A STUDY OF THE EFFECTS OF *EVERYDAY MATHEMATICS* ON
STUDENT ACHIEVEMENT OF THIRD-, FOURTH-, AND
FIFTH-GRADE STUDENTS IN A LARGE NORTH
TEXAS URBAN SCHOOL DISTRICT

Robert D. Waite, B.A., Th.M.

Dissertation Prepared for the Degree of

DOCTOR OF EDUCATION

UNIVERSITY OF NORTH TEXAS

August 2000

Approved:

Hoyt Watson, Major Professor
Richard Simms, Minor Professor
Gary Anderson, Committee Member
William E. Camp, Program Coordinator
John C. Stansel, Chair of the Department of
 Teacher Education and Administration
M. Jean Keller, Dean of the College of
 Education
C. Neal Tate, Dean of the Robert B. Toulouse
 School of Graduate Studies

Waite, Robert D., A study of the effects of *Everyday Mathematics* on student achievement of third-, fourth, and fifth-grade students in a large North Texas Urban School District. Doctor of Education (Education Administration), August 2000, 155 pp., 28 tables, 34 illustrations, references, 82 titles.

Data were examined in this study from student records in a large North Texas urban school district who were taught with two different mathematics curricula to determine whether or not they had different effects on student achievement. One of the mathematics curricula, *Everyday Mathematics*, was developed upon national mathematic standards, written by the National Council of Teachers of Mathematics. The other mathematics curriculum was district-approved, using a textbook from a large publisher, with a more traditional approach.

The students selected for the experimental group came from six schools that had implemented the *Everyday Mathematics* curriculum for the 1998-99 school year. An experimental group was formed from these students. Twelve schools with similar socioeconomic ratios, ethnic makeup and 1998 Iowa Test of Basic Skills mathematic score profiles were selected. A control group was formed from this population of students that was similar to the experimental

group with the exception of having been taught using the district-approved mathematics curriculum.

These two groups were very similar in socioeconomic, ethnic, gender, and grade level makeup. Most importantly, the experimental group and control group were almost identical (there was no statistically significant difference) in their 1998 Iowa Test of Basic Skills mathematics scores, a gauge used to demonstrate that prior mathematics ability was equal going into the 1998-99 school year.

In the statistical analysis, almost all comparisons showed that the experimental group taught with the *Everyday Mathematics* curriculum had higher scores on the 1999 Texas Assessment of Academic Skills mathematics test. When compared to children with similar mathematics ability at the beginning of the 1998-99 school year, the students in this study who were taught using *Everyday Mathematics* showed greater achievement gains than students in classes that used the district-approved curriculum.

TABLE OF CONTENTS

LIST OF TABLES

Table | Page

Table Page

LIST OF ILLUSTRATIONS

Figure Page

Figure Page

Figure | Page

CHAPTER 1

BACKGROUND

In 1983 the National Commission on Excellence in Education published a report titled, *A Nation at Risk.* This document has been cited by many (Brandt, 2000; Finn, 1989; Ravitch, 1995, National Science Foundation, 1988; National Council of Teachers of Mathematics [NCTM], 1989a) as being the catalyst for the current reform movement in education. In this report educators were called upon to strengthen the educational system.

> Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. This report is concerned with only one of the many causes and dimensions of the problem, but it is the one that undergirds American prosperity, security, and civility. We report to the American people that while we can take justifiable pride in what our schools and colleges have historically accomplished and contributed to the United States and the well-being of its people, the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur with others matching and surpassing our educational attainments.
>
> If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. As it stands, we have allowed this to happen to ourselves. We have even squandered the gains in student achievement made in the wake of the Sputnik challenge. Moreover, we have dismantled essential support systems which helped make those gains possible. We have, in effect, been committing an act of unthinking, unilateral educational disarmament (National Commission on Excellence in Education, 1983, p. 5).

Following this report, many national organizations began to develop national standards for education and national organizations of teachers began to write standards for their respective subject areas. The NCTM was one of the organizations that participated in this process. Many of these standards were a direct response to the recommendations found in *A Nation at Risk.* The National Commission on Excellence in Education (1983) recommended that

> the teaching of *mathematics* in high school should equip graduates to: (a) understand geometric and algebraic concepts; (b) understand elementary probability and statistics; (c) apply mathematics in everyday situations; and (d) estimate, approximate, measure, and test the accuracy of their calculations. In addition to the traditional sequence of studies available for college-bound students, new, equally demanding mathematics curricula need to be developed for those who do not plan to continue their formal education immediately. (p. 32)

The response of the NCTM was the development of national standards in mathematics education that implemented these and other recommendations. The *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989a), one of the national standards mathematics documents, began by stating that, "these standards are one facet of the mathematics education community's response to the call for reform in the teaching and learning of mathematics. They reflect, and are an extension of, the community's response to those demands for change" (p. 1).

These national standards in education were not an end in themselves. In order to impact the achievement of students, these standards needed to be applied to the development of curricula and classroom practices. Many projects were proposed to develop curricula that would apply national standards to the classroom. These projects resulted in curricula packages that are marketed to schools.

Along with the reform efforts of national teacher organizations, the federal government is also involved in the current reform movement. In 1950, the United States Congress formed an organization called the National Science Foundation in order to combat the apparent deficits in the science and mathematics preparedness of children to meet future needs of the nation. Although the early programs of the National Science Foundation focused on research projects, the emphasis changed in the 1990s to promote high-quality education in the areas of mathematics and science. As a part of that effort, the National Science Foundation began the Urban Systemic Initiative, a grant program. These grants allow large city school districts to improve education with new curricula, additional teacher training, and increased classroom resources. These two efforts, the government's financial support of reform efforts through Urban Systemic Initiative grants and the development of curricula based on established national standards, have come together in school districts where national grant money is being used to purchase material and train teachers in curricula that meet national standards.

Through the application process, the Urban Systemic Initiative gave a large North Texas urban school district over 1 million dollars annually for 5 years. In 1996, as a part of this grant, the North Texas urban school district began piloting the use of a new mathematics curriculum, *Everyday Mathematics,* a project of the University of Chicago. By the summer of 1999 seventeen schools in the district had faculty members trained in the use of *Everyday Mathematics*. This study has attempted to quantify the effectiveness of the *Everyday Mathematics* program on student achievement in this school district.

Statement of the Problem

The problem of this study was to determine whether or not the implementation of a standards-based curriculum could be used to predict a difference in student achievement. This study sought to determine the effectiveness of *Everyday Mathematics* curriculum in improving the mathematics achievement of students in a large urban school district.

Purpose of the Study

This study had a fourfold purpose. One purpose of the study is to determine whether *Everyday Mathematics* is more effective in improving student achievement than the approved curriculum that was being taught in this urban school district. This study was an attempt to provide those concerned with educating elementary school children with information about effective methods and programs for teaching mathematics. The study also provides a comparison of two types of mathematics curricula; one based on standards and a more traditional type. This should provide some information concerning the relationship between student achievement and the application of national standards to classroom material and practices.

Research Questions

The following questions have guided this study:

1. Are there significant differences between the mathematics scores on the Texas Assessment of Academic Skills of students who have been taught using the *Everyday Mathematics* curriculum and those of students taught using the approved curriculum in this North Texas urban school district?

2. Are there significant differences in the mathematics scores on the Texas Assessment of Academic Skills mathematics test when groups (*Everyday Mathematics* students versus non-*Everyday Mathematics* students) are looked at with regard to ethnicity, gender, socioeconomic status, and grade level?

3. Are there significant differences between the mathematics scores in each domain (concepts, operations, and problem-solving) of the Texas Assessment of Academic Skills mathematics test of students who have been taught using the *Everyday Mathematics* curriculum and those of students taught using the approved curriculum in this North Texas urban school district?

4. What are the relationships between gender, ethnicity, prior achievement, socioeconomic status, and the curriculum used and the Texas Assessment of Academic Skills mathematic scores of third-, fourth-, and fifth-grade students in this large north Texas urban school district?

Hypotheses

1. It is hypothesized that there is no significant difference in the Texas Assessment of Academic Skills mathematics score of students taught using *Everyday Mathematics* and the Texas Assessment of Academic Skills mathematics score of students taught using the district-approved curriculum (assuming the null hypothesis for analysis purpose).

2. It is further hypothesized that there is no significant difference between the Texas Assessment of Academic Skills mathematic scores of those taught with *Everyday Mathematics* and those students taught using the district-approved mathematics curriculum (non-*Everyday Mathematics*) when groups are broken down by ethnicity, gender, socioeconomic status and grade level (null hypothesis).

3. It is further hypothesized that there is no significant difference between the scores in the three separate domains of the Texas Assessment of Academic Skills mathematics test (concepts, operations, and problem-solving) of the students taught using *Everyday Mathematics* and the students who were taught using the district-approved curriculum (null hypothesis).

4. It is further hypothesized that *Everyday Mathematics,* in combination with ethnicity, socioeconomic status, gender, and grade level will not contribute significantly to the mathematics achievement of students (null hypothesis).

Population

The population for this study was all third-, fourth-, and fifth-grade students in a North Texas urban school district. This district has chosen to use the *Everyday Mathematics* curriculum with students in kindergarten through the fifth grade. Although *Everyday Mathematics* was written for sixth graders, the district decided to use another *Standards*-based curriculum, *Connected Math,* in the sixth through eighth grades. An application and selection process was necessary for campuses to participate in a pilot project in the use of *Everyday Mathematics*. Some elementary schools were approved to use this *Standards*-based curriculum and other schools used the district-approved mathematics curriculum. The outcomes measurement, the mathematics score on the Texas Assessment of Academic Skills test, is administered to students in Texas beginning in the third grade.

Significance of the Study

Every educator has some concern about student achievement. The successes of curricula are measured by the improvement of student achievement, or lack thereof, of those taught with them. Although the state of Texas went through a mathematics textbook adoption process in the 1998-99 school year, it is important to have full information about the relationship between a curriculum and the achievement of students who are taught using it. This study should provide information to those who are involved in choosing curricula that can aid in those decisions. This North Texas urban school district received money from the Urban Systemic Initiative grant for the improvement of science and mathematics education of children. Part of this effort has been through the use of the *Everyday Mathematics* curriculum. One significance of this study was to provide the Urban Systemic Initiative department with information concerning the effectiveness of the expenditure of its money. This study has analyzed some of the factors, including this curriculum, which may affect student achievement as measured by the TAAS scores. This study will provide decision makers with information for use in choosing mathematics programs for elementary school students. This may provide information on the effectiveness of *Everyday Mathematics* for various subpopulations.

Basic Assumptions

The assumptions of this study include the following:

1. Prior mathematics achievement of students can be measured by the Iowa Test of Basic Skills mathematics total score.

2. The school district database contains accurate information.

3. All classrooms spend about the same amount of time in mathematics instruction.

4. The Texas Assessment of Academic Skills is an effective measure of student achievement.

5. The school principal accurately reported the mathematics curriculum used in his or her school.

Limitations of the Study

Limitations of this study include the following:

1. It was limited to one school district in North Texas.

2. It was limited to third-, fourth-, and fifth-grade students.

3. The schools that implemented the *Everyday Mathematics* curriculum chose to do so themselves, making this a self-selected study.

4. This study cannot account for the quality of the teacher, which could have affected the academic gains of the students.

5. The investigator did not monitor any classrooms and relied on teacher surveys to determine the full implementation of *Everyday Mathematics.*

Definition of Terms

Everyday Mathematics curriculum--a complete curriculum developed by the University of Chicago for kindergarten through sixth-grade mathematics that includes student material, teacher material, and resource kits.

Approved district mathematics curriculum--this is the curriculum that is presented in the district Curriculum Management System that uses the *Mathematics in Action* (Hoffer et al., 1992) textbook as the foundation.

Low socioeconomic status--a status describing a student who qualifies to participate in the federal free or reduced-price lunch program.

Ethnicity--a student's racial designation as chosen on enrollment forms and entered into the district database.

Prior mathematics ability level--this is a measurement of the student's mathematics ability taken at the end of the 1997-98 school year using the Iowa Test of Basic Skills, mathematics total score.

Design of the Study

This project is an ex post facto study, involving data from the 1998-99 school year. Students were in schools in a large North Texas urban school district and had to attend the same school for the entire year. The measure of achievement was the April 1999 Texas Assessment of Academic Skills, mathematics scores.

Experimental Group

This group was composed of all students in one large North Texas urban school district who had been in the same school and in a math class in which the *Everyday Mathematics* curriculum was fully implemented for the 1998-99 school year. The following were the criteria for the students:

1. They were enrolled in a third-, fourth-, or fifth-grade class.

2. They had an Iowa Test of Basic Skills mathematics score for 1998.

3. They attended a classroom in which the teacher was identified as one who had received the training and had implemented the *Everyday Mathematics* curriculum for the 1998-99 school year.

4. They attended the same school for the entire 1998-99 school year.

5. They had a Texas Assessment of Academic Skills score in mathematics for the 1998-99 school year.

6. They had complete school district data for the 1998-99 school year.

Control Group

This group was composed of students attending the same large North Texas urban school district as the experimental group. These students attended a school and were in classrooms where *Everyday Mathematics* was not used during the 1998-99 school year. The schools for the control group were matched to the schools in the experimental group by ethnicity, socioeconomic status, and prior mathematics ability, according to the 1998-99 Public Education Information Management System data. Two control schools were selected for each experimental school to assure a broader sample. The following were the criteria for the students in this study:

1. They were enrolled in a third-, fourth-, or fifth-grade class.

2. They had an Iowa Test of Basic Skills mathematics score for 1998.

3. They attended a school that used the approved mathematics curriculum for the 1998-99 school year.

4. They attended the same school for the entire 1998-99 school year.

5. They had a Texas Assessment of Academic Skills score in mathematics for the 1998-99 school year.

6. They had complete school district data for the 1998-99 school year.

Data-Collection Process

Seventeen schools in this large North Texas urban school district were identified as having teachers who had been trained in the use of the *Everyday Mathematics* curriculum. The principals of these schools were contacted to identify the use of the curriculum and to obtain permission to survey teachers and examine teachers' lesson plans and class rolls. Teachers who qualified as having implemented the *Everyday Mathematics* identified the class sections taught. These class rolls were obtained, and student identification numbers were placed in a database.

Following the compilation of the experimental group's student identification numbers, the data were submitted to the district research and evaluation department. This department provided data on the identified students from the district database.

After evaluation of the experimental group student data for ethnic breakdown, socioeconomic status breakdown, and prior mathematics ability, control group schools were selected. The research and evaluation department of the school district provided data on the students who met the criteria for this study.

The data were analyzed to determine whether there was any difference between the academic achievement through the 1998-99 school year of students who were taught using *Everyday Mathematics* and the academic achievement through the 1998-99 school year of students who were taught using the district-approved mathematics curriculum. This formed the study to determine whether *Everyday Mathematics* had an effect on student achievement in a large North Texas urban school district.

CHAPTER 2

REVIEW OF RELATED LITERATURE

The Current State of Mathematics Education in the United States

Styles, types, and contents of curricula appear to move in a usually circular current. In language arts the movement tends to go from a component approach to a holistic approach and back. There will be some different nuances or components or activities, but it tends clearly to be circular. Similarly, in mathematics, although not as pronounced, some similar circular movement exists. On one side of the circle is the algorithmic, separate component approach to mathematics. On the other side is the more holistic, practical, problem-solving approach. This has created some clear choices in curricula and division among those with an interest in the education of children.

Traditional and Nontraditional Curricula

Mathematics curricula are divided between the traditional type and the less traditional type. The traditional mathematics curriculum can be characterized as systematic and based on explanation of an algorithm, the practice of problems that demonstrate the concept, and the repetition of problems extended to homework to master the topic. A set of skills is taught at each grade level that should build on each other. For example, addition of single digit numbers is taught in the first grade. In the second grade, two-digit number addition is taught. In the third grade, addition of three numbers and multiple digit numbers makes up the content of the teaching. Problems for practice and homework are predetermined in traditional mathematics curricula, and correct answers are important (Heid, 1997; Schoen, Fey, Hirsch, & Coxford, 1999). The phrase “drill and practice” is often used in traditional mathematics curricula.

