CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

TEACHER PRACTICES IN DIFFERENTIATED INSTRUCTION:

A SURVEY OF PRACTICES IN GRADES FOUR THROUGH EIGHT

A dissertation submitted in partial fulfillment of the requirements
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by

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DEDICATION

This dissertation is dedicated to my family and friends. To my husband, Tony: Your support was always there during these three long years. You shouldered everything so that I could focus on my studies. To my daughter, Vicky: Thank you for your constant encouragement. To my parents: You always believed in me and told me I could do anything, that helped keep me going. To all my friends: Thank you for your patience and encouragement.

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ABSTRACT

TEACHER PRACTICES IN DIFFERENTIATED INSTRUCTION:

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By

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Doctor of Education Degree

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In California, and particularly in Los Angeles, the percent of students who are proficient in mathematics declines as students move from 4th to 8th grade. The purpose of this study was to examine the use of differentiated instructional (DI) strategies by elementary (grades 4 and 5) and middle school (grades 6, 7, and 8) teachers in mathematics, to determine whether the use of DI strategies varied from elementary to middle school and if there were relationships between teachers' reported use of DI and classroom and teacher characteristics. The participants included 98 teachers from nine elementary and three middle schools. Teachers responded to a 31-question survey, based in part on a survey developed by Carol Tomlinson, (Tomlinson & Allen, 2000) which asked them to report on their use of DI in three dimensions (planning and assessment, working with diverse learners, and teaching strategies) and classroom/teacher characteristics (school level, classroom demographics, type of teaching credential, years of experience teaching mathematics, and amount of training in DI). Classroom demographics were defined as

the percentage of English learners, students with disabilities, and gifted students in the classroom. Using descriptive, comparative, and correlational analyses, the means and standard deviations for the three DI dimensions were analyzed against the independent variables of school level, classroom demographics, type of teaching credential, years of teaching experience in math, and training in DI. Significant relationships were found between how frequently teachers reported using DI and both the percentage of students with disabilities in their class and the amount of training they had in DI. The variables of school level, type of credential, and years of mathematics teaching experience had no significant relationship to teachers' reported use of DI, and may be mediated by the amount of training in DI.

CHAPTER I: Statement of the Problem

A report by The Broad Foundation (n.d.) stated that nationwide 70% of 8th-graders can't read at grade level. The report went on to state that students in the United States ranked 25th in mathematics compared to students in 30 other industrialized countries. Although the United States was ranked number one in the 1960s by the Organization of Economic Cooperation and Development (OECD) (an organization representing 30 industrialized countries) in the proportion of young adults with high school diplomas, the ranking dropped to 10th place in 2006. Moreover, in 2006 the Programme for International Student Assessment (PISA) found that 15-year-old students in the U.S. ranked 25th out of 30 OECD countries in mathematics (Schleicher & Stewart, 2008). The United States remains a world leader in education, but no longer has the lead over other countries it once had — a fact that has gained the attention of educators and politicians alike.

The No Child Left Behind (NCLB) Act of 2001 has probably had a greater impact on education in the United States than any other legislation in recent times. The mandate to have all students attain proficiency levels in language arts and mathematics by the year 2014 places a high level of accountability on states, school districts, and, especially, schools. States have responded to this proficiency mandate by developing curricular standards and assessments for those standards, and by adopting standards-based textbooks. In the state of California, for example, only textbooks that are closely aligned with the mathematics content standards for public schools (California Department of Education [CDE], 1999) are adopted by the CDE, and school districts in California are required to purchase books from the adoption list using state monies to fund the

purchases. In the Los Angeles Unified School District (LAUSD), where this study took place, teachers are offered basic and advanced training in the use of new curricular materials. In addition, LAUSD mandates that periodic assessments are given to students in core subject areas.[1] The data from those assessments are used to track student progress and to drive instruction.

In addition to yearly standards-based assessments, states have set benchmark proficiency levels for districts and schools to measure progress toward reaching the NCLB goal of 100% proficiency for all students by 2013-14. Across the country, the number of students reaching proficiency has increased each year, but because the proficiency benchmarks rise annually, more schools are failing to reach their adequate yearly progress (AYP) annual measurable objectives (AMOs). The consequences for schools not reaching their AMOs can be quite serious. For example, in California, schools that do not make their AYP for two consecutive years enter Program Improvement (PI) status. Once it is categorized as PI, the school and its local educational agency (LEA) must take specific actions, ranging from writing a detailed school improvement plan (PI year 1) to removing all/most of the staff and principal or even coming under state control in the 5th year of PI status (CDE, 2009).

Despite better curricular materials, highly qualified teachers, intervention programs, rigorous academic standards, periodic testing, and federal funds that support instructional programs such as Title III for English Learners (EL) and Title I for those from low socioeconomic backgrounds, many students are still not achieving at the desired levels. The California Department of Education (2010) reported that only 54% of

[1] The current LAUSD periodic assessment program includes English Language Arts: K-10; mathematics: k-7, algebra readiness, algebra, geometry; science: 4-5, biology, chemistry; history/social science: 7,8,10, and 11.

the 3.7 million students in grades 2-11 who participated in the Standardized Testing and Reporting (STAR) program achieved proficiency in English Language Arts. In mathematics, only 56% of all students achieved proficiency.

Even more alarming is that proficiency rates in mathematics tend to decrease as students move to a higher grade. A report prepared by LAUSD in 2009 showed that the percentage of proficient students in mathematics for both the state and the district tends to decrease as students transition upward from one grade to another. In the report, cross-sectional data from the California Standards Test (CST) from the 2008-2009 school year showed that in the state of California, only 57% of 5th-graders were proficient or above in math but then the proficiency rate for 7th-graders dropped to 43%. In that same report, the statistics for LAUSD showed that 53% of 5th-grades scored proficient or above in mathematics, but that number dropped to 35% in grade 6 and down to 27% in grade 7. The report also presented longitudinal data for LAUSD students by looking at the same group of proficient students over a four-year period. This data showed that from the original group of proficient students, only 49.5% was found to be proficient four years later, in grade 8. Disaggregated data in the same report also showed a major drop in mathematics proficiency for all students regardless of gender, socioeconomic status (SES), ethnicity, or language proficiency (LAUSD Office of Data and Accountability, 2009).

In addition, according to data compiled by the National Center for Education Statistics (NCES), the achievement gap persists among diverse groups of learners in every state despite the best efforts of educators. As indicated in Table 1.1, in the state of California, African American, and Hispanic students, as well as those identified as

socioeconomically disadvantaged (SED), continue to lag behind in mathematics compared to White students as measured by the National Assessment of Educational Progress (NAEP) tests (NCES, 2010).

Table 1.1

California NAEP Scaled Scores in Mathematics (2009)

Grade	White	African American	Hispanic	SED	All Students
4	247	217	219	220	232
8	289	250	256	258	270

A major goal of NCLB is to close the achievement gap and to ensure that all students from disadvantaged backgrounds achieve academic proficiency. With the advent of standards-based curriculum, the focus has now shifted from *what* is being taught to *how* it is being taught. The NCLB requirement that all children, especially groups that have been traditionally underserved, be taught by highly qualified teachers has forced states to develop plans to improve teacher effectiveness (Konstantopoulos, 2009). Improving teacher quality as a means of educational improvement is considered a cost-effective and long-term method (Phillips, 2010). Teacher quality is also considered a vital factor in improving our nation's security, competitiveness, and future (The Teaching Commission, 2004). However, a highly qualified teacher,[2] as defined by NCLB does not necessarily mean an effective teacher (Palardy & Rumberger, 2008).

Research has shown that teachers have a significant effect on academic achievement (Marzano, 2007; Nye, Konstantopoulos, & Hedges, 2004; Phillips, 2010;

[2] NCLB defines a highly qualified teacher as one who has full state teacher certification, at least a bachelor's degree from an accredited institution, and subject matter competency (U.S. Congress, 2001).

Rivkin, Hanushek, & Kain, 2005) and that effective teachers are essential to academic success (Ding & Sherman, 2006; Heck, 2009; Stronge, Ward, Tucker, & Hindman, 2008; Wright, Horn, & Sanders, 1997). Moreover, effective teachers benefit all students regardless of gender, race, or socioeconomic status (Konstantopoulos, 2009). Rivkin et al. (2005) have further stated that, "High quality instruction throughout primary school could substantially offset disadvantages associated with low socioeconomic background" (p. 419). That teachers have a prominent role in the academic success of students has led educators and researchers to look at why some teachers are better at raising student achievement; in other words, looking at what makes a more effective teacher. Researchers have tried to quantify the effect that teachers have on students by measuring specific teacher characteristics such as college degrees, credentials, and years of teaching experience but little evidence exists that these characteristics have a direct and sustained effect on academic attainment (Palardy & Rumberger, 2008). These characteristics, referred to as *teacher effects*, should not be confused with *teacher effectiveness*. Although studies have been able to measure teacher effects quantitatively (Heck, 2009; Nye et al., 2004; Phillips, 2010), the characteristics of an effective teacher, such as attitudes and practices, are more difficult to pinpoint and measure (Ding & Sherman, 2006; Palardy & Rumberger, 2008). These authors have further stated that recent studies on teacher effectiveness generally focus on specific teaching practices.

In researching teacher effectiveness, Konstantopoulos (2009) has explained that there have been mainly three areas of study in teacher effectiveness. The first area of study has been education production studies that have looked for a link between teacher characteristics and student achievement. The second area of study has been on the

differences in classroom achievement while controlling for student differences, and the third area of study has looked specifically at the relationship between good teaching practices and academic success. The present study focused on a specific set of teaching practices and the effect that variables such as teaching experience, training, classroom demographics, and credentials have on the frequency of use of these strategies by elementary and middle school mathematics teachers.

The majority of studies on effective teachers and successful schools have indicated that schools and teachers under study all incorporate an emphasis on instructional behaviors and practices (Palardy & Rumberger, 2008). A study undertaken by Stronge et al. (2008) showed that one dimension of teacher effectiveness that was evident for all successful teachers was the use of differentiated instruction. A key finding from that study stated, "The effective teachers studied demonstrated a broader range of instructional strategies, using a variety of materials and media to support the curriculum" (p. 176). In other words, effective teachers differentiated or adjusted their instructional delivery to meet the instructional needs of their students. Many researchers have agreed that differentiated instruction is an effective approach to the diverse needs of learners (Beecher & Sweeny, 2008; Cox, 2008; Drapeau, 2004; Levy, 2008).

Differentiated instruction (DI) is an instructional approach that focuses on the unique learning needs of students. DI has been shown to increase student academic achievement (Beecher & Sweeny, 2008; Ferrier, 2007). DI incorporates research-based strategies for instruction, which have proved effective for students at all achievement levels (Beecher & Sweeny, 2008). It is relatively inexpensive to implement because it is based on how we teach students, not what we teach, using existing curricula and teaching

strategies. DI involves learning about students and about what teaching strategies work best with them. Given that mathematics scores drop as students progress in grade levels and that DI has been linked to improved student achievement, the present study examined teacher perceptions across grades four through eight regarding how they use differentiated instruction in their classrooms.

Problem Statement

Schools are currently responsible for the academic progress of all students including students with disabilities (SWD), English Learners (EL), gifted students, socioeconomically disadvantaged students, and ethnic subgroups. As noted previously, the stakes are high for schools that do not meet their state proficiency benchmarks. In California, schools not meeting their Annual Measurable Objectives (AMO) on a yearly basis risk being placed in Program Improvement (PI) status. With benchmark proficiency levels rising every year, more schools are entering PI status. An example of this problem could be seen in the Los Angeles Unified School District (LAUSD): When proficiency targets rose from 35.2% to 45.0% in English Language Arts (ELA) and from 37.0% to 45.5% in math from 2008 to 2009, an additional 51 elementary schools entered PI status for the first time (CDE, 2009). When the target rate rose for the 2009-2010 school year to 56.0% for ELA and 56.4% for mathematics, an additional 58 became PI Year 1 schools.

Although the specific needs of English Learners, students with disabilities, and gifted students are recognized and addressed in the classroom by federal and state-mandated programs, there are still many students who do not fall into these specific categories whose learning needs are not being met. Although students in California have

overall shown academic growth for the past seven years, 46% of all students are still not proficient in English Language Arts (ELA) and 44% has not reached proficiency in mathematics (CDE, 2010). Table 1.2 shows that statistics are even higher for English learners (EL), students with disabilities (SWD), and students who are socioeconomically disadvantaged (SED).

Table 1.2

Percentage of California Students Not Meeting Proficiency Targets in 2010

Groups	ELA %	Mathematics %
EL	64.4	54.4
SWD	68.2	65.5
SED	58.9	53.7
All Students	46.1	43.7

Understanding the diversity of students in the typical general education classroom, and that effective teachers are critical to academic success, educational researchers and leaders are focusing on how teachers are planning, delivering, and assessing instruction to address the unique learning needs of their students.

The Los Angeles Unified School District (LAUSD) is the second largest district in the United States, with over 650,000 students, and a district in which only 43.4% of the students are proficient or above in English Language Arts (ELA) and only 56.4% scored proficient or above in mathematics (CDE, 2010 LEA Report). Additionally, data from for the 2009-2010 school year showed levels of student proficiency dropping dramatically in mathematics as students advanced from elementary to middle school.

This falling off is evident from the district's grade span scores for the 2009-2010 CST, in which 57.6% of students in grades 2-5 scored proficient or advanced but only 31.3% of the students in grades 6-8 reached that proficiency level. This decline in the mathematics proficiency of LAUSD students moving from elementary to middle school prompted this study.

In LAUSD, schools not reaching proficiency benchmarks exist district-wide despite schools having highly qualified trained teachers, standards-based curricular materials, and intervention resources, both during and after school. Although progress has, in fact, been made in increasing the number of students reaching proficiency levels, many schools still struggle to meet rising state-mandated proficiency levels. This occurrence has prompted school districts such as LAUSD to look at instructional practices in the classroom and to focus professional development on research-based strategies such as graphic organizers, reciprocal teaching, feedback, and goal setting, to name a few (Marzano, Pickering, & Pollock, 2001) — all strategies indicative of differentiated instruction.

Differentiated instruction (DI) can be used as an umbrella term for instructional practices that focus on student needs, and although research has covered specific practices that are the foundation of DI, finding empirical studies on DI as a specific practice is limited (Huebner, 2010). Studies looking at the effectiveness of DI have addressed specific student needs such as culture (Santamaria, 2009), learning styles (Dunn & Dunn, 2008), language as a result of learning disabilities (Marin & Franks, 2010), and ability (Tieso, 2005), yet little has been done to examine the use of

differentiated instruction by teachers at the elementary school level as compared to middle school level.

Study Purpose and Significance

The purpose of this study was to examine the use of differentiated instructional strategies by elementary (grades 4 and 5) and middle school level (grades 6, 7, and 8) teachers in mathematics, to determine whether the use of DI strategies varied from elementary to middle school. In addition, the researcher examined the relationship between teacher use of DI and the percentage of students with special needs (English learners, students with disabilities, and gifted) in the classroom as well as teacher factors including years of experience teaching mathematics, credentials held, and amount of training teachers had received in DI. Specifically, this study surveyed teachers in grades 4-8 for their perceptions of how often they used differentiated instructional strategies. Using a written survey based in part on a survey developed by Carol Tomlinson & Allan (Tomlinson & Allen, 2000), a respected author in the field of differentiated instruction, the researcher measured the frequency with which teachers reported using DI in the three dimensions of planning and assessment strategies, working with diverse learners, and teaching strategies.

Although proficiency levels have risen since 2003, the goal of having all students academically proficient by the year 2014 will be a formidable task. In the 2009-2010 school year, California elementary and middle schools needed to reach a 56.4% proficiency level in mathematics school wide and in all numerically significant subgroups (CDE, 2010). In LAUSD, the majority of schools, including some high-achieving schools, were not able to meet these benchmarks for all of their student subgroups.

