052	3.052	.000	.997	157

a. Dependent Variable: READ

Charts

S catterp lot

Dependent Variable: R E AD


Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	535.325	550.721	543.194	4.3873	157
Residual	-45.825	62.128	.000	19.8518	157
Std. Predicted Value	-1.794	1.715	.000	1.000	157
Std. Residual	-2.301	3.120	.000	.997	157

a. Dependent Variable: ELA

Charts

S catterp lot