In the current mathematics curriculum published by McGraw-Hill Publishing Company, *Math in My World*, the chapter subjects are as follows:

> Chapter 1--Addition and Subtraction
> Chapter 2--Place Value and Number Sense
> Chapter 3--Addition of two Digit Numbers and Money
> Chapter 4--Subtraction
> Chapter 5--Time, Data, and Graphs
> Chapter 6--Understanding Multiplication
> Chapter 7--Multiplication Facts
> Chapter 8--Division
> Chapter 9--Measurement
> Chapter 10--Geometry
> Chapter 11--Exploring Fractions and Decimals
> Chapter 12--Patterns and Predictions. (Clements, Jones, Moseley, & Schulman, 1999, p. ii)

Each of these chapters has multiple lessons. They all begin with some explanation of a singular concept, followed by guided practice and independent practice. Each chapter has a chapter review and projects or activities for extensions. However, the emphasis of each chapter is on one central topic, with one or two secondary concepts, such as money in chapter 3 (Clements et al., 1999).

Similarly, Silver-Burdett-Ginn Publishing Company, which combined with Scott-Foresman Publisher to provide curriculum or textbook packages for schools, provides a traditional approach to mathematics. With the addition of teaching specific lessons on time, it is very similar to the Clements et al. (1999) textbook. While the activities are designed to be diverse and interesting to students, the cycle of introducing a concept, teaching the algorithm, guided practice, independent practice, and testing are present in all of the chapters of the Fennell et al. (1999) *Mathematics* textbook.

The current Web page for the *Mathematics* textbook made these points about the curriculum:

> Lessons are written and illustrated to appeal to students at each grade level.
>
> A unique lesson helps students learn to read for understanding by focussing on the information provided and the math skill required to solve problems.
>
> Lessons help students develop the concepts and learn the skills necessary for success in the classroom, on standardized and state tests, and in the real world.
>
> Plenty of practice provided by follow-up exercises and problem-solving opportunities encourages mastery of skills.
>
> Problem-solving analysis, strategies, and applications are taught in the context of the students' experience and interests.
>
> A thematic approach is used throughout this K-6 program to teach concepts and sequenced skills as it reveals the connection between mathematics, other disciplines, and students' own experiences. (*Silver-Burdett-Ginn School Products,* 1999, pp. 1-2)

These use the watchwords and phrases that are popular in education today. Phrases such as, "read for understanding," "problem-solving," and "student's own experience" are used commonly in educational literature. By referring to "standardized and state tests," the literature concerning this curriculum hints that it is aligned with standards or state benchmarks. However, as reviewers of mathematics curriculum have observed, the standards are correlated to the curriculum, rather than the curriculum being created from the standards (Colvin, 1999).

Similarly, the more traditional middle school curricula present mathematics by topics or concepts and follow the cycle of introduction, teaching the algorithm, having guided practice and independent practice, assigning homework that includes numerical and word problems, and giving a test at the end. A single textbook is issued for each grade level. In contrast, the *Connected Mathematics* curriculum, a *Standards*-based project for sixth, seventh, and eighth grades, does not have a textbook; rather, it has eight or nine workbooks for each grade level (Lappan, Fey, Fitzgerald, Friel, & Phillips, 1998).

In an article titled “The Mathematical Miseducation of America’s Youth,” Baptista (1999) asked, “Would parents accept medical treatment for their child that was 10 to 15 years out of date?” (p. 426). That is how he typifies a traditional mathematics curriculum. He further described traditional mathematics as "an endless sequence of memorizing and forgetting facts and procedures that make little sense to them" (Baptista, 1999, p. 426). Another author characterized traditional mathematic courses as “elitist, abstract, too focused on error-free calculation and obsessed with mind-numbing repetition” (Colvin, 1999, p. 26).

The less traditional or nontraditional curricula that have emerged in recent years are usually based upon or connected to the National Council of Mathematics Teachers (NCTM, 1989a) *Standards*. Three curricula have been identified as having been created from the *Standards* for elementary school settings: *Everyday Mathematics*, a project of the University of Chicago; *Investigations in Number, Data and Space,* (Technical Education and Research Center, 1996); and *Math Trailblazers* (Bieler & Kelso, 1996), a project of the University of Illinois. These mathematic programs stress real-world problems and situations. Students are encouraged to develop and explain algorithms to solve the problem with teachers acting as guides, introducing new ideas, and allowing the students to assimilate these in solutions to problems. In the nontraditional type of mathematics curricula, students are encouraged to work in groups, reporting solutions to each other and analyzing one another's attempts. Many nontraditional mathematics curricula use journals and encourage writing. The use of calculators is acceptable and even is promoted in some programs (Colvin, 1999; Heid, 1997).

In order to compare the standards-based curriculum to the traditional one, it is helpful to look at the unit and lesson titles. In *Everyday Mathematics* in the fifth grade the lessons are as follows:

Unit 1--Routines, Review, and Assessments
Lesson 1--Numbers All Around Museum
2--Place-Value Review
3--Collecting Data
4--Analyzing and Displaying Data
5--Tools for Using Mathematics
6--Equivalent Names
7--Calculator Routines
8--Money
9--Solving Problems with Dollars and Cents
10--Number Patterns
11--Length-of-Day Project
12--Fractions

88--Extend Stock-Up Sale
89--Positive and Negative Numbers
90--Geometry: Making Angles
91--Factors of Whole Numbers
92--Sharing Money
93--Broker-Calculator Division
94--Lattice Multiplication
95--Unit 9 Review and Assessment

Unit 10--Measurement

Lesson 96--Review: Units of Length
97--Volume
98--Units of Weight
99--Application: Mailing Packages
100--Finding the Average or Mean
101--Frequency Distribution
102--Application: Food Container Labels
103--Weight and Volume
104--Measuring Angles
105--Coordinate Grids
106--Unit 10 Review and Assessment

Unit 11--Probability; End-of-Year Review

Lesson 107--The Language of Chance Events; Review
108--Reading and Writing Numbers; Review
109--Pattern-Block-Toss Experiment; Review
110--Coin-Toss Experiment; Review
111--Spinner Experiment; Review
112--Geometry Review
113--Designing Spinners; Review
114--Blocks-in-a-Bag Experiment; Review
115--Using Data to Predict Outcomes; Review
116--The Length-of-Day Project Revisited
117--National High/Low Temperatures Summaries, Part 1
118--National High/Low Temperatures Summaries, Part 2
119- Products of Two-Digit Numbers, Part 1
120- Products of Two Digit Numbers, Part 2
(The University of Chicago School Mathematics Project [UCSMP], 1998a, pp. iv-ix).

This list of titles demonstrates that, while the units have a central emphasis, the following concepts are taught in each unit: numeration; operations and relations; problem-solving and mental arithmetic; data collection and analysis; geometry; measure and reference frames; and patterns, rules, and functions.

Another significant difference in traditional and *Standards*-based curricula is the pedagogy. "In many traditional classrooms, learning is conceived of as a process in which students passively absorb information, storing it in easily retrievable fragments as a result of repeated practice and reinforcement" (Resnick, 1987, p. 31). Whereas the traditional curricula suggest that teachers use a variety of teaching strategies, the *Standards*-based curricula are designed to implement the principles found in the *Standards* documents.

> Instruction should vary and include opportunities for appropriate project work, group and individual assignments, discussion between teacher and students and among students, practice on mathematical methods, and exposition by the teacher. Our ideas about problem situations and learning are reflected in the verbs we use to describe student actions (e.g., to investigate, to formulate, to find, to verify) throughout the *Standards.* (NCTM, 1989a, p. 10)

Another difference between traditional curricula and *Standards*-based curricula is their concepts of homework. The teacher's edition of the current Fennell et al. (1999) mathematics textbook stated that "homework is an opportunity for the student to master the concept present in the classroom" (p. xi). Homework in the traditional textbook contains both number problems and word problems on which the student works, away from the classroom or teacher.

In contrast, *Standards* do not address homework as a mastery opportunity. Instead, it suggests that the child be enriched by a variety of experiences to practice problem solving. It also encourages the strengthening of home and school connections. Activities that a student takes home should involve the participation of family members. The *Everyday Mathematics* homework falls into the category of "home and school partnership" (UCSMP, 1998b).

> Optimal learning occurs if it is shared by the child, teacher, and family members. In Grades 1-3, daily Home Links provide activities in which members of a family can participate in a child's mathematics experiences. In Grades 4-6, most lessons have Study Links that provide follow-up and review. Many Study Links should be taken home. At the teacher's discretion, other Study Link activities might be done with partners or alone during study or game time in school. (UCSMP, 1998c, p. xiii)

The contrasts between traditional and nontraditional mathematics curricula can be seen in these major areas. Both the content and the arrangement of content differ in these programs. The methods used in the classroom distinguish these two types of curricula. Lastly, the philosophy and practice of homework set apart traditional and *Standards*-based curricula.

Criticism of Standards-*based Curricula*

Critics of nontraditional mathematic programs often point out the failed “new math” programs of the 1960s. Many parent groups express that they want and expect their children to come home with practice homework from a textbook or worksheet. Others criticize the nontraditional curricula because it may leave a student who cannot solve a problem without an algorithm important for understanding further mathematics. One perspective is that traditional mathematic curricula start with a concept and expect the child to make applications whereas nontraditional mathematic curricula start with an application or situation and expect the child to discover the concept (Civil, 1995; Colvin, 1999).

In an online article Clopton, Clopton, McKeown, and McKeown (1998) reviewed several mathematics curricula. They write the following regarding *Everyday Mathematics*:

> The (poor) result appears to be related to the overall program philosophy which chooses to emphasize ideas and calculators and even mental arithmetic but de-emphasizes matters that require extensive practice and the use of algorithms. Multiplication, which is in the early stages in grade 2, is covered well given that the expectations are mostly conceptual and not intending to lead to mastery (or even close to it) at this level. Despite good coverage of some topics, it may be difficult to identify a situation where the use of this program is very appropriate. If expectations are high, then the program seems to be inappropriate due to the lack of support for the mastery of central. (p. 3)

This criticism was aimed at what the curriculum expresses to be its strength. It further demonstrates the difference in philosophy between the tradition and *Standards*-based curricula.

Hirsch (1996), in the American Federation of Teacher's *American Educator,* criticized *Everyday Mathematics* as having activities that are too simple, not focused on the topic, and as not having enough homework. In the 1998-99 school year, Texas schools adopted new mathematics textbooks. Two groups, Texas Public Policies Foundation and Educational Connections of Texas distributed information to discredit *Standards*-based curricula. A May, 1999 "Policy Action Update," touted the fact that only a few districts chose the "Fuzzy Math" textbooks, referring *to Everyday Mathematics, Connected*

Mathematics, and *Mathematic Thematics*, all curricula developed according to the national standards promoted by the National Council of Teachers of Mathematics (Texas Public Policy Foundations, 1999).

The Mathematically Correct (1998) group reviewed several mathematics curricula and expressed this about *Connected Mathematics*,

> This book is completely dedicated to a constructivist philosophy of learning, with heavy emphasis on discovery exercises and rejection of whole class teacher directed instruction. The introduction to Part 1 says, "*Connected Mathematics* was developed with the belief that calculators should be available and that students should decide when to use them." In one of the great understatements, the *Guide to the Connected Mathematics Curriculum* states, "Students may not do as well on standardized tests assessing computational skills as students in classes that spend" time practicing these skills. (p. 3)

This organization gave the curriculum an overall rating of F, noting that "it is impossible to recommend a book with as little content as this and an inefficient, if philosophically attractive, instructional method" (Mathematically Correct, 1998, p. 4). In reviewing the *Everyday Mathematics,* the Mathematically Correct organization gave it an overall rating of C-, because of lack of mathematical depth, absence of a standard textbook, and limited quantity and scope of expected student work.

In this debate over mathematics curricula there is a clear choice. There are supporters and critics for both types of mathematics. The differences are distinct in content, delivery, and pedagogy.

Change Creates Conflict

As mathematics standards are developed and curricula that attempt to follow these new standards are created, some will object to the changes. These who oppose using a mathematics curriculum that conforms to the *Standards* include mathematics teachers, parents, school boards, and politicians.

The objections to *Standards*-based mathematics curricula often began with the absence of the repetitive drill of numerical problems. The back to basics movement emphasizes an approach that calls for rote memorization and conflicts with those curricula that exclude worksheets with rows and rows of numerical problems. Often the phrase "It was good enough for me" points to the conflict inherent in change (O'Brien, 1999, p. 434).

Colvin (1999) chronicled one debate between traditional and *Standards*-based mathematics curricula. In the early 1990s, California developed a set of educational standards similar to the NCTM *Standards* and encouraged school districts to adopt a curriculum that was based on these standards. However, because of growing controversy, in 1997 the state adopted a new set of standards that returned to a more traditional approach. Parent groups and legislators led the fight against reforms, believing that children were able to learn mathematics better with the traditional approach.

The information used to substantiate the claim that students learn better with a traditional approach is usually anecdotal and flawed. Some point to standardized test results that require students to answer many numerical problems in a set length of time. It stands to reason that those students taught by traditional methods will perform better on these tests because *Standards*-based mathematics does not emphasize repetition of numerical problems, whereas traditional mathematics does. Similarly, large textbooks publishers, which tend to be more traditional, have a stake in having state and local school governance adopt more traditional approaches to mathematics education (Colvin, 1999; O'Brien, 1999). The debate continues on the virtues and detriments of diverse mathematics curricula.

Standards

Former Assistant Secretary of Education, Ravitch (1995), stated the following:

> Americans . . . expect strict standards to govern construction of buildings, bridges, highways, and tunnels; shoddy work would put lives at risk. They expect stringent standards to protect their drinking water, the food they eat, and the air they breathe. . . . Standards are created because they improve the activity of life. (p. 89)

Ravitch believed that national standards in education would improve both the effectiveness of American education and Americans' daily lives.

Similarly, following the publication of *A Nation at Risk,* Seldon of the Council of Chief State School Officers wrote:

> There was a feeling of urgency that the education system needed to be stronger, and that in addition to what states and districts and individual schools were doing we needed a stronger presence at the national level. . . . We recognized that we didn't need a national curriculum, so national goals and voluntary national standards came to be seen as a good mechanism for providing a focus. (as cited in O'Neil, 1995, p. 12)

Growing concerns and assertions about the lack of quality in the education of Americans prompted President George Bush to convene an education summit in Charlottesville, Virginia in 1989. At this meeting several broad goals were adopted, including the following:

> Goal 3: By the year 2000, American students will leave grades 4, 8, and 12 having demonstrated competency in challenging subject matter including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.
>
> Goal 4: By the year 2000, U. S. students will be first in the world in science and mathematics achievement. (National Education Goals Panel, 1991, p. ix)

This opened the floodgate for the development of national education standards.

In the 1990s, standards were developed in every major content area. The National Science Foundation sponsored the National Science Teachers Associations efforts to produce *National Science Standards* in 1990 (National Research Council, 1996). The Curriculum Standards for Social Studies were developed by a Task Force of the National Council for the Social Studies and approved by the National Council for the Social Studies Board of Directors in April 1994 (Schneider et al., 1994). The International Reading Association and the National Council of Teachers of English completed *Standards for the English Language Arts* in 1996. However, the first major publication of national standards for school curriculum was the *Curriculum and Evaluation Standards for School Mathematics* by the NCTM (1989a).

In order to understand the changes in mathematics curricula, it is helpful to look at the development of the set of standards created by the NCTM. In the 1987 and the 1988 annual reports of the NCTM there were strong calls for changes in the content and pedagogy of mathematics education. The Board of Directors formed a commission charged with these tasks:

> 1. To create a coherent vision of what it means to be mathematically literate both in a world that relies on calculators and computers to carry out mathematical procedures and a world where mathematics is rapidly growing and is extensively being applied in diverse fields.
> 2. To create a set of standards to guide the revision of the school mathematics curriculum and it's associated evaluation toward this vision. (NCTM, 1989a, p. 1)

Several study groups were formed and by the time of the 1989 convention and publication of the yearbook, the NCTM (1989a) had completed *Curriculum and Evaluation Standards for School Mathematics*. In the 1989 yearbook, *New Directions for Elementary School Mathematics,* both the rationale and application of new standards were given. The *Standards* were to be the foundational document for reform in mathematics education that continues in the present (NCTM, 1989b).