Research has indicated that good instruction is critical to student academic success but still little is known about what characteristics of teachers and teaching practices have the greatest effect on student achievement (Palardy & Rumberger, 2008). This study is significant in that little research has focused on the frequency of use of DI strategies in the classroom and whether this frequency varies from elementary to middle school. The results of this study will add to the existing body of knowledge on the topic of DI by describing how elementary and middle school teachers perceive their use of DI in the classroom. In addition, this study provides information about the use of DI strategies by this sample of elementary and middle school teachers, which can be used as a focus for professional development activities for teachers seeking to recognize and address student needs in the classroom in the area of mathematics.

This study focused on a specific area of instruction, namely DI practices in grades 4 through 8. It looked not only at the frequency of these practices but also at the following variables: classroom demographics, years of experience teaching mathematics, credentials, and training that might affect the use of these practices. Although many studies have looked at the positive effects of DI and instruction (Beecher & Sweeny, 2008; Ferrier, 2007; Vaughn & Baker, 2007) these studies lack an explanation of how often elementary and middle school teachers report using these strategies with their students throughout the week along with variables that may affect their use of DI.

Research Questions

To examine the use of differentiated instruction across grades 4-8 in mathematics, the following research questions guided this study:

RQ_1. Are there any differences among teachers in elementary compared to middle school on the mean scores of their reported use of DI (planning and assessment strategies, working with diverse learners, and teaching strategies) in teaching mathematics?

RQ_2. Is there a relationship between the teachers' reported use of differentiated instruction in teaching mathematics and student background characteristics (i.e., English learners, students with disabilities, and gifted and talented students).

RQ_3. Are there any differences among the four groups of teachers (i.e., teachers with a multiple subject credential [MS], teachers with a single subject credential in mathematics [SS], teachers with a special education credential [SE], and teachers with a multiple subject credential/supplemental authorization in mathematics [MSM]) in their reported use of differentiated instruction in teaching mathematics?

RQ_4. Is there a relationship between teachers' reported use of differentiated instruction in teaching mathematics and their years of experience in teaching mathematics?

RQ_5. Does the amount of training in differentiated instruction in teaching mathematics have any impact on teachers' reported use of differentiated instruction?

Hypothesis 1. Elementary school teachers self-report using DI in teaching mathematics more frequently than middle school teachers.

Hypothesis 2. It was predicted that there will be a range of responses regarding the frequency with which differentiated instruction techniques/strategies are utilized in the classroom and that this range will vary depending on the percentage of English learners, students with disabilities, and gifted and talented students.

Hypothesis 3. There are significant differences among teachers holding a multiple subject credential, teachers with a single subject credential in mathematics, teachers with special education credentials, and teachers with a multiple subject credential with a supplemental authorization in mathematics and their reported use of differentiated instruction in teaching mathematics.

Hypothesis 4. There is a relationship between a teacher's reported use of differentiated instruction in teaching mathematics and the years of experience a teacher has in teaching mathematics.

Hypothesis 5. The more DI training a teacher reported having received, the more frequently the teacher reported using DI to teach mathematics.

Conceptual Framework

Research has indicated that students have different learning needs and that teachers who differentiate instruction to meet those needs are more effective in advancing student achievement. Because the typical classroom is composed of students with different cultural and educational backgrounds, learning needs, learning modalities, and abilities, using one instructional strategy or modality is not likely to reach or connect with all students (Honigsfeld & Dunn, 2009). Students who cannot connect with instruction become either bored or frustrated, thus resulting in negative classroom behaviors (Boreen, Johnson, Niday, & Potts, 2000). The term *zone of proximal development* (Vygotsky, 1978) has been used to describe the optimal teaching situation, in which the work is just beyond a student's reach, but that with a little support the student is able to complete. A task that is too hard results in frustration whereas a task that is too easy results in boredom. By providing supports and scaffolds, children are able to internalize

the processes that enable them to become self-learners (Coffey, 2009). According to Vygotsky, social interaction is the basis for cognitive growth so it is vital that students have opportunities to interact with and learn from their teachers and peers. By understanding a student's needs and using a differentiated approach to instruction, educators are able to structure instruction to maximize learning for each student.

In an educational system where so many children — even children who are not categorically at-risk — are struggling, researchers have looked at different instructional approaches as a way to connect and engage students by using their unique abilities and addressing their challenges. When children do not connect with the curriculum because of the way it is delivered, they cannot access the information. Teachers must recognize that each child is unique in his or her desire to learn and in his or her abilities and talents (Drapeau, 2004), and that to teach to the average student means that many students are being left out (Haager & Klingner, 2005).

Definition of Terms

For the purpose of this study, the following definitions will be used.

At-Risk Students: Students with at-risk factors that can potentially affect academic achievement. Some of these factors are learning disabilities, limited English skills, and low socioeconomic status.

Differentiated Instruction: Instruction that is focused on and tailored to the needs of the student.

Diverse Learning Needs: Students' needs that affect their ability to access the curriculum such as language, prior experiences, prior education, physical or learning disability, culture, socioeconomic status, or learning modality.

English Learners: Students whose primary language is other than English and who have not reached proficiency levels in English reading, writing, and speaking as determined by the California English Language Development Test (CELDT).

Gifted Students: According to NCLB, *gifted students* refers to

> students, children, or youth who give evidence of high academic capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services or activities not ordinarily provided by the school in order to fully develop those capabilities. (NCLB, Title IX, Part A, Section 9101(22), p. 544)

Instruction: "…anything that is done purposefully to facilitate learning" (Reigeluth, 2009, p.6).

Learning Modalities: Sometimes referred to as *learning styles*, *learning modalities* can be defined as a way for an individual to assimilate and use knowledge (ldpride.net, 2008).

Significant Subgroups: Groups of at least 50 students that comprise 15% or more of the school population or at least 100 students. Subgroups used in calculating the AYP in California are students who identify with any of seven race categories, are socioeconomically disadvantaged, have a disability, or who English Learners.

Socioeconomically Disadvantaged: Students who are eligible for the free or reduced price lunch program known as the National School Lunch Program (NSLP) or a student neither of whose parents has received a high school diploma.

Standards-Based Instruction: Instruction that is based and assessed on a specific set of academic content standards as determined by each state.

Students with Disabilities: Students who receive special education services and have a valid disability code. These students cannot access curriculum using traditional methods.

Teacher Effects: Teacher factors that are easily quantified for research studies. Some of these effects include years of teaching, major of undergraduate study, coursework or degree obtained, and credentials held (Ding & Sherman, 2006).

Overview of Methodology

The study used quantitative survey data that measured teacher perceptions of their use of differentiated instruction. The first part of the survey measured the use frequency of differentiated strategies in the areas of planning and assessment, working with diverse learners, and teaching strategies, and was based on a survey developed by Tomlinson (2000). The second part of the survey collected data about credentials held, years of mathematics teaching experience, amount of training in differentiated instruction, and the number of English learners, students with disabilities, and gifted students in teacher's classrooms. The written survey was given to 4th through 8th grade mathematics teachers in 12 schools in LAUSD. The schools selected were three middle schools and nine elementary schools in the same geographic area. All schools were in the same local district in LAUSD and were Title I schools. After a verbal and written explanation of the project, written surveys were distributed to participants following a faculty meeting. Surveys were anonymous but were given a school and participant code by the researcher to verify data input. Coded survey data was analyzed for significance by research question by using t-tests, bivariate correlation analysis, ANOVA, or linear regression analysis. The researcher used the Statistical Package for the Social Sciences (SPSS) for all data analysis.

Limitations and Delimitations

Limitations

- Only one cluster of schools in LAUSD was used. Although these schools are representative of many Title I schools, the results may not applicable to all schools.
- Mathematics teachers were asked to volunteer for the survey. Not all mathematics teachers from each grade level chose to participate in the survey.
- The survey used self-reported data without classroom observations to verify results.
- Despite assurances of anonymity and confidentiality, some teachers may have responded in such a way as to make the results reflect favorably upon their school.

Delimitations

- The study was limited to mathematics teachers in grades 4-8. A similar study using teachers of mathematics from grades 2-11 may produce different results.
- Only teachers of mathematics were used for the purpose of this study. Teachers in other subject areas may produce different results.

Organization of the Dissertation

The introduction in Chapter I provided a brief overview of the need to improve academic achievement on national, state, and district levels. It further provided a statement of the problem needing additional exploration, the purpose and significance of the study, the research questions and the hypotheses that focused on the study, the

conceptual framework that guided the study, an overview of the methodology, and the study's limitations and delimitations.

Chapter II presents the literature review regarding factors creating a sense of urgency for educators, the history of differentiated instruction, teacher effects, teacher effectiveness, learning modalities, using differentiated instruction to address learning modalities, student engagement, professional development, and the relationship of DI and academic achievement.

Chapter III describes the methods for the study. It details the study's research design, setting, participants, instruments, and data collection procedures. The chapter also describes the statistical methods used for the data analysis as well as the role of the researcher. Chapter IV presents the results and Chapter V provides a discussion of the results, implications for policy and practice, and recommendations for future research.

CHAPTER II: Review of Literature

Facing increasing demands from federal, state, and district entities for higher levels of student achievement, educators are looking for more effective ways to instruct students who enter classrooms with a wide range of instructional needs. Differentiated instruction is not a strategy, *per se*, but a mindset for teachers in which the focus is on the students, not the curriculum. The purpose of this study was to examine teaching practices in mathematics across grades 4 through 8. In particular, this research was focused on the frequency with which elementary and middle school teachers reported utilizing differentiated or child-centered teaching. As part of the study, the research examined variables that might affect the frequency of DI use. These variables included years teaching mathematics, credentials held, classroom demographics, training in DI, and school level.

The literature review analyzed factors creating a sense of urgency for educators, the history of differentiated instruction, teacher effects, teacher effectiveness, learning modalities, professional development, the use of differentiated instruction to address learning modalities, student engagement, and the relationship between DI and academic achievement.

Sense of Urgency

"Without motivation, people won't help and the effort goes nowhere" (Kotter, 1998, p. 3). For an organization to change, people within that organization need to be motivated. According to Kotter, a powerful method of motivating people is to establish a sense of urgency, which is accomplished by clearly communicating information about a current or potential crisis. For educators and government leaders alike, awareness of this

crisis began with *A Nation at Risk* (National Commission on Excellence in Education 1983). *A Nation at Risk* was a wake-up call to America, stating that basically our educational system was failing. This failure of the public school system was blamed for the decline of the U.S. economy and was cited as the reason we were losing economic ground to other countries (DuFour, DuFour, Eaker & Karanek, 2004). In the decade following the publication of *A Nation at Risk*, the federal government provided additional financial support to states to assist them in developing higher academic standards, raising student achievement, and improving the quality of teaching for all students. The initial response to this new funding from the individual states was inconsistent and varied. Sanctions on school districts that did not show gains, based on assessment scores, were wide-ranging and depended on whether the assessments were high stakes or low stakes. There were also inconsistencies in the consequences that districts imposed on schools and teachers who did not meet targeted goals (Hardman & Dawson, 2008).

Following *A Nation at Risk*, the California Department of Education published a report entitled *Caught in the Middle: Educational Reform for Young Adolescents in California Public School* (Report of the Superintendent's Middle Grade Task Force, 1987), which stressed the dire need for middle school reform. With a national statistic of 700,000 dropouts annually, the authors reported that middle school was the "last substantive educational experience for hundreds of thousands of students" (p. vii). The report went on to say that students who fail at middle school often drop out of high school. The report also stated that for educational reform to be successful, educators needed be aware of the intellectual, social, and psychological needs of their students. In 2006 the National Association of Secondary School Principals (NASSP) published

Breaking Ranks in the Middle, which reported an urgent need to reform the system in which the longer students stayed, the further they slid down the global performance scale. *Breaking Ranks in the Middle* report stated, "…that as students move from elementary to middle to high school, they becomes less able to compete favorably with their international counterparts" (p. XVIII).

In 2002, the 1965 Elementary and Secondary Education Act (ESEA) was reauthorized and renamed No Child Left Behind (NCLB). Under NCLB, major changes started taking place in American education. For the first time, the federal government set specified mandates along with fiscal consequences for states not meeting them. The NCLB requirements set by congress included having states prove student proficiency through state-developed standards-based assessments with the goal that all students would be proficient in English Language Arts and mathematics by 2014. States responded by developing curricular standards with annual minimum proficiency targets or benchmarks that needed to be reached each year by all student subgroups. In California, yearly benchmarks were established to meet the goal of 100% proficiency for all students by 2014. These benchmarks are also used to track academic achievement for all children, including those whose lack of academic progress which was once accepted as a result of their challenges. Prior to NCLB, many students with special needs and English learners were not required to take standardized exams; therefore their academic growth was not tracked (Hardman & Dawson, 2008).

Proficiency benchmarks for all students created pressure on school districts, site administrators, and teachers to increase student proficiency or face consequences. Over the past four decades, educational reforms have been centered on state standards,

proficiency assessments, standards-based curricular materials, stringent teacher qualifications, and public reporting of test data (Stronge et al., 2008. Under NCLB (2001), the focus has been on the classroom and, in particular, the teacher in relation to student achievement. Educators and researchers are closely examining teaching processes and practices and their effect on student achievement (Konstantopoulos, 2009; Rivkin et al., 2005; Stronge et al., 2007). Examining how teachers differentiate instruction to meet the needs of a diverse student population is one area that has received increasing attention.

Meeting Diverse Needs: A History

Differentiated instruction or meeting the individual needs of students is not a new concept; however, prior to the passage of the Elementary and Secondary Education Act (ESEA) in 1965, children who were "different" were basically ignored or put into classrooms where they could "sink or swim" (Menzies & Falvey, 2008). This cohort included children of color, children who spoke a language other than English, and children with learning challenges. Prior to 1975, school districts determined if students with disabilities were "educable" — as a result, many children were not schooled at all (Erwin & Soodak, 2008). The educational neglect of so many children became such a major issue that the government stepped in to address the situation. Over several decades, legislation was put into effect that provided funding and programs for children who were previously ignored by our schools. The following section presents what our government did to provide equal educational opportunities for all students, thereby recognizing that children have unique educational need that must be addressed by schools.

Modern day targeted funding for the education of children began in 1965 with the passage of the Elementary and Secondary Education Act (ESEA). Under this legislation, the federal government provided funds for primary and secondary education including financial assistance to local educational agencies (LEAs) for children of low-income families (Title I). In 1966, ESEA was amended with Title V, which provided aid to children with handicaps, and in 1967 an additional amendment (Title VII) provided financial aid to bilingual programs (United States Department of Education).

Federal recognition of students with disabilities began in 1975, when the U.S. Congress passed the Education for All Handicapped Children Act (Public Law 94-142). Renamed in 2004 as the Individuals with Disabilities Education Improvement Act (IDEIA), the act's purpose has been to protect the rights of students, regardless of ability, by making sure that they receive a *free appropriate public education* (FAPE) with equal access to the curriculum in all educational programs, in the *least restrictive environment* (LRE). In 2004, IDEIA aligned with NCLB (2001), mandating that children with special needs had access to the grade-level curriculum in all subject areas (IDEA.ed.gov). This effort was affirmed in Section 504 of the Rehabilitation Act of 1973, which stated that handicapped individuals cannot be discriminated against by any program receiving federal assistance.

Commonly referred to as *special education services*, IDEIA not only modified the curriculum and instruction but also provided for any additional special services such as language and speech (LAS), occupational therapy (OT), adaptive physical education (APE), physical therapy (PT), and other services necessary for students to benefit from their educational programs. Each qualified student is provided with an *Individualized*

Education Plan (IEP), which describes his/her present levels of performance, strengths, areas of need, and academic and/or social/emotional goals.

Teachers working with students with special needs often adapt their teaching strategies so that the curriculum is comprehensible to them. How this effort is accomplished and what is expected of the student is clearly outlined in the student's IEP. A *special day class* (SDC) is for children with disabilities who require special education services for more than 50% of their school day. These classes may have a dozen or more students, each with a unique IEP, which may mean that the teacher has to create a variety of lessons and assessments for the class. For teachers working with students with special needs, the primary focus in instruction and assessment is based on the physical and cognitive needs of their students. These credentialed special education teachers need to differentiate instruction on a daily basis for these students. Placing students with disabilities in the *least restrictive environment (LRE)* can often mean placement in a general education classroom where it is the responsibility of the general education teacher to make adjustments in teaching strategies and assessments to meet the needs of these students.

In California, the needs of students with special abilities (gifted students) was recognized when the state enacted the Mentally Gifted Minor (MGM) act in 1961 for students scoring in the 98th percentile or higher on standardized intellectual ability tests (California Department of Education, 2009). In 2000 the California Education Code (EC 52200) was amended by Assembly Bill 2313, which mandated specific criteria for developing programs with differentiated learning experiences during the school day for gifted students (CDE, 2010). This legislation required that students qualifying as gifted

receive rigorous, differentiated instruction throughout the school day and be taught by specially trained teachers. In addition, the federal government recognized the needs of minority language learners by legislating the *Bilingual Education Act* (BEA) in 1968 as a supplemental grant to assist local school districts in educating their bilingual students by funding programs for bilingual education programs and teacher training.

IDEIA, gifted, and BEA legislations recognized the importance of meeting the specific needs of three diverse groups of learners, students with learning or physical disabilities, students with exceptional abilities or talents, and students whose primary language is not English. As a result, not only were these learning needs recognized and validated, but also federal and state funds were allocated to support programs for these groups of students. This support resulted in criteria for identifying students, program monitoring, and training teachers in differentiated techniques and strategies for meeting student needs.

In addition to the aforementioned groups of students, students in other categories of unique needs may have difficulty accessing the curriculum; these include students who are socioeconomically disadvantaged and students with a specific dominant learning modality that is not addressed in the classroom. The needs of these children cannot always be met with traditional practices of textbook-based, whole group instruction, and the question-and-answer dialogue that have endured over the last century (Cuban as cited in Edwards et al., 2006). For children to be successful in school, educational institutions need to focus on the unique learning needs of all students and to look at ways to effectively reach these students. Nye et al. (2004) has further stated that it is critical for

educational reform to identify effective teachers and those factors that make them effective in raising student achievement.

By researching effective teachers through classroom observation, Stronge et al. (2008) found that, "The effective teachers studied demonstrated a broader range of instructional strategies, using a variety of materials and media to support the curriculum, than those teachers who were considered ineffective" (p. 176). The researchers also determined that effective teachers provided more differentiated assignments for students than teachers who were considered less effective. Clearly, if using differentiated instruction is a factor in creating more effective teachers, then it is important to examine how much differentiated instruction (DI) is actually taking place in classrooms and the variables that affect the use of DI. This determination was the intent of this study.

The foundation of differentiated instruction is how a teacher adapts content, process, and product based on student needs (Levy, 2008; Santamaria, 2009; Tomlinson, 1999). What is taught (content) is determined by state curricular standards, but the teacher determines *how* it is taught and the strategies (process) used. Likewise, the way knowledge is assessed, in many cases, is at the discretion of the teacher. When a teacher uses strategies, materials, and assessments that are appropriate for each student, instruction is differentiated.

Teacher Effects

Equity in Educational Opportunity (Coleman et al., 1966), also known as the Coleman Report, stated that schools only had about a 10% effect on student achievement, with background and social context having the greatest influence. This finding was interpreted as teaching and schools having little effect on a student's academic

achievement (Nye et al., 2004); however, researchers over the past four decades have affirmed that teachers do, indeed, make a difference (Palardy & Rumberger, 2008; Wright et al., 1997). That said, a lack of consensus persists as to which teacher qualities matter the most in improving student achievement (Palardy & Rumberger, 2008). The terms *teacher effect* and *teacher effectiveness* are sometimes used interchangeably but are not to be confused with each other. For the purpose of this study, the teacher effects that were examined were years of experience, training, and credentials.

The quest to examine the effect teachers have on student achievement has generally taken three main approaches. The first approach is termed an *education production function*, whereby measurable teacher characteristics such as experience are measured against student achievement (teacher effects). The second approach has looked at classroom variations that can be attributed to effective teaching while controlling for student background. The third approach has focused on what practices constitute good teaching or teacher effectiveness (Konstantopoulos, 2009).

Because NCLB requires that schools hire highly qualified teachers, much of the education production function research has focused on the NCLB requirements for teachers. These background characteristics include education (a college degree), teaching credential, and showing subject matter and teaching skills competency. However, research considering the links between these characteristics and academic achievement has shown inconsistent results (Nye et al., 2004; Phillips, 2010; Rockoff, 2004).

Likewise, after synthesizing hundreds of research studies, Wayne and Young (2003) concluded that research examining the effects of the type of college the teacher attended, their test scores on teacher qualifying exams, their certification status, and the

courses they took and degrees obtained yielded conflicting results. Researchers have also studied the effects of years of teaching experience on student learning. For example, in research conducted by Rockoff (2004), elementary school data from two neighboring school districts were analyzed and it was found that the level of teacher experience had a positive effect on test scores in reading and math computation but not on math concepts. Nye (2004) found that teacher experience was only significant for 2nd-grade reading and 3rd-grade math scores.

Phillips (2010) studied the relationship between NCLB teacher quality indicators (degrees held, certification, subject matter competence, and years of teaching experience) and achievement gains for 1st-graders. Phillips found that when analyzing fully certified teachers versus teachers not fully certified, there were no positive academic gains in mathematics. Results overall indicated that the traits of highly qualified teachers, as defined by NCLB, did little to ensure increased academic achievement. In a study using the Early Childhood Longitudinal Study Kindergarten (ECLS-K), Leak and Farkas (2011) found that most teacher credentials had no significant effect on achievement in mathematics for kindergarten students. In looking at the quality indicator of experience, King-Rice (2010) discovered that the greatest gain in mathematics scores among 4th and 5th-grade students were attributed to first year teachers and that the least effective teachers were those with more than 20 years of experience.

Notably, the research has not addressed whether these characteristics are linked to the teaching strategies used in the classroom. Thus, in the present study, the researcher examined the connection among three of these teacher characteristics, including

credentials held, years of teaching experience in mathematics, and training in the use of differentiated instruction.

Teacher Effectiveness

Another viewpoint is represented by scholars who argue that the critical factor in raising academic achievement is teaching, not teachers (Stidler & Hiebert as cited in Palardy & Rumberger, 2008). These researchers posit that the practices and attitudes of teachers are more impactful than credentials, test scores, and so forth. Because practices and attitudes are harder to quantify and measure, less attention has been given to this specific area, but numerous studies have shown the substantial effect of teaching practices on student learning.

Shacter and Thum (2004) have also argued that to measure the effect that teachers have on student achievement, one must measure teacher performance, not teacher qualifications. To this end, they created 12 teaching performance standards and rubrics based on research on how children learned. These performance standards were teacher content knowledge, lesson objectives, presentation, lesson structure and pacing, activities, questions, feedback, grouping students, thinking, motivating students, environment, and teacher knowledge of students. Data was collected by means of eight observations in each of 52 elementary classrooms. Their results indicated that teacher performance, based on their indicators, was highly predictive of student academic performance as measured by pre- and post-tests in language, mathematics, and reading. Many of the behaviors exhibited by effective teachers (those raising student achievement) included making allowances for children's learning rates, providing students with choices, making

the material relevant to the student's life, and instructional grouping practices—all examples of differentiated instruction.

Odden, Borman, and Fermanich (2004) used a multilevel educational model to study teaching effectiveness. Odden et al. studied teacher effectiveness by examining the relationship of teacher effectiveness and student achievement at the school, classroom, and student levels. Although this model does not clearly define what constitutes teacher effectiveness and how it interacts with other teacher effect variables, the findings indicated that student learning is an interactive process; that is, teaching is based on the learning characteristics of the students and student learning is conditioned by effective teaching. In other words, effective teachers know their students and design instruction based on that knowledge.

A large-scale study using data from the Early Childhood Longitudinal Study (ECLS) of 20,000 kindergarten students looked at three areas, teacher background characteristics, teacher attitudes, and teacher instructional practices, and how they affected student achievement. Of these three aspects relating to teachers, instructional practices had the greatest effect on student learning. The effects of instructional practices were six times the effects of teacher background on reading achievement (Palardy & Rumberger, 2008). Although these studies focused on effective instructional practices, the researchers did not specifically address the frequency of teachers' use of these practices, which was the focus of the present study.

Although research that compares instruction in elementary to middle school is scarce, literature exists on the issues facing middle schools and the need for reform. Recommended reforms include using instructional practices appropriate for the

developmental characteristics of the students, providing multiple opportunities for students to practice basic skills, challenging students through the use of varied instructional strategies (CDE, 1987), making school student focused, and creating schedules to allow teachers sufficient time to learn about their students (NASSP, 2006).

Professional Development

Another factor that contributes to teacher effectiveness is quality training or professional development. Researchers recognize that high quality professional development for teachers is a critical component for improving student learning (Martin, Strother, Beglau, Bates, Reitzes, & Culp, 2010; Reeves, 2010). Even prior to the implementation of NCLB, over 25 states recognized the importance of teacher professional development by passing laws regarding better teacher professional development (Darling-Hammond as cited in Heath, Lakshmanan, Perlmutter, & Davis, 2010). With the passage of NCLB, the necessary federal funding was put into place under Title II for all states to improve teacher quality through professional development (PD).

Hairrell et al. (2011) have clearly stated that, "PD can be a primary method of supporting teacher's knowledge and practice and increasing the quality of instruction" (p. 242). They go on to emphasize that effective PD should be rigorous and take place over time. Short-term or one-shot workshops are the least effective in changing teacher practice (Birman, Desimone, Garet, & Porter, 2000; Kennedy, 1998).

"High-impact professional learning focuses on people and practices, not on programs (Reeves, 2010, p. 22). Reeves argued that good PD is not measured by what the teachers learn but by what is practiced in the classroom. Teachers who increase their

knowledge and skills through PD are more likely to change their teaching practices (Heath et al., 2010). The research, however, does not address the relationship between the amount of PD participation and the frequency of use of the skills learned. The present study examined the correlation between PD focused on DI strategies and the teachers' reported use of DI strategies in the classroom.

Learning Modalities/Styles

Learning modalities, sometimes referred to as learning styles, can be defined as ways that individuals assimilate and use knowledge (ldpride.net, 2008). Understanding a student's preferred learning modality and acknowledging that modality through differentiated instruction helps that student better access the curriculum. In an effort to explain how students learn, over the years researchers and educators have developed different descriptions of learning modalities/learning styles.

Toye (as cited in Vaughn & Baker, 2007) described learning styles as "attempts to explain learning variation between individuals in the way they approach learning tasks" (p. 240). Sarasin (1999) categorized these variations in the way students learn as *kinesthetic/tactile, visual, or auditory*. Kinesthetic/tactile learners learn best in hands-on situations in which they are physically involved, whereas visual learners learn more effectively by seeing demonstrations or reading, and auditory learners get more information from listening rather than reading. The kinesthetic/tactile learner learns best by incorporating physical or hands-on activities. Sarasin's research suggests that most people possess a combination of learning modalities/styles but tend to favor one style over another and that matching the method of instruction to the person's preferred learning modality/style may improve learning, retention, and achievement.

Gregorc and Butler (as cited in Pitts, 2009) have categorized learning styles as *concrete, abstract, sequential*, and *random*. Like kinesthetic/tactile learners, concrete learners require manipulatives or actual objects to make learning real for them. The authors characterized abstract learners as those who can synthesize information, whereas sequential learners require structure and detail. Random learners do not function well with structure or detail but do well with a *whole picture* approach to learning.

Sims and Sims (1995) argued that learners can be identified as *affective, perceptual, behavioral,* or *cognitive.* These authors have described the affective learner as being emotionally involved with the learning, whereas the perceptual learner looks at concepts holistically and visually. Like the previously mentioned kinesthetic/tactile and concrete learner, the behavioral learner needs active physical involvement as part of the learning process, whereas the cognitive learner needs time to understand the parts of the concept before comprehending the whole.

Grasha (1996) took a different approach to learning styles by describing how students related and worked with their teachers and other students. As a result of his research, Grasha developed six categories of learning styles: *independent, dependent, collaborative, avoidant, participant,* and *competitive*. These categories focused more on how students preferred to work, for example, alone, collaboratively, with minimal involvements, and so forth, rather than individual modality in which they prefer to receive instruction.

Howard Gardner (1983) examined learning styles from yet another perspective when he developed his theory of "multiple intelligences." In his research, Gardner questioned the idea of intelligence being a single unit resulting from a single source, such

as an IQ test, as a measure of an individual's potential. He identified intelligence as *linguistic, logical-mathematical, spatial, kinesthetic, musical, interpersonal, intrapersonal,* and *naturalist.* His premise was that in some individuals, certain intelligences are more developed than others and that learning can be improved by teaching to the more highly developed intelligence when possible and appropriate.

The literature reviewed for this study has shown that the descriptions of learning styles/modalities vary widely. These theories have been used to focus on how students interact with their learning environments, their social interaction preferences, how they process information, and their sensory modality preferences. Despite these different approaches to define learning styles/modalities, one characteristic they share is the belief that all individuals have a preferred method of learning. When educators incorporate a student's learning modality/style to facilitate instruction, they are practicing differentiated instruction.

Research on elementary and middle school practices has pointed to differences in how elementary and middle level teachers approach instruction. Randall and Engelhard (2009) found that when determining student grades, elementary teachers tended to focus on students' ability versus content mastery, whereas middle school teachers focused on students' ability to demonstrate mastery through assessments of content knowledge. The authors suggested that because they spend more time with their students, elementary teachers may feel the need to protect the self-esteem of their students. Moon, Callahan, Tomlinson, and Miller (2002) reported that differentiated strategies, such as tiered assignments, learning centers, and flexible groupings for instruction are rarely used in middle school. In the same study, many middle school teachers indicated that they did

not use a variety of materials to accommodate student reading levels and typically used the lecture method for whole class instruction. To add to this body of research, the present study examined the frequency with which elementary and middle school teachers reported using differentiated instruction (DI) when teaching mathematics and whether a relationship existed between specific classroom/teacher demographics and teachers' reported use of DI.

What is Differentiated Instruction?

We know from the literature that students learn in different ways and that when educators incorporate a student's learning style to facilitate instruction, they are practicing differentiated instruction. Over the years, researchers and practitioners have come up with many definitions for differentiated instruction. Tomlinson, Brimijoin, and Navarez (2008) have defined differentiated instruction (DI) as "something a teacher does in response to particular needs of particular human beings" (p. 5). The authors go on to state that differentiated instruction involves an understanding a student's needs in terms of readiness, individual interests, and specific learning profiles. Tomlinson and McTighe (2006) have described the goals of DI as the processes and strategies that produce effective learning for individuals. DI is instruction that should vary and be adapted based on student needs (Tomlinson, 2001). This aim is accomplished by acknowledging students' learning preferences, language, interests, and academic levels and responding accordingly (Hall, Strangman, & Meyer, 2003).

Heacox (2002) referred to differentiated instruction (DI) as a process-oriented methodology appropriate for classrooms in which students have a wide range of abilities. He explained that the personal needs of students are met with instruction that is flexible

and relevant. Similarly, Wormeli (2007) described DI as moving away from what is taught by the teacher toward what the individual student is able to learn. According to Wormeli, for this shift to occur, the teacher must learn about a student's needs and use the student's prior knowledge to plan instruction. Levy (2008) referred to differentiated instruction as a set of strategies, the use of which enables teachers to meet students where they are academically and to move them ahead.