Philosophy of Standards

The *Curriculum and Evaluation Standards for School Mathematics* was developed because of changes in society and the needs of students.

> The objective of mathematics education must be transformed to meet the critical needs of our society: an informed electorate, mathematically literate workers, opportunity for all students, and problem-solving skills

> that serve lifelong learners. Both the content that is being taught and the way it is taught need to be reconsidered and, in many cases, transformed. To ensure quality, to indicate goals, and to promote change are the three reasons why NCTM issued the *Standards*. (Suydam, 1990, p. 3)

As education reporter Diegmueller (1995) explained, the NCTM standards "redefined the study of math so that topics and concepts would be introduced at an earlier age, and students would view math as a relevant problem-solving discipline rather than as a set of obscure formulas to be memorized" (p. 5). With changes in knowledge, technology, and application of mathematics, the *Standards* attempt to set the pace for reform in education that prepares the students for these changes.

The NCTM also recognized the change in thought concerning students. While the *Standards* establishes the content and behavior needed by all students to be mathematically literate, it recognizes that students learn in uniquely different ways. By suggesting a wide variety of activities and teaching strategies, the *Standards* exhibits a philosophy that provides opportunity for learning to all children (NCTM*,* 1989a).

The NCTM intended to create standards that would create positive change based on the results of good research. In “Contributions of Research to Practice: Applying Findings, Methods, and Perspectives,” there is a clear connection between the formation of mathematics standards and the current research in mathematics education. Both the appropriate level of content and the most effective methods have been researched and were included in the

Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989a). The current standards also encourage ongoing research to insure a high level of quality and relevancy (Silver, 1990).

Documents of Standards

Three books are the result of the efforts of the NCTM. The first of these, completed in 1989 and forming the foundation, is *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989a). The focus of this work is on the content, connections, methods, and activities of the mathematics classroom. The second work, *Professional Standards for Teaching Mathematics*, was published in 1991 (NCTM, 1991). In this book classroom resources, functionality, and teacher evaluation are discussed. The last of these *Assessment Standards for School Mathematics* was published in 1995 (NCTM, 1995). Whereas student evaluation is part of the first book, the latest work contains a revision of the process and promotes more diverse and authentic assessment of students in mathematics. The three works are similar in format, with overviews of standards, statement and discussion of each standard, and suggested practices for the classroom.

In the NCTM publications mentioned above, three basic changes have been suggested for mathematics curricula. One of these revisions is that content and process should be connected to real-world experiences and should be integrated into many activities and projects. Another change suggested is that learning take place from the investigation and discovery of the learner. The third change discussed is that assessment should be varied and could include classroom observation, written journals, extended projects, portfolios, and open-ended problems as well as conventional tests (NCTM, 1989a, 1991, 1995). The more traditional classroom relies on teaching a specific content area such as two digit addition, with the teacher explaining the algorithm, followed by students working several pencil and paper problems. The new *Standards*-based mathematic programs and the traditional mathematic curricula have created clear and different choices and spawned division among both educators, parents, and the community (Colvin, 1999; Schoen et al., 1999).

The Mathematics Standards

Curriculum and Evaluation Standards for School Mathematics includes three divisions, Grades kindergarten through 4, Grades 5 through 8, and Grades 9 through 12 (NCTM, 1989a). In each of these a chart indicates the summary of changes in content and emphasis (Appendix). Those found on pages 20 through 21, 70 through 71, and 126 through 127 are most helpful in understanding the shift in philosophy and practice in mathematics education (NCTM, 1989a).

Buckeye (1999), in a summary article about the national mathematics *Standards*, wrote that the NCTM has identified these competencies that students will need for future success:

> 1. Problem Solving: Students beginning to solve problems is the principal reason for studying mathematics.
> 2. Communicating Mathematical Ideas: Students should learn the language and notation of mathematics.
> 3. Mathematical Reasoning: Students should learn to make independent investigations of mathematical ideas.

4. Applying Mathematics to Everyday Situations: Students should be encouraged to take everyday situations, translate them into mathematical representations (graphs, tables, diagrams, or mathematical expressions), process the mathematics, and interpret the results.

5. Alertness to the Reasonableness of Results: Students must develop the number sense to determine if results of calculation devices are reasonable.

6. Estimation: Student should acquire techniques for estimating measurement.

8. Appropriate Computational Skills: Students should gain facility in using addition, subtraction, multiplication, and division with whole numbers, common fractions, percents, and decimals.

9. Algebraic Thinking: Students should learn to use variables, functions, relations, graphs, equations, formulas, inequalities, positive, and negative numbers.

10. Measurement: Students should be able to measure distance, mass, time, capacity, temperature, area, and volume in metric and standard measurement systems.

11. Geometry: Students should have knowledge of parallelism, perpendicularity, congruence, similarity, and symmetry.

12. Statistics: Students should plan and carry out collection and organization of data to answer questions in their everyday lives.

13. Probability: Students should understand elementary notations of probability to determine the likelihood of future events. (pp. 3-4)

The NCTM (1989a), in *Curriculum and Evaluation Standards in School Mathematics*, created 54 standards: 13 for kindergarten through 4th grade; 13 for 5th grade through 8th grade; 14 for 9th grade through 12th grade; 14 for evaluation. The standards for each of the grade divisions are similar; however, they are grade-level appropriate. Each standard has a broad topic, a general statement, and more specific substatements. The following is an example:

Standard 5: Estimation

In grades K-4, the curriculum should include estimation so that students can--explore estimation strategies; recognize when an estimate is appropriate; determine the reasonableness of results; apply estimation

> in working with quantities, measurement, computation, and problem solving. (NCTM, 1989a, p. 36)

An explanation and discussion of the implementation of the standard follow this statement of a standard. In some cases examples of classroom use are given.

In the following, Buckeye (1999) compared the previous ways of mathematics to the new standards in this chart:

Old Standards	*New Standards*
Paper and Pencil	Physical Materials
Teaching by Telling	Learning by Doing
Topics in Isolation	Topic Relationship
Teacher Talks	Students Discussing Mathematics
Individual Responsibility	Activity Between Students
Competitive Environment	Cooperative Environment
Technology Use Not Permitted	Technology for Exploration & Computation
Follow the Rules	Justify Thinking & Explore
The Right Way	Alternative Approaches
Look for the Clues	Thinking About Problems (p. 2)

Results of Standards

Since the publication of *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989a), several changes have taken place. One of these is that state and local educators have used standards to establish new benchmarks and curriculum guides. California used the National Council of Mathematics' standards almost exclusively to write their 1992 state mathematic standards. Since that time, because of controversy, California has rewritten its standards, which are now less aligned with the national standards.

Many other states have used the *Curriculum and Evaluation Standards for School Mathematics* as a blueprint for their own standards (Colvin, 1999).

In a study conducted by the Council of Chief State School Officers (CCSSO), it was found that all states had used the NCTM *Standards* in developing standards for their state. "In the main categories of state standards which typically cover K-12 or multiple grade levels, state standards have a high degree of similarity to the NCTM math standards" (CCSSO, 1997 p. 9). The summary of this report attributes much of the development of the current state and local content standards to the national standards produced in each content area by national organizations. According to CCSSO, "the NCTM was the pioneer of national standards that have been used in virtually every state to provide educators with direction to educate all children in mathematics" (p. 27).

In 1996 a North Texas urban school district contracted with the Texas Association for Supervision and Curriculum Development to pilot a curriculum guide on a CD-ROM. In this curriculum, all mathematics instruction, kindergarten through the 12th grade, had the ability to access the NCTM's *Standards*. Although the curriculum was not written to the *Standards*, a teacher could view the various standards to see how they applied to lessons (Dallas Public Schools, 1996).

Besides influencing standards and curriculum guides, the *Standards* have influenced textbook companies. In the current Prentice-Hall and Silver-Burdett-Ginn mathematics textbooks, an introductory section lists the national mathematics standards and charts the application of these standards to the material and lessons. However, as a speaker at the 1998 NCTM regional convention stated, there is little consistent use of the 1989 *Standards* in the offerings of the major textbook companies (Jamison, 1998).

A third result of the NCTM (1989a) *Curriculum and Evaluation Standards for School Mathematics* has been the development of curriculum projects specifically designed to apply these standards to all aspects of a curriculum. These are the results of universities or educational research institutions utilizing grants from the National Science Foundation. The Math Curriculum Center found on the Web page of the Education Development Center (1999) identifies 13 curricula that are standards-based mathematics instruction. These are:

> Elementary curricula:
> *Everyday Mathematics*
> *Investigation in Number, Data, and Space*
> *Math Trailblazers*
> Middle School curricula:
> *Connected Mathematics*
> *Mathematics in Context*
> *MathScape: Seeing and Thinking Mathematically*
> *MATHThematics*
> *Middle-school Mathematics Through Application Project II*
> High School curricula:
> *Contemporary Mathematics in Context (Core-Plus)*
> *Interactive Mathematics Program*
> *MATH Connections: A Secondary Mathematics Core Curriculum*
> *Mathematics: Modeling Our World*
> *SIMMS Integrated Mathematics: A Modeling Approach Using Technology.* (pp. 2-3)

These 13 curricula have used the NCTM's *Standards* to develop the instructional modules.

These national standards have changed the landscape of mathematics education in the United States and also in other countries. In *Rethinking the Mathematics Curriculum,* the NCTM's *Standards* was cited as having indirect influence on the current national curriculum in Great Britain. The *Standards* were again directly connected to the mathematics education standards that have been written in Korea (Hoyles, Morgan, & Woodhouse, 1999).

The Current Debate Over Standards

Although the development and implementation of national curriculum standards have been at the forefront of education for the past 10 years, some believe that standards have not produced the hoped-for reform. Diegmueller (1995) wrote, "Despite the publicity given these national goals (standards), the federal support for standards, and the enthusiasm of educators from the various subject areas, critics of the standards movement also caught the public's attention" (p. 6). The issues are the drain on resources, the potential for dividing and labeling students, past failures of standards, the lack of real content, and the shear volume of standards literature. Finn (1995) said in a speech to national educators concerning standards, "The professional associations, without exception, lack discipline. They all demonstrated gluttonous and imperialistic tendencies" (p. 6). He was referring to the massive number of pages of national standards documents.

Mathematically Correct (1998), an organization critical of national mathematic standards, called for several corrections to the current mathematic standards, including the following:

> 1. Demand greater mathematics knowledge for teachers.
> 2. Stress that standards of learning must have yearly benchmarks.
> 3. Admit that weak programs have resulted from following NCTM guidelines.
> 4. Refrain from promoting any theory of learning or method of teaching.
> 5. Encourage frequent objective tests to monitor student progress.
> 6. Keep the focus on mathematics.
> 7. Refrain from promoting heterogeneous grouping or repudiating homogeneous grouping.
> 8. Admit that arithmetic and algebra are the key elements of the early curriculum.
> 9. Include symbolic skill-building, abstract mathematics, and repeated practice.
> 10. Reinstate an emphasis on proof and mathematical justification.
> 11. Emphasize that algorithms should be taught, understood, and used.
> 12. Delete the list of topics for deemphasis.
> 13. Indicate that calculators and computers should be used sparingly. (pp. 1-2)

Marzano and Kendall (1996) wrote concerning the current state of standards in curricula:

> We believe that we will not soon have a set of nationally accepted standards. However, we do not believe that the standards movement is dead. In fact, we assert that the logic behind organizing schooling around standards is so compelling as to make schools and district adopt common standards even in the absence of federal mandates or incentives. (p. 7)

Recently, the NCTM began a revision of the *Standards*, and intend to present these new standards in the Fall, 2000. These new standards are preliminarily called *Principles and Standards for School Mathematics*. These have at this time five content standards and five process standards for each level of grades. The NCTM Website describes how new standards are written to "improve and build upon the previous *Standards* of NCTM" (NCTM, 1999a).

National Science Foundation and Mathematics Curricula

The National Science Foundation is a major organization in the development of national educational standards and support of curriculum projects. The United States Congress passed the National Science Foundation Act almost 50 years ago, forming an independent organization to strengthen the science, mathematics, and engineering education of United States schools. For the first 10 years, the foundation funded large science projects and developed scholarship programs for graduate school science students (National Science Foundation, 1988).

Not until the Russians successfully launched Sputnik did the National Science Foundation receive major funding. In the 1980s the National Science Fund was given greater power and more money through both Title I and Equal Education legislation. During the 1980s the National Science Fund shifted its focus from large science projects to education. Initially, the shift led to funding in colleges and universities, but by the mid-1980s this focus was shared by kindergarten through 12th grade education. The National Science Foundation (1999) reported on its Internet home page in December, 1999 that it will designate $3.3 billion for use in over 200 programs, one-half of which directly impacts kindergarten through 12th grade classrooms.

Improving School Achievement in Mathematics

Through the years the shift in emphasis of the National Science Foundation has continued from science projects and higher-level science education to a focus on formal education. Philosophically, National Science Foundation leaders believe that it should direct all of the funding toward grants to promote the advancement of science and engineering. In the past 15 years, the National Science Foundation's (1988) 24-member board of trustees has determined that a key to providing the science and engineering brain trust for the future is the preparation of children in both science and mathematics. To that end, the financial resources of the National Science Foundation have been directed toward the development of high-quality education for kindergarten through 12th grade in both science and mathematics.

In 1991 the National Science Foundation began to fund projects to develop curricula that supported or conformed to the standards developed by the NCTM and the National Science Teachers Association. In science, the American Association for the Advancement of Science has been funded in part by the National Science Foundation to develop Project 2061 and Benchmarks in Science to evaluate and formulate curricula that conform to national science standards. Also, the National Science Foundation began funding projects that would implement national mathematics standards. Although the funds devoted to the development of curricula constitute a large sum, the National Science Foundation has funded another area that is connected to national curricula standards: the Urban Systemic Initiative (Ravitch, 1995).

Urban Systemic Initiative

The Urban Systemic Initiative is the largest program of the National Science Foundation. Williams, director of the National Science Foundation, introduced the Urban Systemic Initiative in a report *Foundations for the Future* (National Science Foundation, 1994). The Urban Systemic Initiative provides grant money to improve the curriculum, promote community participation, enhance teacher training, and encourage local projects and research in large urban school districts with large student populations that are at or below the poverty level. The Urban Systemic Initiative is referenced in several articles as a strategic force for reform in mathematics education in America (Briars, 1999; Colvin, 1999; Heid, 1997).

In order to qualify for an Urban Systemic Initiative grant, a school district must serve at least 25,000 students, kindergarten through 12th grade, of which at least 50% must be eligible for the free or reduced lunch program. The district must have a single central leader and an existing infrastructure for reform. Qualifying districts' current programs should have a level of technology and current education that would allow for advancement. These eligibility requirements can be found on the Urban Systemic Program's (1999) Web page.

Twenty-five cities with the largest number of children living below the poverty level were targeted in 1994 to participate in this grant program. Seven school districts had completed the application process and were chosen to receive funding under this initiative. By the school year 1998-99, 22 school districts had been selected to receive Urban Systemic Initiative funding. The North Texas school district that is the subject of this dissertation study is one of those districts initially chosen to participate in the Urban Systemic Initiative. Now in the 6th year of the grant, the National Science Foundation (1999) has changed the name and the direction, slightly, of the Urban Systemic Initiative to the Urban Systemic Program to reflect the need to turn reform into the norm in these large urban districts.

University of Chicago School Mathematics Project

Shortly after the *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989a) was published, the National Science Foundation began a grant program for universities that would develop a curriculum that applied these standards. The University of Chicago was the first university to qualify for this grant. In 1990 the university formed a working group of professors and professional mathematicians to begin working on the project. In 1992 the Everyday Learning Corporation was formed to publish and manage the distribution of materials. The pilot program was developed and implemented in the 1992-93 school year, followed by research and evaluation. The *Everyday Mathematics* curriculum was introduced for kindergarten through sixth grade with the first edition published in 1994. After two major revisions, the program was not changed again until 1999, when minor revisions were made (Everyday Learning Corporation, 1999b). *Everyday Mathematics* is a product of the National Science Foundation's funding and an application of the *Curriculum and Evaluations Standards for School Mathematics* from the NCTM.