According to Marzano (2007), assessment is a powerful tool for teachers. Before a teacher can plan instruction, there must be pre-assessment to determine the student's present level of readiness, interests, and learning profiles (Tomlinson, 1999b). Once a child is pre-assessed, planning can take place, which includes content, materials, and strategies to be used, along with formative (ongoing) assessment and summative assessment to measure student outcomes (Tomlinson & Imbeau, 2010).

Because the typical classroom consists of myriad learners, their diverse needs must be taken into account when planning instruction (Tomlinson & McTighe, 2006). When differentiating instruction, teachers need to understand that, "Students differ as learners in terms of background, experience, culture, language, gender, interests, readiness to learn, modes of learning, speed of learning . . . and a host of other ways" (Tomlinson & Imbeau, 2010, p. 14). Simply put, taking each learner's academic needs and learning styles into consideration is a critical component of differentiated instruction. Finally, Voltz, Sims, and Nelson (2010) have argued that the key to a successful classroom is teachers selecting and using instructional strategies (e.g., grouping, pacing, and scaffolding instruction) that address student learning needs. In the present study, these practices were grouped into the dimensions of planning and assessment strategies,

working with diverse learners, and teaching strategies, with the assumption that all of these elements are interconnected processes essential for effective learning. These dimensions include strategies such as tiered instruction, varying tasks by learning needs, and using a variety of materials. All of these strategies acknowledge the uniqueness of each student and allow teachers to address their learning needs.

Why Differentiate Instruction?

Most educators will agree that children learn in different ways and at different rates, but we expect children to adjust to the way lessons are presented instead of adjusting the presentation to their needs (Gregory & Chapman, 2007; Hall et al., 2003; Levy, 2008; Reigeluth, 2009; Sternberg & Zhang, 2005). Because children are unique in how they think and learn, they need different approaches to learning (Johnston, 2008). Students bring to the general education classroom a wide range of needs, including diverse cultural backgrounds, limited English proficiency, lack of prior educational experiences, and learning disabilities (Anderson, 2007; Cox, 2008; Tomlinson, 2009; Wormeli, 2007). To teach with a focus on the average student leaves many students out (Haager & Klingner, 2005).

Reigeluth (2009) has noted that to produce citizens with a diverse range of expertise, instruction needs to be unique and diverse to "help students learn in different ways and at different rates, customized to their diverse profiles of strengths and intelligences" (p. 391). In addition, when children do not connect with the curriculum because of the way it is delivered, they cannot access the information effectively. Tomlinson (2009) has stated that, "People learn more effectively when they can take advantage of their preferred ways of learning" (p. 2).

Students who are not engaged or who do not access the curriculum often fall behind, become frustrated, and in many cases "turn-off" or start "acting out" in the classroom (Barbetta, Norona, & Bicard, 2005; Boreen, Johnson, Niday, & Potts, 2000). In a 2009 interview, Douglas Cullinan, from North Carolina State University, stated that students will also exhibit disruptive behavior if the teacher is going too fast or too slow for their skill level. According to Boreen et al. (2000), classroom management problems can result if a teacher does not address a student's culture, interests, or academic needs. The majority of disruptive students is capable of learning but is not able to access the curriculum through the instruction that is given. Teachers who "teach like they were taught" often use just one or two teaching strategies, which rarely address the learning modalities of all their students (Edwards, Carr, & Siegel, 2006). In addition, much of what goes on in the classroom is focused on the typical learner, creating a situation in which many students with diverse learning needs are unable to connect with the curriculum (Johnston, 2008).

A report from the National Research Council and the Institute of Medicine (2004) stated that students who become disengaged from school are at risk for truancy, drug use, sexual activity, low academic achievement, and not completing their education. Educators know that when students are engaged in what they are doing, learning is increased and negative behaviors are reduced. Lippman and Rivers (2008) pointed out that student engagement is necessary for raising student achievement and is associated with three outcomes: increased academic performance, better school attendance and a decrease in risky behaviors. Schussler (2009) stated, "Formative assessment and differentiated instruction are other specific ways teachers provide academic support to

facilitate student engagement" (p.118). She explained that when teachers modify the process, content, or assessment of an assignment, they are better able to engage students.

Differentiated Instruction and Student Achievement

Huebner (2010) noted that little research addresses differentiated instruction as a practice but some research does validate the different practices that serve as the foundation of DI. A study conducted in an elementary school in Fresno, CA used flexible ability grouping, based on assessment data, to target instruction. The results were a steady increase in student performance levels and a decrease in student discipline referrals (Cusumano & Mueller, 2007). In addition, researchers have reported increased student achievement when they institute practices in which the needs of the child are the focus of instruction (Beecher & Sweeny, 2008; Ferrier, 2007; Hilyer, 2007).

In a study of 2nd-grade students in science, Ferrier (2007) found that students in the class in which differentiated teaching took place scored significantly higher in the science assessments than those students who were taught using a whole-group method. In another study, conducted by Beecher and Sweeny (2008), the results showed that in an elementary school, the achievement gap on state reading, writing, and math tests for students with differing socioeconomic status went from 62% to 10% using a program that included enrichment, staff development, and the implementation of differentiated lessons. In addition, academic gains were made by all ethnic groups. Prior to the study, 23% of Asian and 21% of African American students at the school were at the remedial level in all subject areas. At the conclusion of the study, no students from these subgroups were at the remedial level.

Vaughn and Baker (2007) showed that in working with adults, specific teaching styles matched to certain learning styles enhanced learning and created a healthy teaching-learning environment. In this study, the researchers grouped teachers and students with complementary teaching and learning styles. Teaching styles were categorized as expert, formal authority, personal model, facilitation, and delegation whereas learning styles were organized into categories such as dependent, independent, collaborative, avoidant, participant, and competitive. They concluded that when pairing two compatible styles, such as a facilitator and collaborator, the result was that both teacher and students felt more positive and comfortable about the learning experience. In a similar study, a group of at-risk middle school students were taught using methods related to differentiated instruction, hands-on learning, organizational skills, communication skills, and multiple-intelligences. The results of this study showed significant improvement in behavior and academic achievement (Hilyer, 2007).

Saunders, Goldenberg, and Gallimore (2009) conducted a study focused on grade-level planning, in which teachers were asked to identify specific student needs and then to collaboratively plan instruction that addressed those needs. Over a four-year period (1999-2002), the mean gain in API scores was 189.7 points versus the gain of 111.7 points for the control group, for a difference of 78 points. The practice of differentiated instruction has shown positive effects in addition to those in academic achievement. Tieso (2001) found that students who were taught using DI had higher levels of engagement and motivation, and were excited about learning. Barbetta et al. (2005) found that personalizing instruction and relating it to a student's interest can lessen student misbehavior

Although the majority of studies showed a positive relationship between the use of differentiated instruction and academic achievement, two notable studies did not show a positive effect on DI and student achievement. Pashler, McDaniel, Rohrer, and Bjork (2008) set out to determine if any empirical evidence indicated that adjusting instruction to one's learning style improved test scores. As part of the study, they looked at the interaction between a particular learning style and a matching instructional method, known as the *meshing hypothesis*. To reject the null hypothesis, they needed to show that the instructional method that worked effectively for a student with one learning style was not the most effective for another student with a different learning style. In 3 of the 12 cases, different learning methods optimized learning for different learners; however, in the nine other cases, the same learning method raised scores for different types of learners. Therefore Pashler et al. (2008) concluded that in 9 out of 12 cases, matching learning styles to the method of instruction was not necessary.

A study conducted by Parsons (2004) concluded that the use of differentiated instruction produced no significant difference based on pre- and post-test results. Using a specific reading assessment, the difference between the control and experimental groups was significant on the end-of-year state exams for the gifted students, but not for the other students. The unanswered questions in this study center on the types of differentiated instruction that were presented and how students were identified as to what type of instruction was appropriate for them.

Although the studies done by Pashler et al. (2008) and Parsons (2004) did not support the correlation of DI and increased student achievement, studies by Beecher and Sweeny (2008), Cusumano and Mueller (2007), Ferrier (2007), Hilyer (2007), Saunders

et al. (2009), and Vaughn and Baker (2007) showed positive results. Missing from all of these studies are details about the specific DI strategies used and how frequently these teaching strategies were utilized by elementary compared to middle school teachers, which was the focus of the present study.

Summary

Over the years, the federal government has taken a more active role in assuring that legislation and funding are meeting the needs of students. Recently, due to pressure from NCLB to raise achievement levels for all students, educators are looking at more effective ways to improve education for all; but the characteristics of effective teaching have been difficult to identify. Students come into the classroom with a wide variety of educational needs related to differing learning modalities, language, culture, ability, and poverty — all of which affect a student's ability to learn. Research has shown that when teachers differentiate instruction for these children, their academic achievement increases. However, what is missing from the research is an understanding of the frequency with which teachers use DI and what variables may affect their use of DI.

Through a survey of elementary and middle school mathematics educators, the present study examined specific practices that focus on differentiating instruction to address student needs. The intent of the study was to determine if these practices varied for elementary versus middle school teachers and if there were other factors, such as years of teaching experience in mathematics, training, classroom demographics, and credentials held, that might correlate with the use of these practices. Chapter III presents the methodology utilized for this study.

CHAPTER III: Methodology

Today's teachers face constantly increasing pressure to improve the proficiency levels of their students as measured by benchmarks set by individual states, such as the Annual Measurable Objectives (AMO), as mandated under No Child Left Behind (NCLB, 2001). With the typical classroom consisting of learners with very diverse cultural and/or socioeconomic backgrounds and learning needs, raising student proficiency has become increasingly difficult. Larger class sizes and budget cuts to support services and instructional materials just add to the challenges facing schools as they strive to raise academic achievement. This challenge is in addition to declining proficiency levels in mathematics as students move from elementary to middle school. A review of the literature suggests that using specific instructional techniques, referred to as differentiated instruction (DI), can, despite the barriers that exist, improve student achievement; however, little is known about how frequently DI is used in the elementary (grades 4 and 5) and middle school (grades 6, 7, and 8) classrooms or about factors that affect the use of DI.

The purpose of this study was to determine if there are differences in the frequency of self-reported teacher use of differentiated instructional strategies when teaching mathematics to meet the individual learning needs of students in elementary compared to middle school in a large urban school district. In addition, the study examined teacher/classroom characteristics: school level, classroom demographics, teacher credentials, years of experience in teaching mathematics, and training in DI to determine if a correlation existed between these factors and teachers' self-reported use of differentiated instruction.

To examine the use of differentiated instruction across elementary (grades 4 and 5) and middle school (grades 6, 7, and 8), the following research questions were addressed:

RQ_1. Are there any differences among teachers in elementary compared to middle school on the mean scores of their reported use of DI (planning and assessment strategies, working with diverse learners, and teaching strategies) in teaching mathematics?

RQ_2. Is there a relationship between the teachers' reported use of differentiated instruction in teaching mathematics and student background characteristics (i.e., English learners, students with disabilities, and gifted and talented students).

RQ_3. Are there any differences among the four groups of teachers (i.e., teachers with a multiple subject credential [MS], teachers with a single subject credential in mathematics [SS], teachers with a special education credential [SE], and teachers with a multiple subject credential/supplemental authorization in mathematics [MSM]) in their reported use of differentiated instruction in teaching mathematics?

RQ_4. Is there a relationship between teachers' reported use of differentiated instruction in teaching mathematics and their years of experience in teaching mathematics?

RQ_5. Does the amount of training in differentiated instruction in teaching mathematics have any impact on teachers' reported use of differentiated instruction?

Based on the research questions, the following hypotheses were tested:

Hypothesis 1. Elementary school teachers report using DI in teaching mathematics more frequently than middle school teachers.

Hypothesis 2. It was predicted that there will be a range of responses regarding the frequency with which differentiated instruction techniques/strategies are utilized in the classroom and that this range will vary depending on the percentage of English learners, students with disabilities, and gifted and talented students.

Hypothesis 3. There are significant differences among teachers holding a multiple subject credential, teachers with a single subject credential in mathematics, teachers with special education credentials, and teachers with a multiple subject credential with a supplemental authorization in mathematics and their reported use of differentiated instruction in teaching mathematics.

Hypothesis 4. There is a relationship between a teacher's reported use of differentiated instruction in teaching mathematics and the years of experience a teacher has in teaching mathematics.

Hypothesis 5. The more DI training a teacher reported having received, the more frequently the teacher reported using DI to teach mathematics.

Research Design

This study was a quantitative study involving descriptive, comparative, and correlational research methods. A quantitative approach was selected because it is a recognized method for describing current conditions and investigating relationships (Gay, Mills, & Airasian, 2006). The descriptive component detailed the current practice and understanding of differentiated instruction (DI) at a sample of 12 school sites in a large urban school district. Only teachers who taught mathematics daily participated in this study. The subject area of mathematics was chosen because it may be less dependent on language proficiency skills than English language arts (ELA) or other content areas. In

addition, English learners (EL) tend to have higher proficiency levels in mathematics, compared to ELA (Table 1.2). Comparative analyses were used to examine if school level, type of teacher credential, and experience teaching mathematics were significantly related to the self-reported use of differentiated strategies. Correlational analyses looked at the relationship of the use of DI and factors that may influence the use of differentiated instruction. These factors include classroom demographics, years of experience in teaching mathematics, and the amount of training in differentiated instruction.

Research Setting

The Los Angeles Unified School District (LAUSD) in California encompasses over 710 square miles and serves approximately 667,272 students in grades K-12 (CDE, 2011). The district was labeled as a Program Improvement (PI) district, meaning that it had not met at least one NCLB AMO for more than two years. For the 2009-2010 school year, district students had reached an average proficiency of 43.4% for grades 2 through 11 in English Language Arts (ELA) and 48.0% proficiency in mathematics (CDE, 2010). Five of the 11 significant student subgroups scored lower than the district average in both of these content areas (see Table 3.1).

Table 3.1

Percentage of Students Scoring Proficient on the 2009-10 California Standards Test

Student Group	ELA	Math
All Students	43.4	48.0
African American	38.8	37.4
American Indian	48.3	52.2
Asian	76.4	82.8
Filipino	70.3	71.1
Hispanic or Latino	37.7	43.7
Hawaiian or Pacific Islander	50.2	51.5
White	73.3	74.0
Two or More Races	62.6	59.5
Socioeconomically Disadvantaged	38.4	44.1
English Learners	28.4	38.3
Students with Disabilities	21.1	25.6

At the time of this study, LAUSD had 891 K-12 schools, 518 elementary schools, 126 middle schools, and 127 senior high schools. The remaining 120 schools consisted of span,[3] charter, continuation senior highs, special education, community day, and opportunity high schools (CDE, 2011). The student ethnic breakdown for LAUSD students in 2010 was 73.6% Hispanic, 10.3% African American, 8.9% White, and 3.8%. Asian. The remaining 2.7% consisted of Filipino, Pacific Islanders, First Nation, students

[3] Span schools are configured to include elementary and secondary students.

who reported two or more races, and students who did not report any race. In addition, LAUSD has 48.6% of students classified as English Learners, 10.5% are receiving special education services, and 66% are considered socioeconomically disadvantaged (CDE, 2011). The percentage of gifted students in LAUSD as of June 2011 was 9.6% (LAUSD Office of Gifted and Talented Programs, personal communication, August 4, 2011).

Research Sample and Data Sources

The schools selected for this study included three middle schools and nine elementary schools. This cluster of schools was purposefully selected because of their Title I status, and because of their geographic location. All schools have the same numerically significant subgroups based on 2010 California AYP results. As can be seen in Table 3.2, they also possessed similar demographics, which included the percentage of socioeconomically disadvantaged (students qualifying for free or reduced-price lunch), Latino students, and students receiving special education services. The percentage of English Learners (EL) was lower in the middle schools (average of 27%) than the elementary schools (average of 50%) because the district projects that most ELs should be reclassified as proficient in English after five to six years of targeted instruction. The percentage of identified gifted students in middle schools was almost triple the average percentage of gifted students in elementary schools. This difference was due to the district's criteria, which required students to produce several years of high test scores to be identified as gifted.

The California Academic Performance Index (API) for the middle schools ranged from 678 to 720. The elementary schools' APIs ranged from 668 to 814. As part of

LAUSD, all participant schools were expected to use the California State Standards for instruction, were on the same instructional traditional school year calendar, participated in district periodic assessments, and had the same mandated methodology for teaching English Learners.[4] The 12 schools were located in the same administrative local district within LAUSD.

All of the participating schools were labeled Title I, with over 75% of their students participating in the federal free/reduced lunch program (Table 3.2). All three middle schools were Program Improvement Year 5 (PI 5) schools, meaning that they had not met their AMOs for more than five years. Eight of the nine elementary schools were PI, ranging from PI Year 1 to PI Year 5, with one school (ES5) not in Program Improvement. All 12 schools selected were located within five miles of each other.

[4] All schools are mandated to use Specially Designed Academic Instruction in English (SDAIE) to enable EL students to access core curriculum.

Table 3.2

Demographics of Participating Middle Schools and Elementary Schools

School	API (2010)	EL%	ED%	Latino%	SWD%	GATE%	PI Yr
Middle Schools							
MS1	678	27	87	82	15	13	5
MS2	685	29	88	83	20	12	5
MS3	720	25	84	84	16	13	5
Elementary Schools							
ES1	735	55	88	78	16	1	4
ES2	750	61	91	89	9	4	4
ES3	803	49	84	83	7	6	1
ES4	767	41	84	78	11	9	2
ES5	814	48	91	85	11	6	--
ES6	775	37	77	75	9	9	2
ES7	668	57	95	91	12	3	5
ES8	773	54	90	87	11	3	5
ES9	752	48	87	75	14	9	4

Note. API = Annual Proficiency Index; EL = English Learners; ED = Economically disadvantaged; SWD = Students with Disabilities; GATE = Gifted and Talented; PI Yr = PI Status

Instruments and Procedures

The data for this study were obtained from a 31-question written survey (Appendix A). The survey questions were based on findings and concepts from research in the area of DI. The survey consisted of two sections. The first section focused on differentiated practices. The practices were organized in three dimensions (Planning and

Assessment Strategies, Working with Diverse Learners, and Teaching Strategies). *Planning and Assessment* dealt with strategies such as pre-assessment for readiness or planning assignments based on learner needs (i.e., I pre-assess for student readiness). *Working with Diverse Learners* addressed strategies such as varying tasks by learner profile or developing a student-centered classroom (i.e., My classroom is student centered). The dimension of *Teaching Strategies* contained questions about using strategies that facilitated DI such as flexible groupings and scaffolding instruction (i.e., I plan and use flexible groupings). Participants were asked to rate their perceived frequency of use for each strategy by means of a Likert-type scale ranging from 1 (*never*) to 7 (*daily*). Ten of the 22 questions about teacher practices were taken verbatim from a survey developed by Tomlinson and Allen (2000),[5] an additional five of the questions were edited versions of Tomlinson's questions, which involved multiple strategies. The remaining questions centered on common DI practices, as cited in the literature, or terms that LAUSD teachers would be familiar with. One question (#8 for teaching strategies) stated a practice that involved a lack of DI and was included to identify any item response patterns. This question was not included in any of the analyses. Dr. Tomlinson gave permission to use her survey in whole or in part for this study.

Table 3.3 shows the means for the responses for the elementary and middle school teachers for each DI dimension and the Grand Mean. For Planning and Assessment, the middle school teachers had a slightly higher mean (4.81) than the elementary teachers (4.78). Based on the Likert-type scale (1 -7) that was used, both groups reported using planning and assessment strategies less than twice a week with their students in

[5] Questions taken verbatim from Dr. Tomlinson's survey titled Reflecting on Practices for Differentiating Instruction in Response to Learner Need (2005) are marked with an * in Appendix A. Questions that were slightly changed from the original are marked with a #.

mathematics. The mean for working with diverse learners was higher for both groups, with means ranging from 5.11 for middle school teachers and 5.47 for elementary teachers. This finding equates to using these strategies more than twice a week but less than every other day. This dimension recorded the highest mean for the study. The last dimension, Teaching Strategies, produced a mean of 5.34 for the elementary teachers and 5.04 for the middle school teachers. This finding translates into both groups using these strategies at least twice a week but less than every other day.

Table 3.3

Summary of Participant Responses on the Dimensions of Differentiated Instruction

	ES (N = 60)	MS (N = 38)	Total (N = 98)
Planning and Assessment			
Mean	4.78	4.81	4.79
SD	1.08	1.12	1.09
Range	2.71-7.00	2.43-7.00	2.43-7.00
Working with Diverse Learners			
Mean	5.47	5.11	5.33
SD	0.98	0.99	0.98
Range	3.14-7.00	2.29-6.86	2.29-7.00
Teaching Strategies			
Mean	5.34	5.04	5.22
SD	0.89	1.21	1.03
Range	2.86-7.00	2.57-7.00	2.57-7.00
Grand Mean			
Mean	5.20	4.99	5.12

SD	0.88	1.00	0.93
Range	3.14-6.86	2.64-6.52	2.64-6.86

The second section of the survey was the demographic component with questions concerning the number of years of teaching experience in mathematics, credentials held, the grade taught at the time of the survey administration, the amount of training in DI over the previous five years outside of the teacher's school, and the types of learners in the teacher's classroom. This section contained open-ended questions and checklists.

The survey was piloted in the fall of 2010 with elementary (N = 5) and middle school (N = 7) mathematics teachers who were not part of the research study. The purpose of the pilot was to determine if the survey was easy to understand and if there was any confusion on the part of participants as to the meaning of questions or how to answer any of them. No changes were made in the survey as a result of the pilot. Based upon feedback from the pilot study, face validity was established for the survey.

Survey reliability was established using the Statistical Package for the Social Sciences (SPSS) software program. As described earlier, the first part of the survey was divided into three dimensions (planning and assessment strategies, working with diverse learners, and teaching strategies). Reliability was calculated independently for each dimension. The three dimensions yielded a Cronbach's Alpha of .720, .703, and .760, respectively. According to Nunnaly (as cited in Santos, 1999) an alpha of 0.7 or above is an acceptable reliability coefficient. All three dimensions were thus deemed to have sufficient reliability.

The decision to use a written survey for this study was based on several factors. One factor was that people are generally familiar with written surveys as opposed to one-on-one interviews. Fowler (2009) stated that other advantages to using a survey included the ability to focus questions on a specific topic and to standardize measurement of data. According to Ary, Jacobs, and Razavieh (1972), surveys can be used not only to describe current conditions but also to compare existing conditions with other criteria. In addition, Fowler noted that surveys are more socially desirable in that they allow for anonymity and confidentiality.

Survey Participants

Participants for this study were elementary (N = 60) and middle school (N = 38) mathematics teachers from 12 Title I schools, all located within the same local administrative district within the Los Angeles Unified School District. All teachers who participated were credentialed and teaching mathematics on a daily basis. Participants were told that that survey was anonymous and voluntary. Teachers were not compensated for their participation.

By presenting the survey to all teachers of mathematics at these schools, the researcher was able to obtain a sample of teachers that was diverse in both experience and training. According to the principals at the selected schools, all of the participant-teachers were properly credentialed and teaching within the scope of their credential, which included multiple subject, single subject, or supplemental authorization to teach mathematics.

NCLB requires that teachers be highly qualified — meaning that they have full state teacher certification, at least a bachelor's degree from an accredited institution, and

subject matter competency. Each state has its own credential licensing requirements. In California, holders of single subject credentials must have a major in the subject area or an equivalent, such as passing the California Subject Examination (CSET), and must pass the California Basic Education Skills Test (CBEST). Elementary credential holders must pass the CSET (multiple subjects) examination and the California Basic Education Skills (CBEST) exam. Holders of special education credentials take specific coursework that prepares them to work with students with disabilities and must also pass the CBEST and the appropriate subject matter examinations or hold the appropriate single or multiple subject credential for their assignment in order to be considered highly qualified under NCLB.

Four teachers who participated in the study held both multiple subject and special education credentials. Some teachers held more than one credential, thus the sum of the credential types may exceed the number of teachers participating in the study. Table 3.4 summarizes the demographic information for the participants.

Table 3.4

Participant Demographics

	ES (N = 60)	MS (N = 38)	Total (N = 98)
Yrs. Teaching Math			
Mean	12.77	10.66	11.95
SD	8.97	5.73	7.91
Range	2-38	1-36	1-38
Credential Types			
SS	0	14	14
MS	52	17	69
SE	10	5	15
MSM	1	6	7

Gender			
Female	41	26	67
Male	19	12	31

SS = single subject credential, MS = multiple subject credential, SE= Special Education credential, MSM = Multiple subject credential w. authorization in mathematics.

Data Collection and Procedures

This study adhered to all guidelines for Human Subject protocols put forward by LAUSD and the California State University, Northridge (CSUN). Prior to the start of data collection, the research study was approved by LAUSD Office of Research and Evaluation and CSUN's Office of Research and Sponsored Projects. All participants were furnished with an informational letter explaining the purpose of the study (Appendix B) and a participant's rights and consent form (Appendix C). In addition, permission of the principal at all 12 schools was obtained before the survey was presented to the faculty.

The survey was presented to all mathematics teachers at the three selected middle schools and to all 4th and 5th-grade teachers at the nine selected elementary schools who teach mathematics on a daily basis (N = 110). The surveys were distributed over a two-week period beginning the last week of April 2011. A total of 110 surveys were distributed based on school staffing numbers provided by the school principal. Ninety-eight surveys were returned for a return rate of 89.1%. The participants included 31 male teachers and 67 female teachers. One teacher did not indicate the type of credential held. As shown in Table 3.5, the distribution of responses by grade level taught ranged from 8 teachers who taught 8th grade to 32 teachers who taught 5th grade.

Table 3.5

Elementary and Middle School Survey Responses (N = 98)

Grade	4th	5th	6th	7th	8th
Participants	28	32	14	16	8

The researcher initially met with the principals of participating schools to explain the project and to answer any questions they may have had. Principals were given a document with directions about how to introduce the survey to their faculty (Appendix D). At all the elementary schools and one middle school, the principal presented the survey to the selected staff, explained the procedures for completing the survey, and left the room after designating a staff member to collect the surveys and consent forms. At the other two middle schools, after meeting with the principal, an assistant principal or coordinator was given the task of administering the survey. Neither the researcher nor an administrator was in the room while the surveys were being completed. Each participant was given a survey packet that consisted of a letter introducing the researcher along with an explanation of the study, a consent form, and the two-page survey. Participants were informed in writing (Appendix C) that the survey was voluntary and anonymous. Consent forms were collected before the surveys were distributed. The consent forms and surveys were placed in separate envelopes and placed in a larger envelope that was collected by the researcher on the following day.

At each elementary school site, all teachers in grades 4 and 5 were solicited to participate in the voluntary study at the conclusion of a regularly scheduled faculty meeting. At the middle schools, mathematics teachers in grades 6 through 8 were asked

to take the survey at the conclusion of a faculty meeting. Data for each school were identified by a code, MS1, MS2, MS3 for middle schools, or ES1, ES2, and so forth for elementary schools. In addition, each survey was assigned a letter code after the school code in the event that the researcher needed to verify data input.

Data Analysis

The data derived from the first part of the written surveys were coded using a Likert-type scale ranging from 1 (*never*) to 7 (*daily*). The questions in that section were categorized into three dimensions: Planning and Assessment Strategies, Working with Diverse Learners, and Teaching Strategies. The survey questions in the dimension of Planning and Assessment asked teachers to report on such strategies as the frequency with which they pre-assessed and used tiering with their students. Questions in the dimension of Working with Diverse Learners asked teachers to report on various tasks based on learner profiles and scaffolded learning for struggling students. The Teaching Strategies dimension dealt with the frequency with which teachers used a variety of materials and flexible groupings. The frequency of self-reported use for the DI dimensions was calculated by first organizing the strategies into dimensions, then calculating the mean score for each dimension and the Grand Mean for all three dimensions. The responses for the second section of the survey (participant demographic information) were coded and entered into an Excel spreadsheet that was imported into and analyzed using Statistical Package for the Social Sciences (SPSS). Table 3.6 lists all of the variables and their descriptions and codes used in this study.

Table 3.6

Variables Used in Analysis and Their Descriptions and Codes

Variables	Description/Code
DI Dimensions	
Planning	Planning and Assessment Strategies mean
Working	Working with Diverse Learners mean
Teaching Strategies	Teaching Strategies mean
Grand Mean	Mean score for all three dimensions
Elementary School (ES)	Grades 4 & 5
Middle School (MS)	Grades 6, 7, & 8
School Level	Elementary = 0, Middle = 1
Students	EL= English Learners, GATE = Gifted and Talented Students, SWD = Students with Disabilities
Credentials	SS = Single Subject (Mathematics), MS = Multiple Subject, SE = Special Education, MSM= Multiple Subject w. authorization in Mathematics.
Credential Held	0 = No, 1 = Yes
Teaching Experience	1 = 1-5 years, 2 = 6-10 years, 3 = 11-20 years, 4 = 20+ years.
Training	0 = did not attend, 1 = 1-2 trainings, 2 = 3-5 trainings, 3 = 6 + trainings.

A series of different statistical tests were used to analyze the data from the different research questions. To determine if there was a difference in the frequency with which teachers self-reported using DI in elementary and middle schools (RQ_1), the means, standard deviations, and ranges were calculated for each DI dimension along with a Grand Mean, and the teachers were coded into two groups (elementary for grades 4 and 5 and middle school for grades 6, 7, and 8). An independent samples t-test was used to determine if there was a difference between the two groups and the self-reported use of DI. To determine if there was a significant relationship between the teachers' self-reported use of DI and classroom demographics (RQ_2), the researcher first calculated the percentage of EL, gifted, and SWD students in each teacher's class. Using the means and standard deviations for each DI dimension and student demographic group, bivariate correlations were used to determine the magnitude and direction of the relationships. To examine the relationship between the different credentials and DI dimensions (RQ_3), a descriptive analysis was run to calculate the means and standard deviations of each DI dimension for each credential type. For the purposes of analysis, the teachers holding both special education (SE) credentials and multiple subject credentials (MS) were given an SE code if they reported teaching special education students. All 15 teachers with special education credentials reported having special education students in their class. Teachers holding a single subject credential in mathematics (SS) and a multiple subject credential with supplemental authorization in mathematics (MSM) were coded as a SS, as an SS credential in mathematics is required for teaching higher level mathematics classes, such as geometry. An analysis of variance (ANOVA) was used to examine the

relationship between the types of credentials held by teachers and their reported use of DI.

To determine the relationship of DI and years of teaching experience in mathematics (RQ_4), the researcher first categorized years of experience into four groups (1 = 1-5 years, 2 = 6-10 years, 3 = 11-19 years, 4 = 20 years or more). A descriptive analysis was run to calculate the means and standard deviations for each of the experience groups and DI dimensions. An ANOVA was then used to establish a relationship between these experience groups and the means of the DI dimensions. To analyze RQ_5 (amount of training), the researcher first had to assign a numeric code to each range of training. The number of trainings participants reported attending for the different student groups (EL, gifted, SWD) were categorized as 0 trainings, 1-2 trainings, 3-5 trainings, and 6 or more trainings. These categories were given the values of 0 (no trainings), 1 (1-2 trainings), 2 (3-5 trainings), or 3 (6+ trainings). If the participant did not respond for a particular student group, a value of 0 was assigned. One participant did not respond to any of the categories and was not included in the analysis. The points were totaled for each participant and are referred to as the Training in DI (TIDI, pronounced *tidy*) score. A descriptive analysis was calculated for the mean and standard deviations for the TIDI and DI dimensions. A correlation analysis was used to examine if there was a relationship between the use of DI and the amount of training in DI participants had taken, other than what was provided at their school sites (RQ_5).