"*Everyday Mathematics*" *Program*

Everyday Mathematics differs from other textbooks and curricula. It interweaves concepts in a variety of applications throughout the school year. More traditional curricula usually teach concepts one at a time, in isolation, with little emphasis on application. The *Everyday Mathematics* curriculum recognizes a set of concepts that are used together in activities and projects and recorded in student workbooks and journals throughout the academic year (Everyday Learning Corporation, 1999b).

Effective implementation of the *Everyday Mathematics* program requires that teachers and administrators should receive 40 hours of initial training. In this training, all who will be involved in the educational process are exposed to the mathematics standards and are prepared for the change in philosophy of the *Everyday Mathematics* program (Everyday Learning Corporation, 1999b).

Components of "*Everyday Mathematics*". Each grade level, from kindergarten through sixth grade, has several components. According to the Everyday Learning Corporation (1999b) Web page the

> Teacher's Resource Package contains: *Teacher's Manual and Lesson Guide, Resource Book, Creating Home and School Partnerships, Teacher's Reference Manual, Math Minutes,* and a copy of all student material.
>
> The student material contains: *Everyday Mathematics Journal 1, Everyday Mathematics Journal 2,* a student activity book (2 in the fifth and sixth grade), and *Homelinks (*homework sheets that correspond to the lessons). (pp. 1-2)

The Teacher Resource Package provides the educator with the information needed to effectively implement the curriculum. The *Teacher's Manual and Lesson Guide* provides unit overviews and preparation and specific plans and guides for the daily lessons. The daily lessons have five divisions: Introduction (*Math Minutes* or Math Boxes), Instruction and Discussion, Teacher-Directed Activities, Independent Activities, and Assessments. This guide leads the teacher in each daily activity. The *Math Minutes* are short activities that can be used to begin mathematics instruction or they can be used during a transitional time in mathematic activities. In the introduction to *Math Minutes* it was noted that, "most of the activities do not require pencil and paper, chalkboard, measuring tools, or manipulative materials, hence, can be done anywhere and anytime" (UCSMP, 1998a, p. i). These short activities can be used for reinforcement, introduction, creating discussion points, quick problem solving, filler thought time rather than wasted time. The Math Minutes are divided into Counting, Operations, Geometry, Measure, and Number Stories (the longest section). In the lesson guides specific Math Minutes are suggested, however, others may be used during any learning time (UCSMP, 1998d). To complete the lesson material, a *Resource Book* is provided in the Teacher's Resource Package. This book contains all of the sheets to be reproduced, including are parent letters, home links, daily worksheets, overheads, teaching Aids, and application sheets called "Math in My World." These are sheets that will be copied each year to complement the implementation of *Everyday Mathematics*.

Along with the material necessary for the teacher to plan and implement the daily lessons, the Teacher's Resource Package contains material to help the teacher administer the curriculum. These components are informational and instructional to the educator, but are not necessary for the daily lessons. One, *Towards a Balanced Assessment*, guides the educator in grading the student. Following the NCTM standard of providing varied opportunities for student assessment, this book, "provides a variety of useful techniques and opportunities to assess children's progress on skills, concepts, and thinking processes" (NCTM, 1991 p. 1). It suggests that this take place through ongoing assessment, product assessment, periodic assessment, and outside test (such as standardized tests). Another of these aids is *Creating Home and School Partnerships* which contains articles, questions, and answers to common concerns, a literature list, and a glossary of terms that would help parents. The third title is *Teacher's Reference Manual*, which was written to help the educator to understand the connection of topics, themes, tools, pedagogy, and games. The teacher can gain a greater understanding of classroom activities through this book. According to the introduction, "This manual contains background information on the content, curriculum, and pedagogy of *Everyday Mathematics* for your grade level as well as some preview of what *Everyday Mathematics* students can expect to see in future grades" (UCSMP, 1998d, p. 1). These titles can be used for group training or the individual growth of a teacher.

Also included is a materials kit that contains all the manipulatives, such as rulers, dice, shape templates, and the like that are needed for students to complete the lessons. While many of these materials could be purchased at a retail store, the Everyday Learning Corporation offers them for the convenience of the teacher (UCSMP, 1997).

The 1999 costs of the *Everyday Mathematics* material were found in the catalogue from Everyday Learning Corporation. The Teacher Resource Packages cost $175.00 each. This is a one-time purchase per teacher. The student material costs differ by grade level and are: kindergarten, $6.25; first grade, $15.25; second grade, $15.25; third grade, $15.25; fourth grade, $17.50; fifth grade, $18.50; and sixth grade, $25. The Manipulative Kits, with sets for 25 students, range in price from $255 to $530, depending on the grade level. The costs of the textbooks of the more traditional curricula are $40.20 and $47 each, with a consumable workbook costing approximately $7 (Texas Educational Agency, 1999d). When compared in the 1999-2000 school year, the cost of the *Everyday Mathematics* curriculum is similar to the cost of traditional curricula.

In the newest catalogue, the *Everyday Mathematics* curriculum has added two new components that can be purchased separately. They are *Skills Links* which are described as "providing extra cumulative practice on basic facts, computations, word problems, mental math, and estimation skills" (Everyday Learning Corporation, 2000, p. 7). The other new title, *Operations Handbook,* is, "For teachers and has basic operations used in *Everyday Mathematics*. Algorithms are presented with teaching notes and accompanying blackline masters" (Everyday Learning Corporation, 2000, p. 7). It appears that the authors of *Everyday Mathematics* have listened to some of their critics.

Lessons. The method of teaching mathematics used in the *Everyday Mathematics* program attempts to improve student interest and therefore student achievement. According to Everyday Learning Corporation (1999a), “The K-6 *Everyday Mathematics* curriculum encourages teachers and students to go beyond arithmetic and to explore more of the mathematics spectrum by investigating data gathering and analysis, probability, geometry, patterns and algebra” (p. 2). *Everyday Mathematics* does not teach topics, strands, or concepts in isolation. In a typical lesson several concepts are used and taught: "Numbers, Numeration, and Order Relations, Measurement; Measure, and Numbers in Reference Frames; Operations, Mental Arithmetic, and Number Systems; Problem-Solving and Mathematical Modeling; Exploring Data; Geometry and Spatial Sense; Patterns, Rules, and Formulas; and Algebra and Uses of Variables" (Everyday Learning Corporation, 1999b, p. 1).

Most lessons in all grade levels contain several components. They usually begin with a Math Message, which is a focus for the daily lesson. Hands-on group and individual activities that require investigation and discovery are called Explorations. Teachers lead discussions and instruction. Math Boxes are used in the lesson to reinforce mathematical understanding. Fact practice and games provide skill-based activity for mastering concepts of the lesson. *Math Minutes* provides mental practice for transitional times.

HomeLinks is the homework component with practical experiences that often include help from others at home. Journal writing requires that a student write about the mathematic concepts to increase mathematic understanding and encourage language arts skills. Throughout the year projects are a part of the lessons and extend from class period to class period. All of these are explained in the *Everyday Mathematics: Teacher's Guide and Lesson Plans* (UCSMP, 1998c). The lessons follow a basic lesson cycle of focus, teacher instruction, guided practice, independent practice, and assessment.

Studies of Improvement of Student Achievement

Several studies have been conducted on student achievement when *Everyday Mathematics* has been used. These studies can be found on the Everyday Learning Corporation (1999b) Internet site. These are a part of the material used to publicize the *Everyday Mathematics* curriculum.

One of the studies examined the increase of student achievement on the standardized test used in Illinois. At Lee Elementary School in Chicago, third-grade students increased their average score from 180 (on a scale from 0 to 500) to 319. The state average score was 286, and the Chicago Public Schools' average score was 221 (Everyday Learning Corporation, 1999c).

Another study, at Silver Ridge Elementary School in Silverdale, Washington, was conducted in 1993-94 as a part of the pilot project of *Everyday Mathematics*. This study analyzed the problem-solving ability of third graders. In this study, students of Silver Ridge School, where *Everyday*

Mathematics was used, showed significant gains on the Test of Problem Solving, whereas a control group not using the *Everyday Mathematics* program showed no significant gain (Everyday Learning Corporation, 1999c).

A third study, conducted in a charter school affiliated with a local university in Texas, analyzed gains in the achievement scores of students. These students were taught using the *Everyday Mathematics* curriculum. The students increased their scores on the Texas Assessment of Academic Skills by 15% the 1st year and an additional 10% each of the next 2 years (Everyday Learning Corporation, 1999c).

Everyday Learning Corporation (1999c) chronicled the study of a Pennsylvania school district that implemented the *Everyday Mathematics* curriculum in all seven of its elementary schools. Students showed significant gains on both the Iowa Test of Basic Skills and the Pennsylvania System of Schools Assessment. Although these studies lack details and appear to have flaws in design, they indicate that students have achievement gains attributable to the use of *Everyday Mathematics* in the classroom.

The Use of *Everyday Mathematics* for Urban Systemic Initiative in a North Texas School District

In 1995 a large North Texas urban school district applied for and was approved as a recipient of Urban Systemic Initiative grant money. New curricula in both science and mathematics were a part of this district's plan for use of the funds. New curricula had to be research based and meet the standards of the Texas Education Agency. *Everyday Mathematics* had been introduced in a South Texas urban school district during the 1995-96 school year and appeared to have a positive effect on student achievement. The Urban Systemic Initiative director for the North Texas urban school district to be studied decided to use the *Everyday Mathematics* curriculum in pilot schools during the 1996-97 school year. At the beginning of the 1998-99 school year, 17 schools in the district qualified to use the *Everyday Mathematics* curriculum in their classrooms (S. Dudley, personal communication, September 20, 1999).

The Current Choice of Mathematics Curricula

The Texas Education Agency followed the new adoption procedure for mathematics textbooks during the 1998-99 school year. It divided the various possible adoptions into “Conforming” and “Nonconforming” curricula. Some of the criteria for a conforming curriculum are that it be aligned with the Texas Essentials of Knowledge and Skills, it have a singular textbook, and have a set of standardized assessments. All curricula must cover all of the Texas Essentials of Knowledge and Skills. The *Everyday Mathematics* curriculum was classified as a nonconforming curriculum. It was evaluated as having alignment with 80% of the Texas Essentials of Knowledge and Skills. Although the Texas Teachers of Mathematics (1998) listed it as the best it was not selected by any of the large school districts of Texas as the adopted program.

Statewide Assessment of Student Achievement in Mathematics

The State of Texas has a state board of education that oversees the development of public formal education in the state. The Texas Education Agency carries out the direction of the state board of education. Both of these are governed by the state legislature, which adopts educational law that is formulated into the Texas Educational Code (1995). As a part of that code (Section 39.021, 39.022, 39.023), the legislature has mandated that a statewide assessment be developed and implemented.

In the 1980s the Texas Assessment of Basic Skills was used. In 1990 the state law changed requiring the implementation of a new criterion-referenced program, the Texas Assessment of Academic Skills. This indicated a shift in emphasis from basic skills to academic skills. Throughout the 1990s there have been various changes in the administration and the content and processes, or benchmarks, have been included in the test. Students are required to demonstrate satisfactory performance on each section of the test. Exit-level tests are given in the 10th grade, and a student must pass in order to graduate (Texas Education Agency, 1999b).

The Texas Education Agency has a student assessment division that is given the responsibility for planning, scheduling, administrating, and securing all major assessment activities. Three companies have contracted with the state to help with the development of the Texas Assessment of Academic Skills. Since 1981 National Computer Systems has been the primary contractor to provide the statewide assessment. Harcourt Brace Educational Measurement is involved in the development of Texas statewide tests. It provides guidance in the item and data review and technical assistance in the testing process, it also produces the products for the test. Measurement Incorporated conducts the handscoring of the written compositions and open-ended items on the Texas Assessment of Academic Skills (Texas Education Agency, 1999c).

The benchmarks or objectives that are required in the education of Texas students have changed over the years. From 1990 to 1993, the Texas Education Agency provided benchmarks for education by grade level and content area to all Texas public schools. These changed in the fall of 1993 to the essential elements. In 1997, this changed again to the Texas Essentials of Knowledge and Skills (Texas Education Agency, 1997b).

The Texas Assessment of Academic Skills mathematics section has the following objectives that fall into three domains:

Domain: Concepts

Objective 1--The student will demonstrate an understanding of number concepts.

Objective 2--The student will demonstrate an understanding of mathematical relations, functions, and other algebraic thinking.

Objective 3--The student will demonstrate an understanding of geometric properties and relationships.

Objective 4--The student will demonstrate an understanding of measurement concepts using metric and customary units.

Objective 5--The student will demonstrate an understanding of probability and statistics.

Domain: Operations

Objective 6--The student will demonstrate an understanding of addition to solve problems.

Objective 7--The student will demonstrate an understanding of subtraction to solve problems.

Objective 8--The student will demonstrate an understanding of multiplication to solve problems.

Objective 9--The student will demonstrate an understanding of division to solve problems.

Domain: Problem Solving

Objective 10--The student will estimate solutions to a problem situation.

Objective 11--The student will determine solution strategies and will analyze or solve problems.

Objective 12--The student will express or solve problems using mathematical representation.

Objective 13- The student will evaluate the reasonableness of a solution to a problem situation. (Texas Education Agency, 1999b, pp. 42-43)

There are different numbers of questions for each grade level in each objective and domain. The Texas Education Agency sets the level of passing for each objective and an overall number of correct answers for a passing score for mathematics. It was necessary for a third-grade student in 1999 to answer correctly at least 33 of 44 questions to pass the Texas Assessment of Academic Skills. On the fourth-grade Texas Assessment of Academic Skills mathematics test in 1999, the student had to answer correctly a minimum of 35 out of 50 questions to pass. The fifth-grade students were required to answer at least 34 of 52 questions correctly to pass the 1999 mathematics Texas Assessment of Academic Skills (Texas Education Agency, 1999b).

The results of the Texas Assessment of Academic Skills are sent to the school districts, then forwarded to the schools and the parents of the student. According to the Texas Education Agency (1999c), the scores are to be used in at least five ways:

Reporting results to parents of individual students. The test reports contain information about the student's scores in relation to the passing standards, the content areas in which the student may need remedial instruction, the specific skills in which further diagnosis is indicated, and the student's performance in comparison with the performance of his or her peers. This information can help parents more fully understand their child's achievement.

Reporting results to the local school board, school professionals, and the community. Although individual students' scores are confidential by law, reports of group (aggregated) scores are considered public record. However, if the specific group (e.g., limited English proficient students) contains fewer than five students, scores are not included in reports in order to protect student confidentiality.

Evaluating student scores for use in placement decisions. Remedial instruction is required by state law for students exhibiting difficulty with skills on the TAAS [Texas Assessment of Academic Skills] tests. Student test scores should also be used in conjunction with other performance indicators to assist in making placement decisions, such as whether a student should take a reading improvement course, be placed in a gifted and talented program, or exit a bilingual program.

Evaluating programs, resources, and staffing patterns. Districts may use campus and district test scores in evaluating a particular program or a particular resource or staffing pattern. For example, a campus may use its scores to evaluate its improvement in an at-risk program or to assess the need to focus resources and staff on a particular group of students.

Evaluating district and campus curriculum and instruction. Since the tests are designed to measure the essential elements for reading, writing, mathematics, science, and social studies, considering performance results by subject area and by objective may be helpful when evaluating curriculum and instruction. Generalizations from student scores may be made to the specific content domain represented by the objective or set of objectives being measured on the exam. However, because the tests are measuring a finite set of skills with a limited set of item types, generalizations should be made only to student achievement as measured on a particular test. (p. 3)

In this study the use of the Texas Assessment of Academic Skills mathematics scores are being used to evaluate the *Everyday Mathematics* curriculum and its use in schools.