Finally, to examine the combined effects of all the variables on DI, stepwise linear regression analyses were performed with each of the DI dimensions and the Grand Mean as dependent variables. The independent variables included credential types held;

percentage of English learners, gifted students, and students with disabilities; years of experience teaching mathematics; and TIDI scores. The dichotomous variable of credential type was coded "1" if the teacher reported having the credential type and "0" if the teacher reported not having the credential type. The dichotomous variable of school level was coded "0" for elementary school and "1" for middle school.

One survey was used at all 12 schools, thus ensuring instrumentation reliability. All data was coded and imported into Statistical Package for the Social Sciences (SPSS) for analysis. SPSS is a widely used and accepted statistical analysis software package capable of running a full range of analyses (SPSS, 2008).

Role of the Researcher

The researcher is an experienced elementary principal in LAUSD and is familiar with current curriculum and instructional practices. The researcher's elementary school was not part of the final study because of possible conflict of interest or researcher bias.

"The researcher's primary goal is to add to knowledge, not pass judgment on a setting." (Bogdan & Biklen, 2007, p. 38). The researcher attempted to minimize researcher bias by making sure that all data was recorded accurately for all surveys that were received. All schools were provided with the same set of instructions and each participant was given the same survey. The survey was previously piloted at one elementary and one middle school to determine if the questions were confusing or misleading. The researcher did not speak directly to any of teachers who participated in the study with regard to the study and participants were not offered any type of monetary compensation for taking the survey. The project was presented to the principals as a survey of instructional strategies across grades 4 through 8.

Summary

This quantitative study used a written survey of 4th through 8th-grade mathematics teachers in 12 schools in the Los Angeles Unified School District. The survey attempted to measure teacher perceptions of their own practices in differentiated instruction along with other factors that may be related to implementation. The data was collected and analyzed to support or reject the hypotheses as set forth by the research questions.

CHAPTER IV: RESULTS

The purpose of this quantitative study was to examine the practices of differentiated instruction (DI) among mathematics teachers across grades 4 through 8. In addition, the researcher examined the use of DI in relationship to the following variables: credentials, classroom demographics, amount of training in DI, and years of mathematics teaching experience. Although research has focused on the effectiveness of differentiated instruction (Beecher & Sweeny, 2008; Ferrier, 2007; Vaughn & Baker, 2007), research that examines how much differentiated instruction (DI) actually takes place in elementary compared to middle school mathematics classrooms is still lacking. There is also a dearth of research examining the previously mentioned factors and their correlation with the use of DI.

Research Questions

This study was conducted to answer the following five research questions:

RQ_1. Are there any differences among teachers in elementary compared to middle school on the mean scores of their reported use of DI (planning and assessment, working with diverse learners, and teaching strategies) in teaching mathematics?

RQ_2. Is there a relationship between the teachers' reported use of differentiated instruction in teaching mathematics and student background characteristics (i.e., English learners, students with disabilities, and gifted and talented students)?

RQ_3. Are there any differences among the four groups of teachers (i.e., teachers with a multiple subject credential [MS], teachers with a single subject credential in mathematics [SS], teachers with a special education credential [SE], and teachers with a

multiple subject credential/supplemental authorization in mathematics [MSM]) in their reported use of differentiated instruction in teaching mathematics?

RQ_4. Is there a relationship between teachers' reported use of differentiated instruction in teaching mathematics and their years of experience in teaching mathematics?

RQ_5. Does the amount of training in differentiated instruction in teaching mathematics have any impact on teachers' reported use of differentiated instruction?

Methods

This study surveyed teachers in grades 4 through 8 in 12 schools in one local administrative school district in LAUSD. The surveys were distributed to all teachers who taught math on a daily basis at the 12 schools (N = 110). Ninety-eight of the surveys were returned, for a response rate of 89%. The 31-question survey was divided into two sections. The first part of the survey consisted of 22 questions relating to teacher practices in DI. These questions were organized into three dimensions: planning and assessment strategies, working with diverse learners, and teaching strategies. A mean was calculated for each dimension, along with a grand mean for all three dimensions. These means were used to determine significance in relationship to the other variables.

The second part of the survey gathered demographic information on the teachers and their classrooms. These variables included grade taught, years of experience in teaching mathematics, credentials held, classroom demographics, and participation in DI training outside of their school site. Based on the responses to the item on grade taught, teachers were placed into two groups: elementary for grades 4 and 5, and middle school for grades 6, 7, and 8. Years of experience teaching mathematics was put into categories

(1 = 1-5 years, 2 = 6-10 years, 3 = 11-20 years, and 4 = 20+ years). Responses to items on participation in DI training for each group of students (English learners, gifted, students with disabilities) were assigned values (0 = no training, 1 = 1-2 trainings, 2 = 3-5 trainings, and 3 = 6 or more trainings), which were totaled for each teacher for a Training in Differentiated Instruction (TIDI) score. For the RQ_3 (credentials) and RQ_4 (experience), descriptive analysis was used to determine the mean and standard deviations along with an ANOVA to determine significant differences between these variables and the DI means. The analysis for RQ_2 (demographics) and RQ_5 (training) involved descriptive analysis and correlation analysis to determine if there was a relationship between the DI means and these variables. In addition, to analyze the effects of all the variables simultaneously on the reported use of DI, stepwise linear regression analyses were performed using the means for the DI dimensions as the dependent variables and the aforementioned variables as the independent variables.

Results

Hypothesis 1. Elementary school teachers report using DI in teaching mathematics more frequently than middle school teachers.

The teachers were put into two groups, elementary (teachers in grades 4 and 5) and middle school (for grades 6, 7, and 8) based on the reported grade taught. The means, standard deviations, and ranges for the elementary and middle school teachers were calculated for each DI dimension along with a Grand Mean for all three dimensions. Independent samples t-tests were used to determine if significant differences existed between elementary and middle school teachers on the reported use of DI.

As can be seen in Table 4.1, the means for the three DI dimensions for elementary teachers (N = 60) ranged from 4.78 (Planning and Assessment) to 5.47 (Working with Diverse Learners). The range for middle school teachers (N = 38) was from a low of 4.81 (Working with Diverse Learners) to a high of 5.11 (Planning and Assessment). These means indicate that, on average, participating teachers reported using differentiated instruction strategies one to two times per week. While the mean was higher for elementary teachers for two of the DI dimensions (Working with Diverse Learners and Teaching Strategies) and the Grand Mean, independent samples t-tests showed that none of the differences were significant at the .05 level (see Table 4.1). To summarize, no significant differences emerged between the elementary and middle school teachers in any of the DI dimensions or the Grand Mean. The hypothesis stating that elementary teachers self-report using DI in teaching mathematics more frequently than middle school teachers was not supported.

Table 4.1

Differences Among Elementary (ES) and Middle School (MS) Teachers in Three Dimensions of Differentiated Instruction (N =60 Elementary Teachers and N =38 Middle School Teachers)

Variable	*M*	*SD*	*t*	*df*	*p*
Planning and Assessment			.154	96	.878
ES	4.78	1.08			
MS	4.81	1.23			
Working with Diverse Learners			1.762	96	.081
ES	5.47	0 .98			
MS	5.11	0 .99			
Teaching Strategies			1.346	62.27	.153
ES	5.34	0.89			
MS	5.04	1.21			
Grand Mean			1.09	96	.278
ES	5.20	0.88			
MS	4.99	1.00			

Hypothesis 2. It is predicted that there will be a range of responses regarding the frequency with which differentiated instruction techniques/strategies are utilized in the classroom and that this range will vary depending on the percentage of English learners, students with disabilities, and gifted students.

The mean and standard deviation for the dimensions of DI and student groups was calculated along with the range of responses for the dimensions (see Table 4.2). Ten of the participants did not include the number of English learners, gifted students, or students with disabilities; thus there is a lower sample size for these variables (N = 88) compared to the DI dimensions (N = 98).

Table 4.2

Descriptive Statistics for DI Dimensions and Student Demographics

	Mean	Std. Deviation	Range
Planning	4.79	1.09	2.43 – 7.00
Working	5.33	0.97	3.71 – 6.57
Teaching	5.22	1.03	2.57 – 7.00
Grand Mean	5.12	0.93	2.64 – 6.87
EL Students (N = 88)	0.39	0.33	0 – 100*
Gifted Students (N = 88)	0.12	0.19	0 – 77*
SWD Students (N = 88)	0.23	0.30	0 – 100*

** indicates reported classroom percentages*

A bivariate correlation analysis was run using the mean scores for each DI dimension and the percentages of English Learners (EL), gifted students, and students with disabilities (SWD) teachers reported having in their classrooms (Table 4.3). Using a 2-tailed t-test of significance, significant correlations ($p < .05$) were found for the dimensions of working with diverse learners, teaching strategies, and for the overall grand mean when correlated with the percentage of students with disabilities (SWD) in the class. This data indicated that teachers were more likely to report using DI strategies related to the dimensions of working with diverse learners and teaching strategies when there were higher percentages of students with disabilities in their classrooms, but that reported use of DI strategies was not related to the percentage of English learners or gifted students (Table 4.3). The hypothesis is supported for SWD students and the self-reported use of DI but not for the other two groups of students.

Table 4.3

Correlation of the Use of DI and Classroom Demographics

Variable	1	2	3	4	5	6	7
Planning		.679**	.680**	.885**	-.057	.081	.091
Working			.748**	.899**	.056	-.075	.190*
Teaching				.902**	.048	-.069	.233*
Grand Mean					.016	-.021	.188*
EL Students						-.479**	.378**
Gifted Students							-.356**
SWD Students							

* $p < 0.05$, ** $p < 0.01$

The significant correlations between the DI dimensions (Table 4.3) indicate that teachers who were more likely to report using DI strategies from one dimension were also more likely to report using DI strategies in the other dimensions. The negative correlations between the percentage of gifted students and the percentage of both EL and SWD student are likely the result of the LAUSD district policies to cluster each of these student groups to better meet their needs.

Hypothesis 3. There are significant differences between teachers holding a multiple subject credential, teachers with a single subject credential in mathematics, teachers with special education credentials, and teachers with a multiple subject credential with a supplemental authorization in mathematics and their reported use of differentiated instruction in teaching mathematics.

The survey provided a checklist of possible credentials and teachers were asked to check off all credentials they currently held. The researcher then compiled the data on

the credentials held by participants. As noted in Table 3.4, some teachers held more than one credential. For the purposes of analysis, the four elementary teachers with special education (SE) credentials and multiple subject credentials (MS) were given an SE code, as they were currently teaching special education students. The three middle school teachers with a single subject credential in mathematics (SS) and a multiple subject credential with a supplemental authorization in mathematics (MSM) were coded as SS, as an SS credential in mathematics is required for teaching higher level mathematics classes such as geometry. One teacher did not indicate any specific credential and was excluded from the analysis. The means and standard deviation were calculated for each credential type and for the DI dimensions and DI Grand Mean (Table 4.4).

Table 4.4

Descriptive Statistics Comparing Four Credential Groups and Dimensions of DI

Credential	Planning		Working		Teaching		DI Grand M	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
SS (N = 14)	4.94	0.97	5.01	0.78	4.83	1.13	4.92	0.80
MS (N = 62)	4.80	0.99	5.43	1.00	5.27	0.89	5.17	0.86
SE (N = 15)	4.96	1.33	5.51	1.17	5.70	1.22	5.39	1.16
MSM (N = 6)	4.24	1.57	4.78	0.72	4.85	1.08	4.62	1.07
Totals (N = 97)	4.81	1.08	5.34	0.99	5.25	1.01	5.13	0.92

SS =single subject credential in mathematics, MS = multiple subject credential, SE = special education credential, MSM =multiple subject credential with an authorization in mathematics.

An analysis of variance (ANOVA) was used to determine if there was a difference in the use of DI among the teachers who held four different types of credentials. Although the means for teachers with SE credentials were higher across all

the DI dimensions, when the ANOVA was run, the results (Table 4.5) showed nonsignificant differences among the different credential holders on each dimension of DI. As a result of this analysis, the hypothesis was rejected.

Table 4.5

ANOVA Summary Table Comparing Credential Groups

Source	*SS*	*df*	*MS*	*F*	*p*
Planning Mean					
Between Groups	2.538	3	.846	.724	.540
Within Groups	108.72	93	1.17		
Total	111.27	96			
Working Mean					
Between Groups	4.34	3	1.45	1.48	.225
Within Groups	91.07	93	.979		
Total	95.42	96			
Teaching Mean					
Between Groups	6.60	3	2.20	2.23	.090
Within Groups	91.80	93	.987		
Total	98.401	96			
Grand Mean					
Between Groups	3.267	3	1.09	1.30	.278
Within Groups	77.723	93	.836		
Total	80.99	96			

Hypothesis 4. There is a relationship between a teacher's reported use of differentiated instruction in teaching mathematics and the years of experience a teacher has in teaching mathematics.

For this hypothesis, elementary and middle school teachers were grouped together. Years of experience were grouped into four ranges: 1-5 years, 6-10 years, 11-20 years, and 20+ years. A descriptive analysis showed the means and standard deviations for each experience group as compared to the dimensions of DI. When comparing the means for the four experience levels (Table 4.6), the results showed some difference in the means for the three dimensions.

Table 4.6

Comparing Years of Experience Teaching Mathematics and the Use of DI

	Planning		Working		Teaching		Grand	
Years	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1-5 (N = 16)	4.87	0.95	5.48	0.82	5.54	1.13	5.30	0.81
6-10 (N = 36)	4.62	1.12	5.23	1.06	5.11	1.07	4.99	1.01
11-20 (N = 33)	4.88	1.16	5.38	0.97	5.26	1.02	5.17	0.93
20+ (N = 13)	4.95	1.08	5.32	1.15	5.08	0.85	5.11	0.90
Total (N = 98)	4.79	1.09	5.33	1.00	5.22	1.03	5.12	0.93

However, the ANOVA results for this data (Table 4.7) showed no significant differences at the .05 level between years of experience and the self-reported use of DI for any of the experience ranges. Correlation analysis also found a lack of significant relationship between the years of experience in teaching mathematics and the DI dimensions (all *r*s < .13, *p*s > .05, *ns).* Therefore, Hypothesis 4 was rejected.

Table 4.7

ANOVA Comparing Levels of Teaching Experience in Mathematics and Use of DI

Source	*SS*	*df*	*MS*	*F*	*p*
Planning					
Between Groups	1.75	3	0.58	0.48	0.70
Within Groups	114.48	94	1.22		
Total	116.24	97			
Working					
Between Groups	0.79	3	0.26	0.26	0.86
Within Groups	95.46	94	1.02		
Total	96.24	97			
Teaching					
Between Groups	2.46	3	0.82	0.76	0.52
Within Groups	100.94	94	1.07		
Total	103.40	97			
Grand					
Between Groups	1.25	3	0.42	0.47	0.70
Within Groups	82.95	94	0.88		
Total	84.20	97			

Hypothesis 5. The more DI training a teacher reported having received, the more frequently the teacher reported using DI to teach mathematics.

In the survey, teachers were asked to indicate the number of trainings and seminars in differentiated instruction they had participated in during the prior five years, not including professional development at the school site, separately for English learners, gifted students, and students with disabilities. The number of trainings for each student group was categorized as 0 trainings, 1-2 trainings, 3-5 trainings, and 6 or more trainings.

These categories were given the values of 0 (no trainings), 1 (1-2 trainings), 2 (3-5 trainings), or 3 (6+ trainings). If the participant did not respond for a particular student group, a value of 0 was assigned. The points were totaled for each participant and are referred to as the Training in DI (TIDI) score. One participant did not respond to any of the categories and was excluded from the analysis. Because one person was excluded from this analysis, the means and standard deviations for the DI dimensions in Table 4.8 differ from the values in Table 4.2.

Table 4.8

Descriptive Statistics and Ranges for DI Dimensions and TIDI (N =97)

	TIDI	Planning	Working	Teaching	Grand
Mean	3.80	4.80	5.33	5.23	5.12
SD	2.23	1.08	1.00	1.04	0.93
Range of Means	0-9	2.43-7.00	3.71-6.57	2.57-7.00	2.64-6.87

Using a 1-tailed t-test of significance, significant correlations were shown between DI training and the planning and assessment and teaching strategies dimensions along with the Grand Mean for DI (Table 4.9). As the reported amount of DI training was significant in the areas of planning, and assessment, teaching strategies, and the grand mean, the hypothesis was accepted.

Table 4.9

Correlation Matrix for Training in DI (TIDI) and DI Dimensions

Variable	2	3	4	5
1. TIDI	.269**	.100	.249**	.233*
2. Planning		.687***	.684***	.887***
3. Working			.749***	.901***
4. Teaching				.903***
5. Grand Mean				

* $p < .05$, ** $p < .01$, ***$p < .001$..

Regression Analyses

The research questions and hypotheses examined the relationship of each of the variables (student demographics, teacher credentials, years of mathematics teaching experience, and amount of training in DI) to the DI dimensions. To analyze the effects of all the variables on the DI dimensions simultaneously, a stepwise regression analysis was performed. Eighty-five of the 98 participants answered all dimension and demographic questions on the survey. The means and standard deviations for these 85 participants are included in Table 4.10.

Table 4.10

Participant Demographic Statistics (N=85)

Variables	*M*	*SD*
DI Dimensions		
Planning	4.82	1.09
Working	5.37	1.02
Teaching	5.22	1.03
Grand Mean	5.13	0.95
Demographics		
Credentials		
SS	0.09	0.29
MS	0.75	0.43
SE	0.18	0.38
MSM	0.07	0.26
School Level		
ES	0.67	0.47
MS	0.33	0.47
Class Demographics		
% EL Students	0.39	0.33
% Gifted Students	0.11	0.19
% SWD Students	0.23	0.31
Years Experience-Math	11.78	8.11
TIDI	3.91	2.28

For credential type, participants were given a score of “1” if they possessed that credential and a “0” if they did not. As can be seen in Table 4.10, 9% of the teachers had a single subject credential. The percentage of credential types exceeded 100%, as some teachers reported having more than one type of credential. Given the scoring of “0” for elementary and “1” for middle school, a mean middle school score of 0.33 indicates that 33% of the 85 teachers were classified as middle school teachers.

Separate regression analyses were performed for each DI dimension and Grand Mean. For the dimension of Planning and Assessment the only demographic variable that was significantly correlated was TIDI (r (85) = 0.21, p = .029); however, when a stepwise linear regression analysis was performed, no variable was significantly related to Planning and Assessment (all ps > .05).

For the dimension of working with diverse learners, the only demographic variable that was significantly correlated was the percentage of students with disabilities (SWD) in the class (r (85) = .18, p = .048). A stepwise linear regression analysis was performed and revealed that the percentage of students with disabilities was the only significantly related variable for that dimension (t = 2.32, p = .023).

A regression analysis was performed on the dimension of Teaching Strategies and revealed that several significant demographic variables were correlated (see Table 4.11). When a stepwise linear regression analysis was performed, the variables of percent of students with disabilities, possession of a multiple subjects credential (MS Cred), and training in differentiated instruction (TIDI) were significantly related to the Teaching Strategies dimension (see Table 4.12). Combined, these variables accounted for 18.3% of the variance in Teaching Strategies.

Table 4.11

Correlation of DI Teaching Strategies with Demographic Variables (N =85)

Variables	*r*	*p*
% SWD Students	2.43	.013*
SS Cred	230	.017*
TIDI	.228	.018*
SE Cred	.220	.022*
School Level	-.194	.038*
MS Cred	.114	.149
Years Experience-Math	-.100	.182
MSM Cred.	-.092	.201
% Gifted Students	.074	.250
% EL Students	.066	.274

*$p < .05$

Table 4.12

Summary of Regression Analysis on the DI Dimension of Teaching Strategies (N = 85)

	B	*beta*	*t*	*p*
Variables				
% SWD	1.33	.393	3.46	.001***
MS Cred	0.68	.283	2.49	.015*
TIDI	0.11	.242	2.41	.018*

** $p < .05$, *** $p < .001$*

To determine if there was a difference between teachers with multiple subject credentials in elementary school, compared to middle school in the dimension of

Teaching Strategies, a follow-up regression analysis was performed. Using the same significant variables as the prior analysis (percentage of students with disabilities, TIDI), school level was recoded (ES = 1, MS = 0), the presence of a multiple subject credential (yes = 1, no = 0), and the interaction of credential and school level by multiplying school level and presence of multiple subject credential (1 indicating that the participant was an elementary school multiple subject credential holder, 0 indicating a different combination of credential and school level). As can be seen in Table 4.13, the presence of a multiple subject credential remained significantly related to Teaching Strategies (p = .024), but school level (*p = .204) and the interaction of multiple subject credentialed teachers and school level* (*p = .298) were not significant,* indicating that multiple subject credential holders in both elementary and middle schools were not significantly different in their self-reported use of the DI dimension of Teaching Strategies.

Table 4.13

Summary of Follow-Up Regression Analysis on the Dimension of Teaching Strategies (N=85)

	B	*beta*	*t*	*p*
Variables				
% SWD	1.06	.315	2.51	.014*
MS Cred	0.81	.338	2.31	.024*
TIDI	0.11	.236	2.37	.020*
School Level	0.63	.292	1.28	.204
MS Cred X School Level	-0.61	-.295	-1.07	.289

** p< .05*

Finally, for the Grand Mean of DI, only two of the demographic variables were significantly correlated, TIDI (r (85) = .21, p = .030) and % SWD (r (85) = .19, p = .043). However, when a stepwise linear regression was performed, none of the variables was significantly related to the Grand Mean (all ps > .05).

Summary of Results

This study, which examined teachers' self-reported use of DI in elementary and middle schools, produced mixed results. The hypothesis (H_1) that elementary teachers used DI more frequently than middle school teachers was rejected. The hypothesis (H_3) stating there was a difference in the self-reported use of DI by teacher credential type was also rejected. Likewise, the hypothesis (H_4) that looked at the relationship of years of teaching experience in mathematics and self-reported use of DI was also rejected.

The study did find a significant correlation between the percentage of students with disabilities (SWD) in a classroom and the self-reported use of DI (H_2). The strongest correlation results were in connection with the examination of the correlation of training and DI (H_5). The stepwise linear regression analyses supported the results of the other analyses, which found training (TIDI) to be a significant variable in connection with the use of DI in the dimension of Teaching Strategies. The percent of students with disabilities in a classroom was significantly related to the use of DI in the dimensions of working with diverse learners and teaching strategies. A discussion of these results and their implications are presented in Chapter V.

CHAPTER V: DISCUSSION AND CONCLUSIONS

This chapter begins with a brief overview of the problem and the purpose of the study, a review of the methodology, and a summary of the major findings. A discussion of the results and implications for policy and practice follows. The chapter concludes with recommendations for future research.

Study Problem and Purpose

With the passage of NCLB in 2002, schools are responsible for the academic progress of all students and, as noted in Chapter I, stakes are high for schools not meeting their state's proficiency benchmarks. Although students in California have shown academic growth over the past seven years, 46% of students are still not proficient in English Language Arts and 47% has not reached proficiency in mathematics (CDE, 2010). In Los Angeles Unified School District, where this study took place, 2010 California Standards Test showed levels of student proficiency dropping dramatically in mathematics as students advanced from elementary to middle school, with over 57.6% of students in grades 2-5 scoring proficient or advanced in mathematics compared to only 31.3% of students in grades 6-8 (CDE, 2011). We know that effective teachers are critical to students' academic success (Konstantopoulos, 2009; Wright et al., 1997), and considering the diversity of students in the typical classroom, researchers are focused on teacher characteristics that may impact student learning (Palardy & Rumberger, 2008; Shacter & Thum, 2004) and on how teachers are planning, assessing, and delivering instruction to meet the unique learning needs of students (Stronge et al., 2008).

The purpose of this study was to examine teachers' self-reported use of differentiated instructional strategies at the elementary (grades 4 and 5) and middle

school level (grades 6, 7, and 8) in mathematics, to determine whether the use of DI strategies varied from elementary to middle school. In addition, the researcher examined the relationship between teachers' use of DI and the percentage of students with special needs (English learners, students with disabilities, and gifted students) in the classroom as well as teacher factors including years of experience teaching mathematics, credentials held, and amount of training teachers had received in DI.

Review of Methodology

This study surveyed teachers in grades 4 through 8 at nine elementary schools and three middle schools in one local administrative district in LAUSD. The surveys were distributed to all teachers who taught mathematics on a daily basis at the 12 schools (N = 110). Ninety-eight of the surveys were returned, for a response rate of 89%. Using the Statistical Package for the Social Sciences (SPSS), survey data was coded and analyzed for significance using t-tests, bivariate correlation analysis, ANOVA, or linear regression analysis.

Summary of Results

RQ_1. Are there any differences among teachers in elementary compared to middle school on the mean scores of their reported use of DI (planning and assessment, working with diverse learners, and teaching strategies) in teaching mathematics?

The DI Grand Means of 4.99 (middle school) and 5.20 (elementary) based on the Likert-type scale that was used, indicated that DI strategies were being utilized slightly less than twice a week for middle school teachers and slightly more than twice a week for elementary teachers. This finding shows an awareness of DI strategies in the sample schools, but a lack of consistency in daily use. The means for the self-reported frequency

of use of DI were higher for elementary teachers in the dimensions of working with diverse learners and teaching strategies, along with a higher grand mean for these dimensions. However, independent samples t-tests on those means produced no significant differences between school level and teachers' reported use of DI in any of the DI dimensions (all ts < 1.763, ps > .080).

It was hypothesized that elementary teachers would report using more DI than middle school teachers. Data from LAUSD showed that the percentage of students who scored proficient and above in mathematics dropped significantly when those students entered middle school. Research indicates that instructional practices have an unparalleled effect on student learning (Palardy & Rumberger, 2008), and studies (Beecher & Sweeny, 2008; Ferrier, 2007; Hilyer, 2007) have indicated that the use of DI practices result in higher academic achievement. The lower scores could be due, in part, to the instructional practices and strategies used at these two different school levels; however, when comparing the reported use of differentiated instruction by elementary and middle school teachers, the researcher determined that no significant difference (p > .05) existed for any of the DI dimensions for elementary teachers, compared to their middle school counterparts.

There are several implications based on the results of the analysis for this research question. Teachers need to become more knowledgeable of what constitutes differentiated instruction and how to use it. Although the study indicated that DI practices are taking place in the classroom, both elementary and middle school teachers reported using these strategies on average approximately twice a week. This rate is in spite of the fact that differentiated instruction is embedded within the curriculum

materials provided to teachers in LAUSD, where this study takes place. Discussions with teachers need to take place regarding how well they understand what differentiated strategies are, the purpose behind using these strategies, and when they need to be used with students. Teachers also need to understand that DI strategies are not subject-specific, that they can be used in all content areas for all students and that differentiated instruction does not mean developing individualized lesson plans for each student. Professional development dedicated to increasing teacher understanding of DI and how to implement it effectively across all content areas is also recommended.

RQ_2. Is there a relationship between teachers' reported use of differentiated instruction in teaching mathematics and student background characteristics (i.e., English learners, students with disabilities, and gifted students)?

Using the means and standard deviations for the DI dimensions and the percentage of each of the three student groups in the teachers' classes, a bivariate correlation was used to determine the magnitude and direction of the relationship. The bivariate correlation showed a significant positive relationship ($p < .05$) between the percentage of students with disabilities (SWD) in a class and the reported use of DI in the dimensions of working with diverse learners and teaching strategies, along with the grand mean (Table 4.3). None of the DI dimensions nor the Grand Mean were significantly correlated with either the percentage of ELs or the percentage of gifted students (all rs < .082, ps >.05). The data showed that the presence of students with disabilities in the classroom seemed to have an influence on the reported use of DI strategies.

The results suggest that more differentiation occurs in classes with higher percentages of SWD, but do not explain why. One explanation might be due to Federal

(IDEIA) laws and state compliance mandates for students with disabilities (SWD). Teachers working with SWD have more information available to them about each student's needs than other teachers. As part of the process involved in developing an individual educational plan (IEP), teachers are provided details about a student's academic needs as well as physical limitations, learning challenges, or anything else that might affect student learning. The IEP also sets academic and social goals. All of this information enables teachers to better design instruction to meet the needs of their students. In addition, annual meetings are held with the teacher, parent, and support providers to examine academic growth and to adjust the IEP goals and instructional strategies as needed. Teachers with students with disabilities may be more aware of the needs of these students and thus report using DI strategies more frequently.

The Planning and Assessment dimension of DI was not significantly related to the percentage of students with disabilities. It may be that students with disabilities, who are held accountable for grade-level standards, are using a mathematics program that is tied to a pacing plan, structured lessons, and mandated assessments. In following such a program, teachers may feel that differentiation during the planning and assessment phase of instruction is not possible

The analysis for this research question also showed that teachers who reported using DI strategies in one dimension were more likely to report using DI strategies in other dimensions (all rs >.678, ps > .001), meaning that using DI is not a piecemeal process, but rather an approach to instruction that incorporates many dimensions. DI involves the domains of content, process, and product (Tomlinson & Imbeau, 2010), and encompasses all aspects of planning and assessment, working with diverse learners, and

teaching strategies. If a teacher uses DI strategies in one dimension, they will likely be using DI in the other dimensions, a conclusion supported by the data from this study.

Although not a hypothesis, correlations among the percentages of students from the three groups are notable. The significant negative correlation between the gifted students and both the ELs and SWDs (Table 4.3) and the DI dimensions is likely the result of district policies to cluster each of these student groups to better meet their needs. This finding may also explain the lack of significant correlations between both the ELs and gifted students and the DI dimensions, as teachers may feel that clustering these students is a sufficient form of differentiation and that it is not as necessary to differentiate within a cluster of gifted or EL students.

RQ_3. Are there any differences among the four groups of teachers (i.e., teachers with a multiple subject credential [MS], teachers with a single subject credential in mathematics [SS], teachers with a special education credential [SE], and teachers with a multiple subject credential/supplemental authorization in mathematics [MSM]) in their reported use of differentiated instruction in teaching mathematics?

To examine the relationship of different teaching credentials and the self-reported use of DI by teachers, means and standard deviations were determined for each DI dimension and credential types (Table 4.4). ANOVA was used to examine if a significant relationship existed between the types of credentials and teachers' reported use of DI. Although the means (Table 4.4) for teachers with special education credentials were higher than the other credential holders for all dimensions, the results of the ANOVA (Table 4.5) showed no significant relationship between this independent

variable (credentials) and teachers' reported use of differentiated instruction (DI) (all *F*s < 2.24, *p*s > .089).

This result was somewhat surprising, as we know from the literature that the foundation of DI is how a teacher adapts content, process, and product based on student needs (Levy, 2008; Santamaria, 2009; Tomlinson, 1999a). It was expected that teachers holding special education credentials would differentiate instruction more frequently in planning and assessment, working with diverse learners, and teaching strategies due to their training and the diverse needs of students with disabilities. The lack of significance may be due in part to the small number of teachers with the different credentials (special education N = 15, single subject N = 14, multiple subject with an authorization to teach mathematics N = 6). A larger sample may have produced different results.

The researcher had expected that teachers with multiple subject credentials would have scored significantly higher than teachers holding a single subject credential. The reason for this expectation is that multiple subject certification includes coursework in child development and behavior, which is not part of secondary preparation coursework (Leak & Farkas, 2011). According to Manning (2002) effective teachers understand the physical, learning, and psychological needs of their students. In other words, the knowledge of pedagogy that teachers with multiple subject credentials possess may enable them to reach the zone of proximal development (Vygotsky, 1978) for each student, requiring greater differentiation.