Mathematics--Texas Essentials of Knowledge Skills and National Standards

Because a curriculum aligned to national standards is implemented in a system that measures student achievement by state standards, the connection between state and national standards raises concern. Three connections can be seen between the national standards developed by the NCTM and the Texas Essentials of Knowledge and Skills. The developers of the Texas Essentials of Knowledge and Skills considered several documents, including the *Standards* documents. L. Wilson, a retired educator in Texas, was on the writing team for the mathematics portion of the Texas Essentials of Knowledge and Skills test. She said in an interview that the committee members were given many documents to evaluate before writing the state norms. The NCTM *Standards* documents were distributed to all involved in writing the mathematics portion of the Texas Essentials of Knowledge and Skills test. When asked if the *Standards* were specifically referred to, she replied, "The committee avoided references to any other document, although individuals were directly influenced by the *Standards*" (L. Wilson, personal communication, August 20, 1999).

Secondly, the similarities found in the state and national standards point to connection between these two documents. The Texas Essentials of Knowledge and Skills give specific objective that the student in each grade level and content area should obtain. However they parallel the *Standards* in content areas.

The list of Texas standards for the second grade are: "(a) Numbers, Operations, and Quantitative Reasoning; (b) Patterns, Relationships, and Algebraic Thinking; (c) Geometry and Spatial Reasoning; (d) Measurement; (e) Probability and Statistics; and (f) Problem-Solving" (Texas Education

Agency, 1998b, p. 3). In close similarity, the NCTM *Standards* list the kindergarten through fourth grade standards as: "(a) Numeration, Whole Number Operations, and Computations; (b) Patterns and Relationships; (c) Geometry and Spatial Sense; (d) Measurement; (e) Statistics and Probability; and (f) Mathematics as Problem-Solving" (NCTM, 1989a, p. 15). Similarly, both documents refer to the use of manipulatives, variety in teaching methods, and real-world situations and assessments.

Thirdly, connections are evident in the use of curricula that are aligned with *Standards* in the State Systemic Initiative. The University of Texas, Charles Dana Center, leads this effort in Texas education. Among the programs it has is the Connected Mathematics Project: "This project helps seven diverse Texas sites implement a complete, standards-based curriculum for grades 6-8 that has been developed with NSF [National Science Foundation] funds at Michigan State University" (Texas Education Agency, 2000, p. 1). Resource help is available through the Texas Educational Regional Service Centers to aid in the implementation of *Standards*-based mathematics and science programs. It is evident that Texas students must meet state standards that are similar to the national standards in mathematics.

Summary

Mathematics education has faced significant change in the last 10 years. Although a starting point may be remote, the work of the NCTM radically moved mathematics reform forward. When the NCTM's (1989a) *Curriculum and Evaluation Standards for School Mathematics* was published, it established a benchmark for American schools. As the National Science Foundation attempted to elevate science and mathematics education in kindergarten through the 12th grade, it encouraged the development of curricula that applied the standards and the use of these curricula in large urban school districts. All of this has come together in a large North Texas urban school district. Through the Urban Systemic Initiative, this district has begun the use of *Everyday Mathematics*, a *Standards*-based curriculum, in several of its elementary schools. This study has attempted to measure the effects of this curriculum on student achievement (National Science Foundation, 1994).

CHAPTER 3

METHODS AND PROCEDURES

Research Design

The focus of this research concerned the effects of a *Standards*-based mathematics curriculum on the achievement of students in a large North Texas urban school district. The students' mathematic scores on the critical test, the Texas Assessment of Academic Skills, measures student achievement; this test is administered at the end of each school year. The subjects for this study were all drawn from a single school district.

This was an ex post facto study based upon data from the 1998-99 school year. One portion of data, the prior mathematics ability as measured by the Iowa Test of Basic Skills Mathematics score, came from the April 1998 administration of the test. This was also a self-selected study, with the schools that comprise the experimental group having chosen to participate in the *Everyday Mathematics* program pilot implementation.

The Experimental Group

The experimental group for this study was formed from the schools that had applied for and been accepted as pilot schools for the implementation of the *Everyday Mathematics* curriculum. The principal of each school made the commitment to use the material. Both the teachers and administrator received

40 hours of training in the use of the material and the "Teacher's Resource Package." By the beginning of the 1998-99 school year, 17 schools had been trained to use the *Everyday Mathematics* curriculum.

The principals of these schools were contacted for this study to determine the level of implementation of the curriculum. Although there was a required commitment, there were only seven schools using *Everyday Mathematics* in the 1998-99 school year. Five of the principals not using the *Everyday Mathematics* material said that the cost of the student material was the reason the program was not used. Four different principals had been appointed to the schools after the training and were more comfortable with the traditional curriculum that the district had adopted by the district. The other principal thought, after the training workshop, that the teachers of the school were not ready to implement the new curriculum.

This left seven schools in which *Everyday Mathematics* was implemented in the 1998-99 school year. Six of the principals agreed to participate in the study, with the seventh principal stating that he did not have the time to allow his teachers to complete the interviews and have lesson plans and school rolls reviewed.

In order to complete this study, it was important that the school district endorse the project. The assistant superintendent for curriculum was contacted and showed an interest in the study. A proposal was presented to the research committee of the district, with both the assistant superintendent for curriculum and the director of the Urban Systemic Initiative endorsing the study. This proposal was accepted, and the principals of the schools received a letter approving the interviews of teachers, review of records, and the release of school student rolls from the 1998-99 school year.

During September and October of 1999, dates were established with the principals to conduct the initial interviews with teachers in each school. All of these were conducted at the end of the school day. All teachers who had taught mathematics during the 1998-99 school year were gathered in a single place. They were asked to complete a one-page questionnaire. Following this, an explanation of the study was given to the group. Each teacher was then briefly interviewed to determine the accuracy of the answers on the questionnaire.

On the questionnaire (Appendix) teachers identified themselves, the school, the grade level taught, and the section(s) they had taught during the 1998-99 school year. This was followed by a set of five statements to which the teachers answered *yes* or *no*. Concerning the training and resources necessary to implement the *Everyday Mathematics* curriculum. In order to participate in the study, the teachers had to answer affirmatively. A few teachers had not attended the official training offered in the summer for *Everyday Mathematics*, but they received training in their buildings on the use of the curriculum.

The second section of the questionnaire had three questions requiring short answers. The first of these identified the amount of time that a teacher taught mathematics to each class daily. If the teacher taught multiple classes and the times differed, each classroom was identified as to the time spent teaching mathematics. The teacher needed to spend at least 1 hour daily in mathematics instruction to qualify for the study. The next question concerned the types or methods of assessments used to evaluate students. This question was used to qualify a class based on the variety of assessments suggested by the *Everyday Mathematics* material. The third question in this section concerned other material used during mathematics instruction. Any class that used the traditional or the approved mathematics curriculum was eliminated from the study. Two teachers stated that they used the textbook *Mathematics in Action* (Hoffer et al., 1992) for more than 2 hours weekly. They were excluded from the experimental group. Many teachers identified the *Everyday Counts* (Clark, Gilispie, & Kanter, 1998), a calendar mathematics program, as one that they used as a supplement in the classroom. Other teachers used bell ringers, material to help students on standardized tests, and a variety of minor items to supplement mathematics instruction. If a teacher had identified materials that took a majority of the instructional time, they were eliminated from the study. One fifth-grade teacher who stated that she used *Connected Math* (Lappan, Fey, Fitzgerald, Friel, & Phillips, 1998) at the end of the school year was eliminated from the study. *Connected Math* (Lappan et al., 1998) is another of the National Science Foundation projects for mathematics standards curriculum. However, it is written for middle school, the sixth through eighth grades.

After reviewing the answers that the teachers gave in the interview and on the questionnaire, the teachers' lesson plans for 1998-99 school year were examined. These are required to be archived and were provided by the principal, custodian, or computer records clerk. In order to qualify for the study, the lesson plans had to reflect that *Everyday Mathematics* was used daily and that the student assessments reflected the variety suggested by the curriculum.

When, through the interview process and the examination of lesson plans, teachers demonstrated that they had implemented the *Everyday Mathematics* curriculum, their class rolls from the 1998-99 school year were secured and reviewed. Students whose names were present on the class roll for both the 1st and 6th six weeks were selected for the study. The district student identification numbers were placed on a database. There were 930 children identified as students who were in classes for the entire 1998-99 school year, in which *Everyday Mathematics* was used. These came from 52 classes of students taught by 40 teachers in 6 schools.

The Control Group

Following the identification and selection of the experimental group, the student identification numbers were submitted to the district's student data department. The student data required for the study included: (a) gender, (b) ethnicity, (c) grade level, (d) participation on free or reduced lunch program, (e) 1998 Iowa Test of Basic Skills raw score, (f) 1998 Iowa Test of Basic Skills percentage rank, (g) individual mathematics objective score on the 1999 Texas Assessment of Academic Skills, and (h) percentage rank on the

1999 Texas Assessment of Academic Skills. The data of the students selected to be in the experimental group for this study were compared with that of all the students in each school. This was necessary in the selection process of control schools to ensure that similar students were involved. The ethnic makeup, the percentage of low to other socioeconomic status, and 1998 Iowa Test of Basic Skills mathematic scores were identified for students by school for each of the six schools that comprised the experimental group.

Having profiled the experimental group by schools according to socioeconomic status, previous mathematics ability, and ethnic diversity, a search was initiated for schools within the district that were similar to the experimental group schools. The research and evaluation department of the school district aided in this search. A compilation of school data, *School Snapshots 1998-99* (Dallas Public Schools, 1999), was used to find similar schools. In this book, schools are listed and data provided for population makeup and standardized test scores. Lists of schools were developed for each experimental school. These were examined for similar data in each of the three categories used for comparison. The two schools closest to the data of the experimental school were selected to comprise the control group. Interestingly, all of these schools were in close proximity to the experimental school to which they were compared.

For example, School A is an experimental school. The ethnic breakdown of the school is 60% African-American, 25% Hispanic, 12% Anglo, and 3% other. The socioeconomic status makeup is 70% low socioeconomic status and

30% other socioeconomic status. The mean 1998 Iowa Test of Basic Skills mathematics score was 50.5. Examination of the data school by school revealed that the school most similar in data is School Y. The ethnic breakdown of the school is 58% African-American, 26% Hispanic, 13% Anglo, and 3% other. The socioeconomic status makeup is 68% low socioeconomic status and 32% other socioeconomic status. The mean 1998 Iowa Test of Basic Skills mathematics score is 50.8. School Z is also similar to School A. The ethnic breakdown of the school is 62% African-American, 25% Hispanic, 11% Anglo, and 2% other. The socioeconomic status makeup is 71% low socioeconomic status and 29% other socioeconomic status. The mean 1998 Iowa Test of Basic Skills mathematics score is 49.9. Therefore, School A was self-selected to be in the experimental group by the choice to use *Everyday Mathematics,* and School Y and School Z are control group schools by the matches in socioeconomic status, ethnic diversity, and prior mathematics ability of their students.

The schools that were matched and selected to be in the control group needed to be contacted to ensure that *Everyday Mathematics* was not used in the classrooms for mathematics instruction. The principal of each school in the control group was called and questioned about the mathematics curriculum that was used for the 1998-99 school year. Three of the principals were new to their school and consulted with the teachers who were present in the school during the 1998-99 school year. All of the principals of the control group schools reported that their school had not used *Everyday Mathematics* as a mathematics curriculum.

A Texas Education Agency identification number identified each school in the district. These identification numbers were submitted to the research department for data on all of the third-, fourth-, and fifth-grade students enrolled in the school for the entire 1998-99 school year. A total of 3,404 students was identified as third-, fourth-, and fifth-graders having been enrolled for the entire school year 1998-99 in the 12 schools selected to be the control group for this study.

Collection of Data

For the sake of this study, the control group was matched to the experimental group by three items of data. Ethnic makeup, prior mathematics ability, and socioeconomic status percentages were used to eliminate the differences of these items as causes for variance in the outcome measure, increasing the probability of identifying the effect of the *Everyday Mathematics.*

Matching Procedure

Ethnicity was used as a matching item of data because of differences in scores on the Texas Assessment of Academic Skills. Anglos, African-Americans, and Hispanics each have different levels of passing this standardized test (Texas Education Agency, 1999b) Creating similar ratios of ethnicity in the experimental and control groups, should limit ethnicity as a major determinate of difference in the outcomes measure. In this study, using the ethnic designations identified by the school district, five ethnic identities were cited: Anglo, African-American, Hispanic, Native-American Indian, and Asian.

The second item of matching data was the 1998 Iowa Test of Basic Skills mathematics score. This standardized test is given the 3rd week of April to measure student achievement. The score is provided as raw score, percentage rank, and a scaled score with a school year and month. This test is used because third graders do not have previous Texas Assessment of Academic Skills scores. The director of the research and evaluation department of the district believed that the Iowa Test of Basic Skills is an adequate measure of prior mathematics ability. By matching schools by these scores, the experimental and control groups should have similar mathematics achievement or ability at the beginning of the 1998-99 school year.

The third item of matching data was socioeconomic status. This status was determined by one's qualification for the federal free or reduced lunch program. Application to this program is voluntary and is made to the district. The district, using government guidelines, assesses eligibility to receive either a free school lunch or one at a reduced price. The factors in making the decision are number of family members and total household income. For this study, if student's qualified for the free or reduced-priced lunch program or were automatically qualified because their parents or guardians receive Aid to Families with Dependent Children, formerly known as welfare, they were designated as low socioeconomic status. Otherwise students were designated as other socioeconomic status. Socioeconomic status is seen as a major determinate of difference in student achievement (Steinberg, 1996). Matching the percentages of these two groups of students in both the experimental and control groups, minimized this factor as a cause of any difference in the outcome measurement in this study.

Student Data

Each school required that students return completed forms at the beginning of each school year. The child's parent or guardian completed basic information on an enrollment form and income and family composition information on an application for participation in the free or reduced-price lunch program. The school's computer records clerk then entered the information on the school's database. This was then fed to the district's database. All students were given a district identification number that remained with them as long as they were enrolled in a district school.

Students were required to take two different standardized tests during the school year. In April of each year, the Iowa Test of Basic Skills was administered in every school in the district. At the end of April or early May of each year, the state of Texas required that all students in the 3rd through the 10th grades take the Texas Assessment of Academic Skills. The results of these standardized tests were reported to the district and recorded on the district database.

By receiving approval to obtain information from the district's student database, it was possible to retrieve all the necessary information for this study. A request for information was submitted and approved. The list of information for each student identification number included school code; grade level; gender; socioeconomic status; the 1998 Iowa Test of Basic Skills raw mathematics score and percentage rank mathematics score; the 1999 Texas Assessment of Academic Skills scoring code, score on individual mathematics objectives (13), and score percentage rank.

Final Data Set

With all of the data accumulated for the students whose identification numbers were submitted to the district, additional work was necessary for the final data set. First, the students needed to be designated as *Everyday Mathematics* students or non-*Everyday Mathematics* students. A column of data was established, and students were coded by the mathematics curriculum with which they were taught.

Secondly, rather than analyzing the 1999 Texas Assessment of Academic Skills scores by individual objective, domains that group several objective were used. Most of the individual objectives contain four items on the test. Each domain consists of four or five objectives. In order to do this, the correct objectives were added together into the three domains: concepts, operations and problem-solving. Three columns of data were established for this purpose.

After completion of the necessary categories for data, the cases for the study needed to be examined. Several of the cases, both in the experimental and control group had incomplete data. Primarily, in the test scores, many cases were missing either the Iowa Test of Basic Skills score or the 1999 Texas Assessment of Academic Skills score. There were several reasons for missing test scores. Most missing scores were the result of not having taken the tests. Cases with incomplete data were eliminated from the study. This left 732 cases in the experimental group and 2,704 cases in the control group.

Instrument to Analyze Data

All of the cases were imported into the Statistical Package of the Social Sciences (SPSS) Base 9.0 computer program. According to the application guide, "SPSS 9.0 is a comprehensive system for analyzing data. SPSS can take data from almost any type of file and use them to generate tabulated reports, charts, and plots of distributions and trends, descriptive statistics, and complex statistical analyses" (SPSS, 1999, p. 3). All statistical analyses and descriptive statistics were made with this computer program.

Generalizability

As stated previously, this is a self-selected study. All of the schools that implemented the *Everyday Mathematics* curriculum did so by their own choice, which limits the generalizability of this study. Although the schools in this study compose approximately 15% of the elementary schools in the district and almost 10% of the third-, fourth-, and fifth-grade students in the district, they were not randomly selected. Therefore, although it is an important study, it cannot be statistically generalized to the entire district student population.

Reliability and Validity Issues

The measure of outcome for this study is the 1999 Texas Assessment of Academic Skills, a test designed for all public school students in Texas. This test is mandated by the Texas legislature and was developed and administered by the Texas Education Agency. From the beginning, the Texas Assessment of Academic Skills was designed to assess higher-order thinking skills and problem solving rather than minimum skills (Texas Education Agency, 1997b).

The Texas Education Agency has suggested at least five uses for the Texas Assessment of Academic Skills. These are: "reporting results to parents of an individual student; reporting results to the local school board, school professionals, and the community; evaluating student scores for placement decisions; evaluating programs, resources, and staffing patterns; and evaluating district and campus curriculum and instruction" (Texas Education Agency, 1998a, pp. 36-37). The use of the Texas Assessment of Academic Skills in this study falls within the suggested uses.

The Texas Education Agency reported that the Texas Assessment of Academic Skills is a highly reliable test. Using the Kuder-Richardson method the agency records a reliability range from .88 to .92, which is an indication of an extremely reliable instrument (Texas Education Agency, 1998a).

The Texas Education Agency (1999c), in the *TEA Technical Guide to TAAS*, reported on the validity of the instrument. The test is a criterion-referenced assessment and is developed from the state-mandated curriculum. This involved a lengthy review and evaluation process. The Texas Education Agency claimed that the test is highly valid in regards to curriculum content, essential elements, and subpopulation scoring. In regard to content validity, the Texas Education Agency (1999c) stated the following:

> Criterion-referenced assessments, such as the TAAS [Texas Assessment of Academic Skills] and end-of-course tests, are based on an extensive definition of the content they assess. TAAS and end-of-course test validity is, therefore, content-based and tied directly to the statewide curriculum. As it has since the inception of TAAS and the end-of-course tests, the cycle of educator committee item review and data review continued on new and field-tested items, respectively. The item writers as well as the reviewers for each stage of development verify the alignment of test items with the objectives and measurement specifications to ensure that the items measure appropriate content. The sequential stages of item development and item review provide many opportunities for Texas educators to offer suggestions for improving or eliminating items and to offer insights into the interpretation of the statewide curriculum. The nature and specificity of these various review procedures provide additional strong evidence for the content validity of the TAAS. Not only do Texas educators provide valued input on the content and the match between the items and the statewide curriculum, but many current and former Texas educators and some educators from other states work as independent contractors to write items specifically to measure the objectives and specifications. This provides for a system of checks-and-balances for item development and review that reduces single source bias. In other words, because test items are written by many different people with different backgrounds, it is less likely that items will suffer from a bias that might occur if items were written by a single author. The direct input from educators offers additional evidence regarding the content validity of constructed TAAS. The staff at TEA [Texas Education Agency] as well as professional test developers from Harcourt Brace Educational Measurement, National Computer Systems, and Measurement Incorporated provide a history of test building experience, including content-related expertise. Each internal review of an item by these experts increases the probability of the item being an accurate measure of the intended objective. Hence, these reviews are offered as additional evidence for the content validity of the TAAS and end-of-course tests. (pp. 62-63).

In reference to construct validity the Texas Education Agency (1999c) noted:

> Construct validity is the extent to which a test can be said to measure a theoretical construct or trait. In the case of TAAS [Texas Assessment of Academic Skills], the construct tested is the mastery of academic content required by the statewide curriculum. With curriculum-based achievement tests such as the TAAS, both construct and content validity are intertwined. The construct validity is grounded in the content validity of the test. (p. 67)

Another area of validity is criterion-related validity, which indicates the relationship between test performance and performance on some other measure. The Texas Education Agency (1998a) has correlated different levels and content area tests with students' end-of-year scores and has an average of 0.52 positive statistic. The most recent study, which appears in *1998 Summary of Student Performance Results* (Texas Education Agency, 1998a), compares students' performance on the Grade 3 Texas Assessment of Academic Skills reading test with their performance (pass/fail) in their Grade 3 reading course. This study was conducted as a statewide random sample. This analysis showed a strong correlation of 0.72, which indicates a relationship between the test and the evaluations of students by their teachers (Texas Education Agency, 1998a). Overall, in content, construct, and criterion-related validity, the Texas Education Agency has demonstrated an effort to test the ability of students who have been taught by the statewide objectives, the Texas Essentials of Knowledge and Skills.

This study attempted to identify and collect data on as many students as possible who were taught by the *Everyday Mathematics* curriculum. Then a control group was developed to closely match those students, but who were taught through the use of the district-approved mathematics curriculum. Data were gathered that could compare these two groups. The 1999 Texas Assessment of Academic Skills mathematics score was used as the outcomes measure. The result was a large set of data to determine whether the students had different achievement gains.

CHAPTER 4

ANALYSIS OF DATA

The problem as previously stated for this study was to analyze the student data of those children taught using the *Everyday Mathematics* program and the data of children taught using the approved mathematics curriculum of the school district. The problem was to determine whether or not the implementation of a *Standards*-based curriculum could be used to predict a difference in student achievement. The purpose of this study was to determine the effects that the *Everyday Mathematics* curriculum had on student achievement in a large North Texas urban school district.

Descriptive Analysis of the Experimental and Control Groups

The analysis of these data began with a descriptive analysis of the two groups. The experimental group was comprised of students who were, for the entire 1998-99 school year, in classrooms in which the *Everyday Mathematics* curriculum was implemented. The control group was comprised of students who were, for the entire 1998-99 school year, in classrooms in which the district approved curriculum was used.

The experimental group had 732 students and the control group had 2,704 students. The number of students who were taught using *Everyday Mathematics* determined the number of students in the experimental group. A total of 1,160 third-, fourth-, and fifth-grade students in a large North Texas urban school district were taught using the *Everyday Mathematics* curriculum in the 1998-99 school year. Six of seven schools using the curriculum were included in the study. The seventh school, which did not participate, had 230 students who may have qualified. Students were eliminated because of incomplete data or because the principal would not approve the study, leaving a final number of 732 in the experimental group.

The number of students in the control group was determined by the selection of schools, with similar student composition regarding ethnicity, socioeconomic status, and prior mathematics ability. Some students were eliminated from the study either because of incomplete data or because failure to remain in the school for the entire school year. This left the number of students at 2,704.

Comparison of Ethnicity

The ethnic designations for this large North Texas urban school district are African-American, Hispanic, Native-American Indian, Asian, and Anglo. The number of students in each of these ethnic designations and the percentage of each group, those taught with *Everyday Mathematics* and those taught with the district-approved curriculum (non-*Everyday Mathematics*) are seen in Table 1 and Figure 1.

In comparison, the major ethnic groups were similar. The African-American population made up the majority of both groups, with only a 1% difference between the experimental and control group. The Anglo population

Table 1

The Frequency and Percentage of the Experimental and Control Groups

Ethnicity	Frequency	Percentage
The experimental group (*Everyday Mathematics*)		
African-American	407	55.6
Asian	3	.4
Hispanic	137	18.7
Native-American Indian	5	.7
Anglo	180	24.6
Total	732	100.0
The control group (non-*Everyday Mathematics*)		
African-American	1,477	54.6
Asian	52	1.9
Hispanic	577	21.3
Native-American Indian	14	.5
Anglo	584	21.6
Total	2,704	100.0

had a 3% difference, with this being the second largest subpopulation in each group. The Hispanic student population was the third largest in each group, with a difference of 2.6%. The remainder of the students were Asian and Native-American Indian, with 2.4% of the total students of the control group and 1.1% of the experimental group.

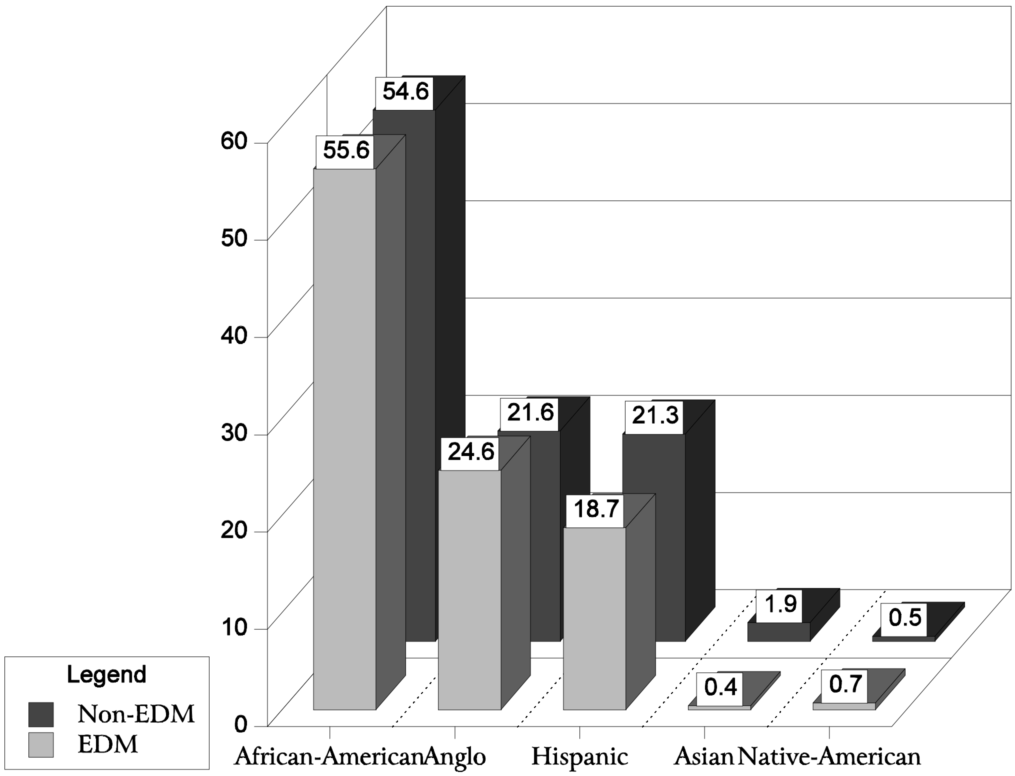


Figure 1. Comparison of ethnic makeup by percentage of the experimental group (*Everyday Mathematics*) and control group (non-*Everyday Mathematics*). EDM = *Everyday Mathematics*.

Comparison of Socioeconomic Status

The socioeconomic status of students was determined by acceptance of their applications to participate in the federal free or reduced price lunch program. Those students who applied and qualified for a free or reduced lunch, along with those automatically qualified by participation in Aide for Families with Dependent Children, are considered low socioeconomic status. All other students were considered other socioeconomic status. The number of students in the experimental and control groups and percentages of the group by socioeconomic designation is delineated in Table 2 and Figure 2. The numbers shown in Table 2 delineate that the differences between the control and experimental groups were less than 6% with both having about a two-to-one ratio between the students of low and those of other socioeconomic status.

Table 2

The Number and Percentage Makeup of Socioeconomic Status Among the "Everyday Mathematics" and Non-"Everyday Mathematics" Students

Socioeconomic status	Frequency	Percentage
The experimental group (*Everyday Mathematics*)		
Low	463	63.3
Other	269	36.7
Total	732	100.0
The control group (non-*Everyday Mathematics*)		
Low	1,865	69.0
Other	839	31.0
Total	2,704	100.0

Comparison of Gender

One might suppose that the gender comparisons would be negligible; however, because it was a factor in the multiple regression model, it is

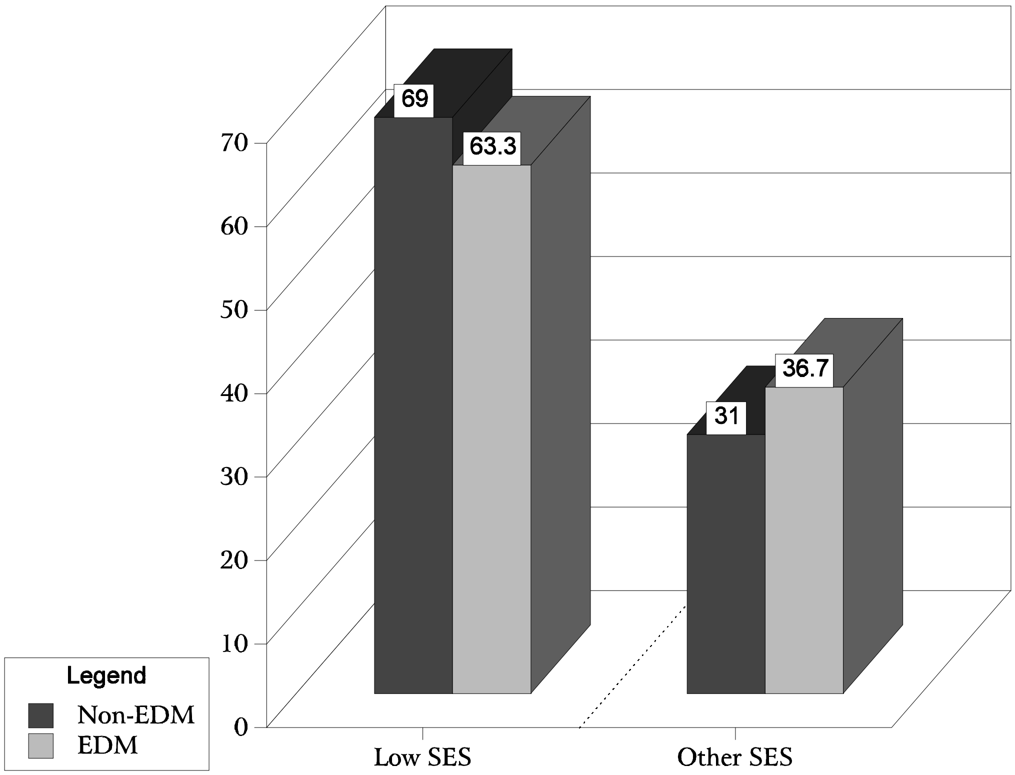


Figure 2. Comparison of socioeconomic makeup by percentage of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*). EDM = *Everyday Mathematics*, SES = socioeconomic status.

important to give the frequencies of each group. The number of male and female in each group and the percentage of the group are noted in Table 3 and Figure 3. In both groups the larger subpopulation was female, with the experimental group having a larger difference than the control group.