This result for the hypothesis may be attributed to another factor in addition to the small sample size, which is that teachers in the present study were using curricular

materials that had differentiated strategies embedded in the curriculum, so their reported use of DI may not be related to their credential training.

RQ_4. Is there a relationship between teachers' use of differentiated instruction in teaching mathematics and their years of experience in teaching mathematics?

To determine the relationship of teaching experience in mathematics and the use of DI, years of experience were categorized into four groups (Table 3.6). The means and standard deviations were calculated for each experience group and compared to the means of the DI dimensions. Using ANOVA and correlational analysis, both tests found a lack of significant relationship between the years of experience in teaching mathematics and the DI dimensions (all Fs < 0.77, ps $> .581$, *ns*).

Research conducted by King-Rice (2010) found less experienced teachers had students with greater gains in mathematics than teachers with 20 or more years of experience. However, Nye et al. (2004) and Rockoff (2004) found that experience counts in raising student academic achievement. The lack of a significant relationship between the years of mathematics teaching experience and teachers' reported use of DI may, again, be related to the small sample size. In addition, the highly structured curricular materials teachers were required to utilize in this district may mean that they were simply following the program.

It would have been interesting to look specifically at new teachers (0-1 years experience), but the researcher was unable to conduct that analysis as there was only one teacher in the study who met that criteria.

RQ_5. Does the amount of training in differentiated instruction in teaching mathematics have any impact on teachers' reported use of differentiated instruction?

In analyzing the relationship between the amount of training in DI (TIDI) and teachers' self-reported use of DI, the results (Table 4.9) showed significance between TIDI and the dimensions of Planning and Assessment ($r(97) = .269$, $p < .01$) and Teaching Strategies ($r(97) = .249$, $p < .01$) and for the Grand Mean ($r(97) = .233$, $p < .05$). Because the training amount was a total of all types of DI training taken, it is unclear which trainings (those trainings targeted at gifted, EL, or students with disabilities) had the greatest impact. This study only examined the numbers or quantity of trainings, not the duration or quality.

High quality training or professional development has a large impact in creating effective teachers (Hairrell et al. 2011; Martin et al. 2010). In addition, training has been shown to increase not only teachers' instructional skills but also their sense of efficacy (Crum, 2004). This positive relationship between TIDI and the reported use of DI suggests that training in DI can increase the use of DI in the classroom. In addition, evidence showed that participation in DI training can increase the use of DI across credential types, years of mathematics teaching experience, and school level. The present study showed no significant differences in the amount of reported TIDI based on credential type (all means between 3.00 and 4.14, $F(3,94) = 0.724$, $p = .540$, *ns*), level of experience (all means between 2.69 and 4.31, $F(3,94) = 1.706$, $p = .171$, *ns*), or school level (elementary school mean = 3.82, middle school mean = 3.84, $F(1,96) = .003$, $p = .959$, *ns*).

Regression Analysis

To examine the combined effect of all independent demographic variables (school level, classroom demographics, credentials held, years of experience in teaching

mathematics, and the amount of training in DI) and the teachers' self-reported use of DI, stepwise linear regression was performed for each DI dimension and the Grand Mean. This analysis had 85 participants (versus 98 for the previous analyses), as teachers who did not complete the entire survey were excluded from the analysis.

For the dimension of Planning and Assessment and for the Grand Mean, the stepwise regressions indicated that no independent demographic variables were significantly related to the use of DI (all ps > .05). When examining the dimension of Working with Diverse Learners, the stepwise regression found a correlation with the percentage of students with disabilities ($t = 2.32$, $p = .023$) and teachers' self-reported use of DI. When the stepwise regression analysis was performed on the dimension of Teaching Strategies (Table 4.12), three independent variables, the percentage of students with disabilities, ($p < .001$), MS credentials ($p < .05$), and amount of training (TIDI, $p < .05$) were significantly related. The regression analyses were consistent with the findings of Research Question 2, which showed that the presence of students with disabilities had the most significant impact on the reported use of differentiated instruction. Whether this finding is due to differences in the training of teachers who teach students with special needs, the IEP, or other factors cannot be determined within the scope of this study.

Discussion

Overall, the results of this study indicate that the presence of students with disabilities had the most significant impact on teachers' reported use of differentiated instruction. More research is needed to determine why this effect occurred, given the

finding that the type of credential held did not have a significant effect on the reported use of differentiated instruction.

The lack of an effect for ELs and gifted students is surprising, given the mandates on the use of Specially Designed Academic Instruction in English (SDAIE) strategies for English Learners (Commission on Teacher Credentialing, 1995) and the requirement to differentiate instruction to meet the needs, abilities, and interests of gifted students (California State Board of Education, 2005). SDAIE strategies that are required for working with all English Learners are part of everyday instruction and may not be recognized by teachers as differentiation, as such. The lack of differentiation for ELs and gifted students may also be due to district policies that group these students, as evidenced by the intercorrelations in Table 4.3. Teachers may consider grouping the students to be sufficient differentiation and may not feel compelled to differentiate *within* these groups. More research is needed in this area.

The results of the present study also showed that the amount of training in differentiated instruction had a significant effect on the reported use of DI. Teachers need to know their students in order to provide instruction to meet their needs. Also needed is professional development that focuses not only on the differentiated strategies but also on understanding students' learning needs so that appropriate strategies are selected and used. A suggestion for future practices would to provide all teachers with more detailed information about their students, training on how to use this information, and opportunities for them to meet with parents and previous teachers to learn about the students. Further study is needed to examine the type of DI training that will have the

greatest effect on the teachers' use of DI, including questions of content, frequency, duration, and focus student group of the training.

There was no significant difference in the reported use of differentiated instruction between teachers based on the level of school, credentials held, and years of experience; however, in the present study the amount of training in DI (TIDI) was significantly related to the reported use of DI teaching strategies across credential, experience levels, and school levels. In the past 10 years in LAUSD, teachers have had multiple opportunities to participate in training in new curriculum materials in English Language Arts and mathematics in which DI strategies are embedded. Participation in this training may exert a strong influence on the use of DI.

This lack of significance may also be due to the sample size in the present study. Whereas it may be sufficient for correlational research related to the proportion of students with disabilities and the amount of training in DI, the overall sample size of 98 participants was not large enough to ensure a sufficient sampling by school level, credential type, and years of experience. A study with a larger number of participants might produce different results.

The results reported by teachers in this study were not validated through observation or interviews, leading to the question as to whether the teachers really understood what differentiated instruction was. Interviews and direct observation may provide a more accurate indication of the teachers' knowledge of differentiated instruction practices and the amount of differentiation that occurs in classrooms.

Another factor is the mathematics curriculum used by the teachers in the study. LAUSD has tightly structured the mathematics curriculum that middle school and

elementary teachers are expected to teach. With the preponderance of pacing plans, standards-based instruction, and teaching guides, teachers may feel that planning is not something within their control. Because teachers in LAUSD use a mathematics programs that embeds differentiated activities, they may not consider the strategies they use as part of the program to be DI.

Recommendations for Future Research

Given the results of this study, several areas would benefit from being more closely examined.

- The results of the study did not find a significant difference between elementary and middle school reported levels of differentiated instruction; a clearer picture of differentiated practices could result from a study in which observations and teacher interviews are used in conjunction with survey results.
- Data suggests that more training in DI results in a higher reported use of DI in the classroom. This study did not address the duration and content of the training. Of interest would be to examine the different types of DI training (student focus) and to determine which ones have the greatest effect on teaching practices. This area warrants further research.
- Having students with disabilities in a classroom seems to drive the use of DI for some teachers. More examination of this relationship is needed.
- Although years of experience in teaching mathematics were not significant in this study, it would be interesting to look at experience in combination with additional coursework in DI in conjunction with training and how it may relate to the use of DI.

- The relationship between the use of differentiated instruction and academic achievement across the grade levels needs to be validated.
- To date, no empirical analysis of Carol Tomlinson's' survey has been conducted, thus the researcher was unable to establish a precedent for comparison of the results of the present study. Future research using the present survey would be beneficial.

As societal demands to improve education for all students persist, educators must identify, develop, and improve on teaching practices that address the needs of *all* students. The use of differentiated instruction has shown potential, if undertaken properly, in helping teachers be more effective in meeting the needs of all students, especially diverse learners with special needs. With limited school budgets and scant resources, differentiated instruction needs to be carefully considered as a practice, which schools can implement at little to no additional cost that may improve students' achievement.

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APPENDIX A:

TEACHER PRACTICES IN DIFFERENTIATED INSTRUCTION:

A SURVEY OF PRACTICES IN GRADES FOUR THROUGH EIGHT

Research Survey

Read each statement below. Circle the response that most closely describes the extent to which you use each practice **in teaching mathematics** on a daily basis. <u>If you teach more than one grade, select one class and use that class to answer the following questions.</u>

Please use the following scale to describe how often you use these teaching strategies when teaching mathematics in your class.

(1) never
(2) once a month
(3) once every two weeks
(4) once a week
(5) twice a week
(6) every other day
(7) daily

Planning and Assessment Strategies

		(1) never	***(7) daily***
1.	I pre-assess for student readiness.*	**1....2....3....4....5….6….7**	
2.	I pre-assess to determine level of understanding*.	**1....2....3....4....5….6….7**	
3.	I use on-going assessments for instructional planning*.	**1....2....3....4....5….6….7**	
4.	I use tiering.* .	**1....2....3....4....5….6….7**	
5.	The assignments I give differ based on learner needs. and readiness.#	**1....2....3....4....5….6….7**	
6.	The assignments I give differ based on learner interests#.	**1....2....3....4....5….6….7**	
6.	I adhere to the district pacing plan (Mathematics Instructional Guide or MIG)	**1....2....3....4....5….6….7**	

Working with Diverse Learners

1.	I vary tasks by learner profile(academic & learning needs)#.	**1....2....3....4....5….6….7**
2.	I identify student interests.*	**1....2....3....4....5….6….7**
3.	I support independent study.*	**1....2....3....4....5….6….7**
4.	I use various strategies to address learning styles (e.g. oral, visual, musical, spatial, kinesthetic, or creative).	**1....2....3....4....5….6….7**
5.	I scaffold learning for any struggling student.	**1....2....3....4....5….6….7**
6.	My classroom is student-centered*.	**1....2....3....4....5….6….7**
7.	I assess my students with textbook assessment.	**1....2....3....4....5….6….7**

Teaching Strategies

1. I plan and use flexible groupings.* **1....2....3....4....5….6….7**
2. I allow for a wide range of product alternatives (projects).# **1....2....3....4....5….6….7**
3. I vary the pace of learning for learner needs*. **1....2....3....4....5….6….7**
4. I scaffold instruction for learners with different needs.# **1....2....3....4....5….6….7**
5. I use a variety of materials other than the standard text.* **1....2....3....4....5….6…7**
6. I use interest-based learning centers to differentiate instruction.
1....2....3....4....5….6….7
7. I use differentiated instruction in mathematics. **1....2....3....4....5….6….7**
8. I assign the same homework assignment to all my students. **1....2....3....4....5….6….7**

Teacher Practices in Differentiated Instruction
Demographic Information

1. What grade level math are you teaching in the 2010-2011 school year? _____ (If you teach more than one grade, select one class for the purpose of this study).

2. How many years have you taught at this grade level? _____

3. In total, how many years have you been teaching mathematics? _____

4. What is your gender? Male Female (circle)

5. Describe the types and numbers of identified student learners in your math class. (Check all that apply).
   - † General education students # _____
   - † English Learners (EL) # _____
   - † Gifted students # _____
   - † Students with IEPs # _____
   - † Students with 504 accommodations # _____

   Total # of students in your class ___

6. What was your major in college? _____ College minor? _____

7. Type of teaching credential that you hold (circle all that apply):

   Single Subject in mathematics Multiple Subject Special Education credential

   Multiple Subject with an authorization in mathematics

   Other (name) _____

8. Have you ever taken any classes on using differentiated instruction (DI) other than those which were part of your credential program? Yes or No (circle)

9. Approximately how many seminars or trainings in DI have you taken during the past five years for each of these types of students? (Do not include professional developments at your school) *EL= English Learners, GATE- Gifted and Talented, SWD= Students with Disabilities*

EL	† 1-2	† 3-5	† 6 or more	† did not attend any seminars or training
GATE	† 1-2	† 3-5	† 6 or more	† did not attend any seminars or training
SWD	† 1-2	† 3-5	† 6 or more	† did not attend any seminars or training

Questions taken from Dr. Tomlinson's survey titled Reflecting on Practices for Differentiating Instruction in Response to Learner Need (2005) verbatim are marked with an * in Appendix A. Questions that were slightly changed from the original are marked with a #.

APPENDIX B:

PROJECT DESCRIPTION

Principal Researcher: Donna Zero
Research Title: Teacher Practices in Differentiated Instruction

You are invited to voluntarily participate in a research study on differentiated instruction. The purpose of this study is to examine teacher perceptions on how they use differentiated instructional techniques during mathematics instruction in their classroom. **This study does not seek to assess students or faculty members.** What the study will look at is if the use of differentiated strategies varies from grade to grade and from school level to level (i.e. elementary to secondary). The study will add to the limited literature on instructional practices in the area of differentiated instruction.

If you consent to this study, you will be asked to complete a 10 minute, anonymous survey. One volunteer from your staff will be asked to collect and seal the surveys in an envelope which will be picked up by the researcher. You will also have the option of returning the survey directly to the researcher in a self addressed stamped envelope which will be provided.

A total of 12 elementary and middle schools will participate in this study. Each school that participates will be given a pseudonym. Information from the completed surveys is confidential and the surveys will be kept in a secure, locked file. The only data that will be available to principals and other district employees will be the analyzed data contained in the final report. Neither the researcher nor the any district administrator will be in the room while the surveys are being completed.

The researcher, Donna Zero, has been an employee of LAUSD for the past 34 years as a teacher and administrator both at the elementary and middle school levels. Your participation in this project is greatly appreciated.

APPENDIX C

PARTICIPANTS RIGHTS AND CONSENT FORM

Principal Researcher: Donna Zero
Research Title: Teacher Practices in Differentiated Instruction

Participant's Rights

- I have read and understand the research description.
- My participation in this research is voluntary. My participation or refusal to participate will have no effect on my employment, future employment, or other entitlements.
- I have the right to withdraw from the observation at any time or ask that the data not be used.
- If at any time I have any questions about the research or my participation, I can contact the researcher, Donna Zero, at (818) 427-6141 or dzero@LAUSD.net. I can also contact the researcher's advisor, Dr. Peggy Johnson at peggy.johnson@csun.edu.
- If at any time I have comments or concerns regarding the conduct of the researcher, I can contact the California State University, Northridge, Institutional Review Board at (818) 677-2901.

My signature below means that I understand my rights as a participant and agree to participate in this study.

Participant's signature _____ Date: _____/_____/_____

Name: (Please print) _____

Please return this consent form in the envelope provided.

APPENDIX D

SURVEY INSTRUCTIONS

You will find the packets in the envelope for the teachers containing;

- Project description
- Participants Rights and Consent Form
- Research Survey
- Pens

For the principal I have included…

- Letter of permission from LAUSD to conduct the study (for your information)
- Permission letter from the principal to conduct the survey (to be completed on school letterhead).
  If you would like me to email the template for this letter to you, email me at dzero@lausd.net. This permission letter is required by CSUN.

Directions for the Principal or Designee

- Remind the teachers that participation is voluntary!
- This survey is for teachers who teach math in grades 4-8 on a daily basis.
- Please pass out the packets and pens to the participants and ask them to fill in the consent form.
- Please remind the participants that the survey is confidential and anonymous. Once that is done and the consent forms are collected, teachers may fill out the survey.
- Administrators should not be in the room while the survey is being completed.
- Please ask a volunteer to collect the surveys
- **Separate the consent forms and the surveys** and place both in the envelope. Seal the envelope and bring it to the office to be picked-up by the researcher the following day.

Thank you!

Donna Zero