Table 3

The Frequency and Percentage of Gender in Each Group

Gender	Frequency	Percentage
The experimental group (*Everyday Mathematics*)		
Female	396	54.1
Male	336	45.9
Total	732	100.0
The control group (non-*Everyday Mathematics*)		
Female	1,379	51.0
Male	1,325	49.0
Total	2,704	100.0

Comparison of Grade Level

Students in the third, fourth, and fifth grade were used for this study. These grades were selected for two reasons. The school district determined to use the *Everyday Mathematics* curriculum in the kindergarten through the fifth grade. Although this material goes through the sixth grade, another middle school curriculum was chosen for the sixth through eighth grades. The outcomes measure of academic achievement used for this study, the Texas Achievement of Academic Skills, is administered to students beginning in the third grade. These two facts limited this study to third-, fourth-, and fifth-grade

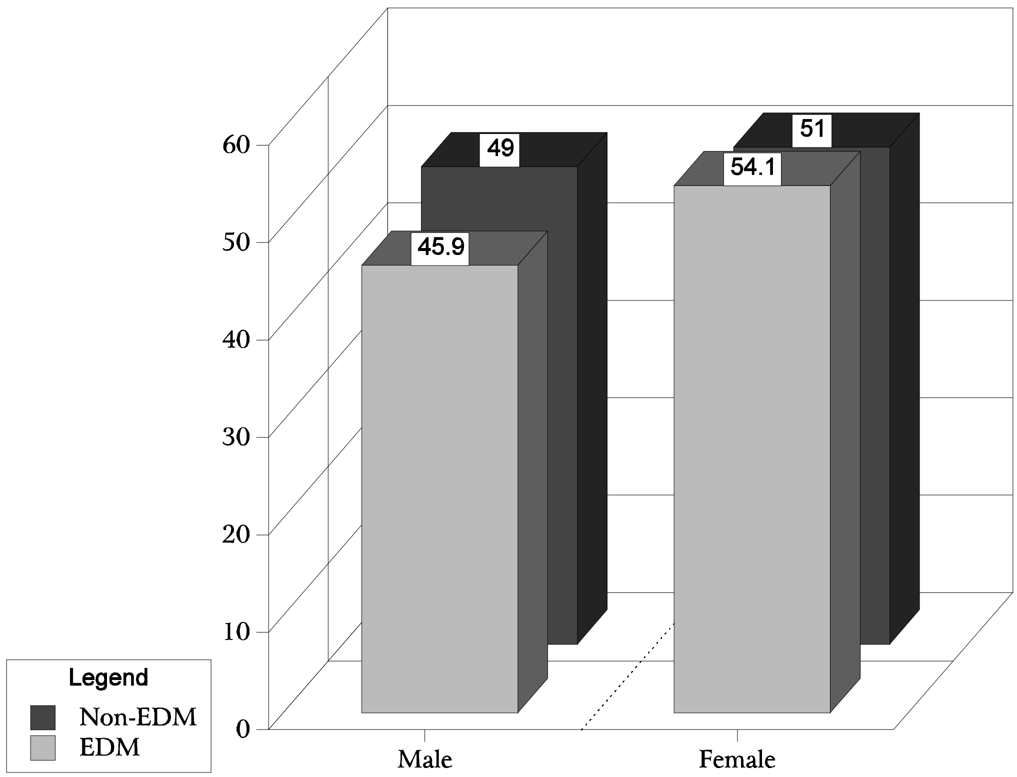


Figure 3. Comparison of gender makeup by percentage of the experimental (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*). EDM = *Everyday Mathematics*.

students. The number and the percentage of students in third, fourth, and fifth grades in each of the groups is seen in Table 4 and Figure 4.

These numbers indicate some differences in the experimental (*Everyday Mathematics*) and the control (non-*Everyday Mathematics*) groups. The experimental group had 5.5% more third grade students than the control group. A similar difference is seen in the fifth graders, with the experimental group having 6.4% more than the control group. The fourth grade has the greatest difference, with the control group having 11.9% more students than

Table 4

The Frequency and Percentage of Students in Each Grade Level in the Experimental and Control Groups

Grade level	Frequency	Percentage
The experimental group (*Everyday Mathematics*)		
Grade 3	1,007	37.2
Grade 4	845	31.3
Grade 5	852	31.5
Total	2,704	100.0
The control group (non-*Everyday Mathematics*)		
Grade 3	232	31.7
Grade 4	316	43.2
Grade 5	184	25.1
Total	732	100.0

the experimental group. These differences should make no statistically significant difference in the outcome comparison. A later comparison examines the outcome measure of each grade level.

Comparison of Prior Mathematics Ability

In order to ensure that students in both groups were level at the beginning of the school year, students' prior mathematics ability was compared. The measure of prior mathematics ability was the mathematics

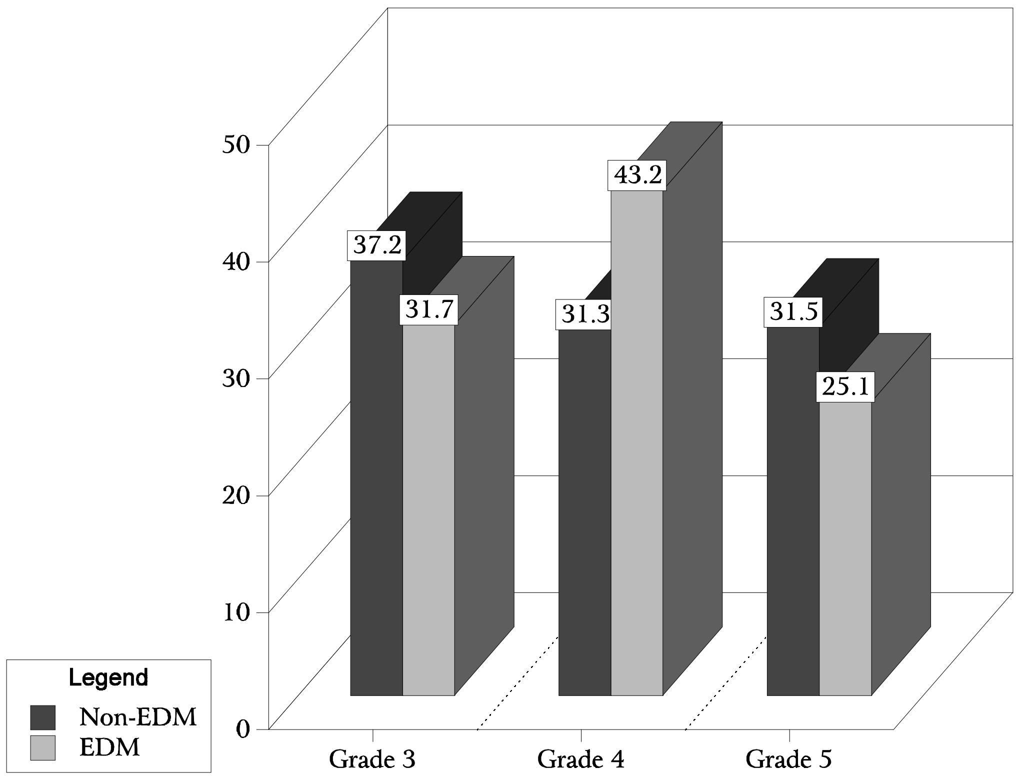


Figure 4. Comparison of grade level makeup by percentage of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*). EDM = *Everyday Mathematics*.

score on the Iowa Test of Basic Skills test administered in April, 1998. This was chosen because it correlates with the Texas Assessment of Academic Skills test and was given to second graders who would become the third graders in this study in the 1998-99 school year. Using the national percentage comparison ranking the description of the scores for the experimental group is displayed in Table 5 and graphically compared in Figure 5.

Table 5

Descriptive Statistics of the 1998 Iowa Test of Basic Skills Mathematic Scores for Each Group

Group	*N*	Minimum	Maximum	Mean	Standard deviation
Everyday Mathematics	732	1.0	99.0	55.891	27.855
Non-*Everyday Mathematics*	2,704	1.0	99.0	55.946	27.983

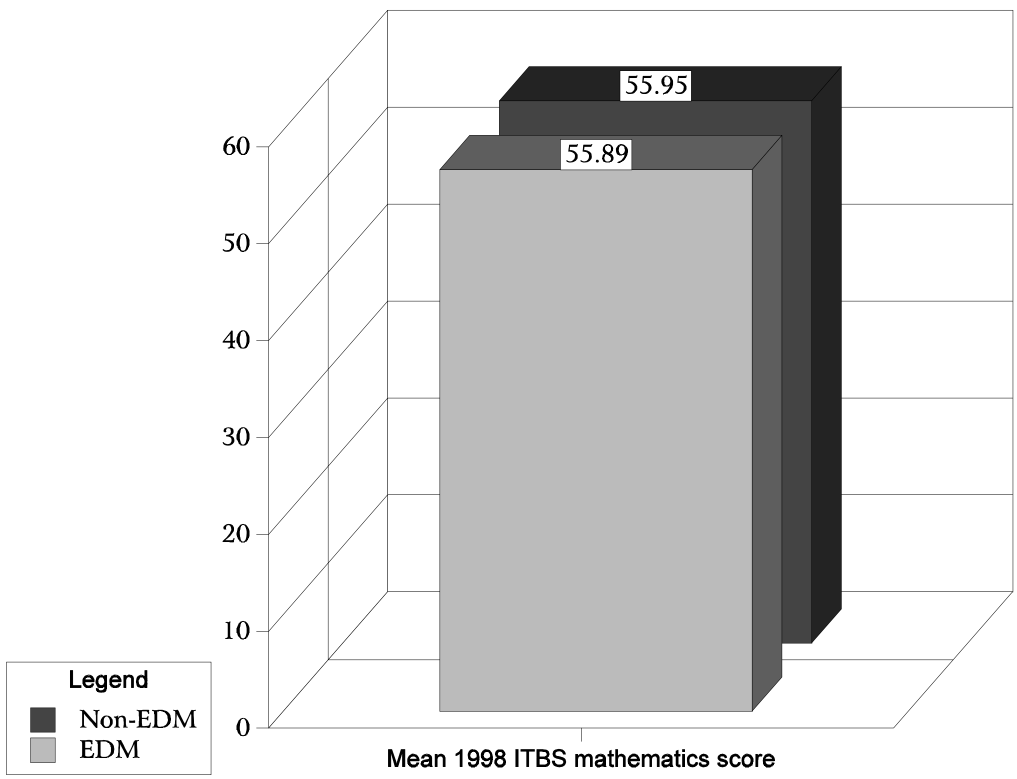


Figure 5. Comparison of the mean 1998 Iowa Test of Basic Skills mathematics score (prior mathematics ability) of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*). ITBS = Iowa Test of Basic Skills, EDM = *Everyday Mathematics.*

The Iowa Test of Basic Skills mathematic scores of the experimental and control group were subject to a *t*-test of equality of means. The results are shown in Table 6.

Table 6

Independent Samples Test t-Test for Equality of Means Between the 1998 Iowa Test of Basic Skills Mathematics Score for "Everyday Mathematics" and Non-"Everyday Mathematics" Students

Test	*t*	*DF*	Significance (2-tailed)	Mean difference	Standard error difference
ITBS	.047	3,434	.962	.05	1.165

Note. ITBS = Iowa Test of Basic Skills.

The critical value for rejection of the null hypothesis is 1.96. The result of the *t*-test gave a value of .047. This shows that there is no statistically significant difference between the scores of these two groups on the 1998 Iowa Test of Basic Skills mathematics test. The control group had a slightly higher mean on the scores. The distribution of the scores was also similar. This makes the point that based on the Iowa Test of Basic Skills mathematics test scores the two groups started out the 1998-99 school year at virtually the same mathematics ability.

Summary of the Description of the Experimental and Control Groups

The statistical description of the groups in this study shows that they are similar in every category considered. They are almost identical in prior mathematics ability, a critical category in comparing the increase in mathematics achievement.

Research Question 1

The first research question in this study is as follows:

Are there significant differences between the mathematics scores on the Texas Assessment of Academic Skills of students who have been taught using the *Everyday Mathematics* curriculum and those of students taught using the approved curriculum in this North Texas urban school district?

The hypothesis for this question, as previously stated, is as follows:

There is no significant difference in mathematic scores on the Texas Assessment of Academic Skills of students taught using *Everyday Mathematics* and mathematic scores on the Texas Assessment of Academic Skills of students taught using the district-approved mathematics curriculum.

This requires a two-tailed *t*-test. The critical value for *t* at the .05 level of significance is 1.960, and at the highest or most conservative level of significance, the .001 level, the critical value for *t* is 3.291. The hypothesis is: H_o: $t < 1.960$, $\alpha.05$, H_o: $t < 3.291$, $\alpha.001$. In other words, in order to accept the null hypothesis that the 1999 Texas Assessment of Academic Skills mathematic test scores of *Everyday Mathematics* students will not be significantly different from the non-*Everyday Mathematics* students is a result of something other than chance, the *t*-test result must be less than 1.960. This would have a 5% probability of a Type I error, which is the error of rejecting a true null hypothesis. In order to lower the probability of a Type I error to .1%, the *t* statistic would have to be less than 3.291.

In the independent sample *t*-test the 1999 Texas Assessment of Academic Skills mathematic scores of students who were taught using the *Everyday Mathematics* curriculum were compared to the 1999 Texas Assessment of Academic Skills mathematic scores of students who were taught using the district-approved mathematics curriculum (non-*Everyday Mathematics*). The group statistics for this test are displayed in Table 7. A graphic comparison of the means of the 1999 Texas Assessment of Academic Skills mathematic scores are displayed in Figure 6. The results of the *t*-test are between the means of the 1999 Texas Assessment of Academic Skills mathematic scores of the *Everyday Mathematics* and the non-*Everyday Mathematics* students as displayed in Table 8.

Table 7

Group Statistics for the 1999 Texas Assessment of Academic Skills Mathematics Test

Group	*N*	Mean	Standard deviation	Standard error mean
Everyday Mathematics	732	78.82	11.46	.42
Non-*Everyday Mathematics*	2,704	74.93	14.81	.28

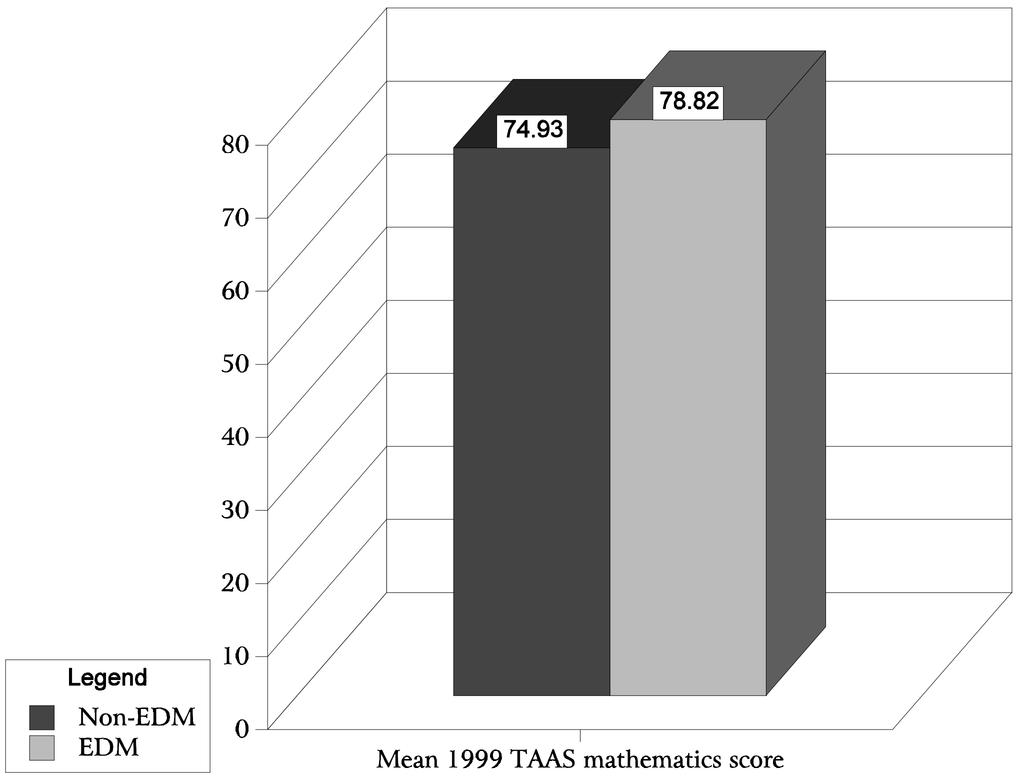


Figure 6. Comparison of the mean 1999 Texas Assessment of Academic Skills mathematics score (outcomes measurement) of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*). TAAS = Texas Assessment of Academic Skills, EDM = *Everyday Mathematics*.

Table 8

Independent Samples t-Test of 1999 Texas Assessment of Academic Skills Mathematic Scores of "Everyday Mathematics" and Non-"Everyday Mathematics" Students

Test	*t*	*DF*	Significance (2-tailed)	Mean difference	Standard error difference
TAAS	6.603	3,434	.000	3.90	.59

Note. TAAS = Texas Assessment of Academic Skills.

According to this test the hypothesis H_0 is rejected and at the most conservative level of significance. There are statistically significant differences in the Texas Assessment of Academic Skills mathematic scores of the two groups that are attributable to something other than chance.

Research Question 2

The second research question is as follows:

Are there significant differences in the mathematics scores on the Texas Assessment of Academic Skills when groups (*Everyday Mathematics* students vs. non-*Everyday Mathematics* students) are examined with regard to ethnicity, gender, socioeconomic status, and grade level?

The proposed hypothesis for this question is as follows:

There will be no significant difference between the 1999 Texas Assessment of Academic Skills mathematic scores of students taught with the *Everyday Mathematics* curriculum and the 1999 Texas Assessment of Academic Skills mathematic scores of students taught using the district-approved mathematics curriculum when groups are broken down by ethnicity, gender, socioeconomic status, and grade level.

In order to test for this hypothesis, several two-tailed *t*-tests were conducted. The first of these was a *t*-test of equality of means, an independent sample test of the means of the Texas Assessment of Academic Skills mathematic scores between ethnically similar students in *Everyday Mathematics* classes and ethnically similar students in classes taught by the district-approved mathematics curriculum (non-*Everyday Mathematics*).

Comparison of Texas Assessment of Academic Skills Scores by Ethnicity

The ethnic categories in this study are African-American, Hispanic, Anglo, Asian, and Native-American Indian. The last two categories had few students making statistical comparison insignificant. These two ethnic groups were combined and reported as "other" for the sake of completeness in this study. The *N* for Asian and Native-American Indian was low making the data unusable. The scores of students in ethnic division in *Everyday Mathematics* and non-*Everyday Mathematics* groups are seen in Table 9. The *t*-test results for

Table 9

Group Statistics of Ethnic Designations of "Everyday Mathematics" and Non-"Everyday Mathematics" Students

Group	*N*	Means	Standard deviation	Standard error means
		African-American		
Everyday Mathematics	407	76.11	12.36	.61
Non-*Everyday Mathematics*	1,477	70.75	15.91	.41
		Hispanic		
Everyday Mathematics	137	78.62	10.31	.88
Non-*Everyday Mathematics*	577	78.58	12.04	.50
		Anglo		
Everyday Mathematics	180	84.91	7.15	.53
Non-*Everyday Mathematics*	584	81.31	10.92	.45

equality of means on 1999 Texas Assessment of Academic Skills mathematic scores broken down by ethnicity between *Everyday Mathematics* and non-*Everyday Mathematics* students are seen in Table 10.

Table 10

Results of t-Test of Scores on 1999 Texas Assessment of Academic Skills Mathematics Test Broken Down by Ethnicity

Ethnicity	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
African-American	6.289	.000	1,882	5.36	.85
Hispanic	0.037	.970	712	.04	1.11
Anglo	4.151	.000	762	3.60	.87

Note. The statement of the null hypothesis is: H_o: $t < 1.96$, $\alpha .05$, H_o: $t < 3.291$, $\alpha .001$.

The comparison of means is significantly different in the ethnic designations of African-American and Anglo students as shown in Table 10. These have differences in means that can be attributed to something other than chance at the highest level of significance. It is important to note that the Hispanic population showed no significant difference in the means of Texas Assessment of Academic Skills mathematic test scores. These results are graphically displayed in Figure 7.

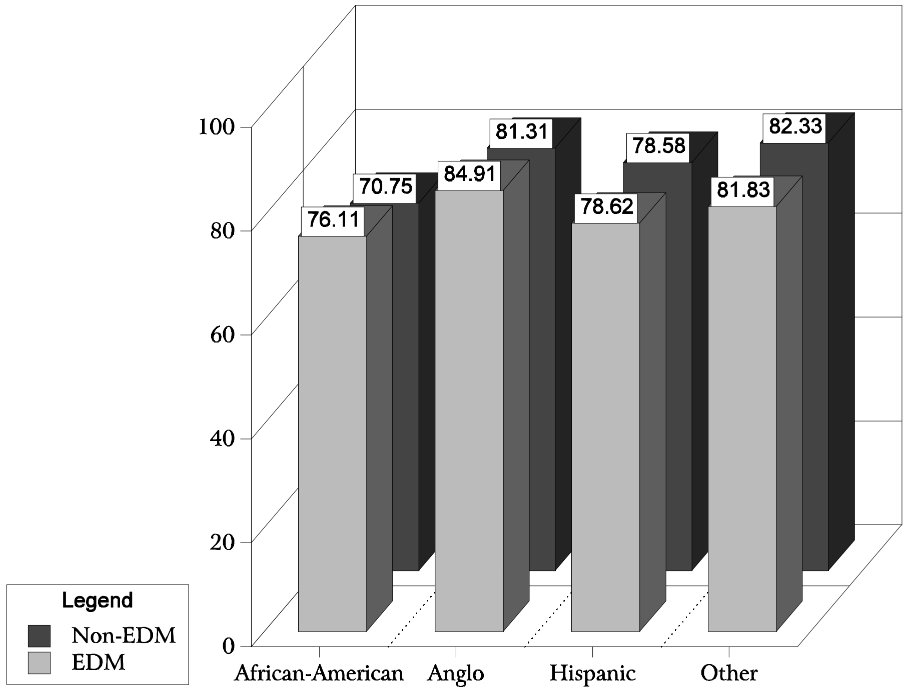


Figure 7. Comparison of 1999 Texas Assessment of Academic Skills mathematics score average of experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*) by ethnicity. EDM = *Everyday Mathematics*.

Comparison Texas Assessment of Academic Skills Scores by Gender

The next area of comparison is gender. It has been believed (even on a current television commercial) that girls start out behind in mathematics and science but by age 12 often catch up to boys. This belief is addressed in this study. The group statistics are reported in Table 11 and a comparison by *t*-test on the Texas Assessment of Academic Skills mathematic scores by gender are reported in Table 12.

Table 11

Group Statistics by Gender of "Everyday Mathematics" and Non-"Everyday Mathematics" Students' 1999 Texas Assessment of Academic Skills Mathematic Scores

Group	*N*	Means	Standard deviation	Standard error means
		Females		
Everyday Mathematics	396	78.92	11.11	.56
Non-*Everyday Mathematics*	1,379	75.57	14.14	.38
Total	1,775	76.32	13.59	.32
		Males		
Everyday Mathematics	336	78.71	11.88	.65
Non-*Everyday Mathematics*	1,325	74.26	15.47	.42
Total	1,661	75.16	14.91	.37

Three *t*-tests were conducted to determine if there were any significant differences. One was run between scores of the *Everyday Mathematics* and non-*Everyday Mathematics* female students. A second was run between the scores of the *Everyday Mathematics* and non-*Everyday Mathematics* male students. A third was run between the scores of all female students (both *Everyday Mathematics* and non-*Everyday Mathematics*) and all male students. The results of these *t*-tests are detailed in Table 12.

Table 12

Comparison of 1999 Texas Assessment of Academic Skills Mathematic Scores by Gender

Gender	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Females	4.345	.000	1,773	3.35	.77
Males		4.925	.000	1,659	4.46
.90					
Female versus male	2.385	.020	3,434	1.16	.49

Note. The statement of the null hypothesis is: H_o: t < 1.645, α.05, H_o: t < 3.291, α.001.

These results show that both male and female students had statistically significant higher scores on the Texas Assessment of Academic Skills mathematics test. Female *Everyday Mathematics* students had an average score 3.35 points higher than their non-*Everyday Mathematics* counterparts. Similarly, the male *Everyday Mathematics* students scored 4.46 points higher than males taught using the district-adopted mathematics curriculum. These results are graphically displayed in Figure 8.

When all males were compared to all females, the females scored higher by an average of 1.16 on the mathematics Texas Assessment of Academic Skills test. A graphic illustration of this is in Figure 9. This contradicts the belief that girls start out behind and catch up by the sixth grade. According to this study, girls in this population are already ahead of boys in mathematics

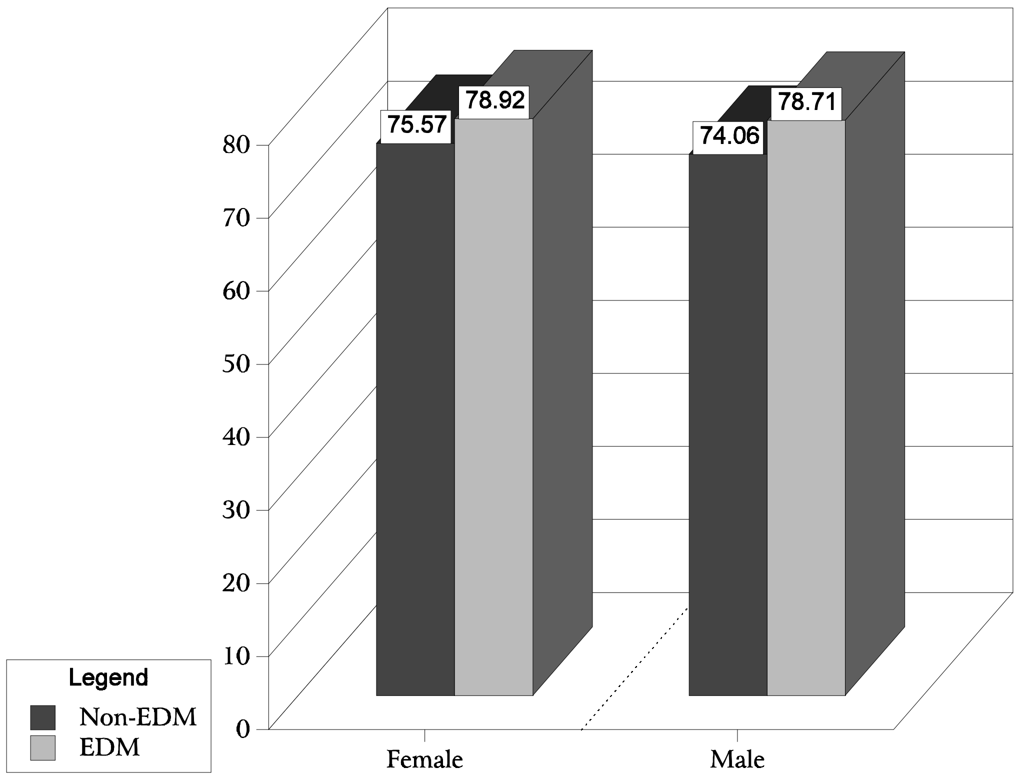


Figure 8. Comparison of mean 1999 Texas Assessment of Academic Skills mathematic scores of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*) divided by gender. EDM = *Everyday Mathematics*.

achievement as measured by the Texas Assessment of Academic Skills mathematics test in the elementary grades.

Comparison of Texas Assessment of Academic Skills Scores by Socioeconomic Status

This analysis looked at the level of family income as it related to a student's mathematics achievement. For this study, a student who qualified for a lunch at a free or reduced price according to the federal government and

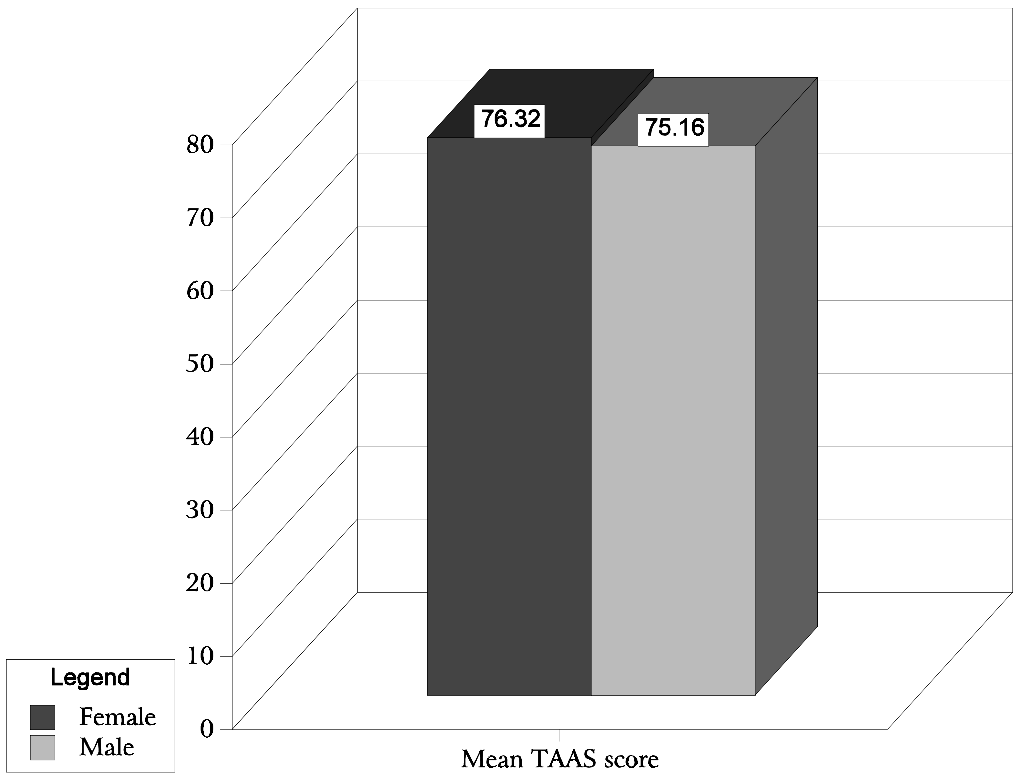


Figure 9. Comparison of the mean 1999 Texas Assessment of Academic Skills mathematics score between all female and all male students in this study. TAAS = Texas Assessment of Academic Skills.

applied for this program is considered low socioeconomic status. Table 13 is a display of the group statistics of the *Everyday Mathematics* and non-*Everyday Mathematics* students' 1999 Texas Assessment of Academic Skills mathematic scores when divided by socioeconomic status. The results of *t*-tests comparing scores of students (*Everyday Mathematics* vs. non-*Everyday Mathematics*) in each socioeconomic designation and of a *t*-test comparing all low socioeconomic students and all other socioeconomic students are found in Table 14.

Table 13

Groups Statistics of 1999 Texas Assessment of Academic Skills Scores in Each Socioeconomic Designation

Group	*N*	Means	Standard deviation	Standard error means
		Low socioeconomic status		
Everyday Mathematics	463	76.55	11.61	.54
Non-*Everyday Mathematics*	1,865	72.35	15.49	.36
Total	2,328	73.19	14.89	.31
		Other socioeconomic status		
Everyday Mathematics	269	82.73	10.08	.61
Non-*Everyday Mathematics*	839	80.65	11.27	.39
Total	1,108	81.16	11.02	.33

Table 14

Results of t-Test Comparing Within Socioeconomic Designations

Socioeconomic status	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Low	5.470	.000	2,326	4.20	.77
Other	2.702	.001	1,106	2.08	.77

Note. The statement of the null hypothesis is: H_o: $t < 1.645$, $\alpha .05$; H_o: $t < 3.291$, $\alpha .001$.

These results show that the differences in the scores on the mathematics test of the Texas Assessment of Academic Skills of low socioeconomic students who were taught using the *Everyday Mathematics* program were significantly higher, in statistical terms, than those of students of similar economic status but who were taught using the district-approved mathematics curriculum. The difference in the average in the Texas Assessment of Academic Skills mathematic scores of these two groups was 4.2 points. Also, a difference existed in the experimental group and the control group of other socioeconomic status students. The difference in their mean scores was 2.08 points. A graphic illustration of this is seen in Figure 10.

Comparison of Texas Assessment of Academic Skills Scores by Grade Level

The two groups, *Everyday Mathematics* and non-*Everyday Mathematics*, were divided into the third-, fourth-, and fifth-grade students. A two-tailed *t*-test was run on the Texas Assessment of Academic Skills mathematic scores between experimental and control groups in each grade level. The descriptive statistics of the scores on the 1999 Texas Assessment of Academic Skills mathematics test when examined by grade level are found in Table 15. The results of the *t*-tests comparing the *Everyday Mathematics* students and the non-*Everyday Mathematics* students in each grade level are found in Table 16.

The results of this analysis show that in each level (third, fourth, and fifth grade) there were statistically significant differences in the average Texas Assessment of Academic Skills mathematic scores of the *Everyday Mathematics*

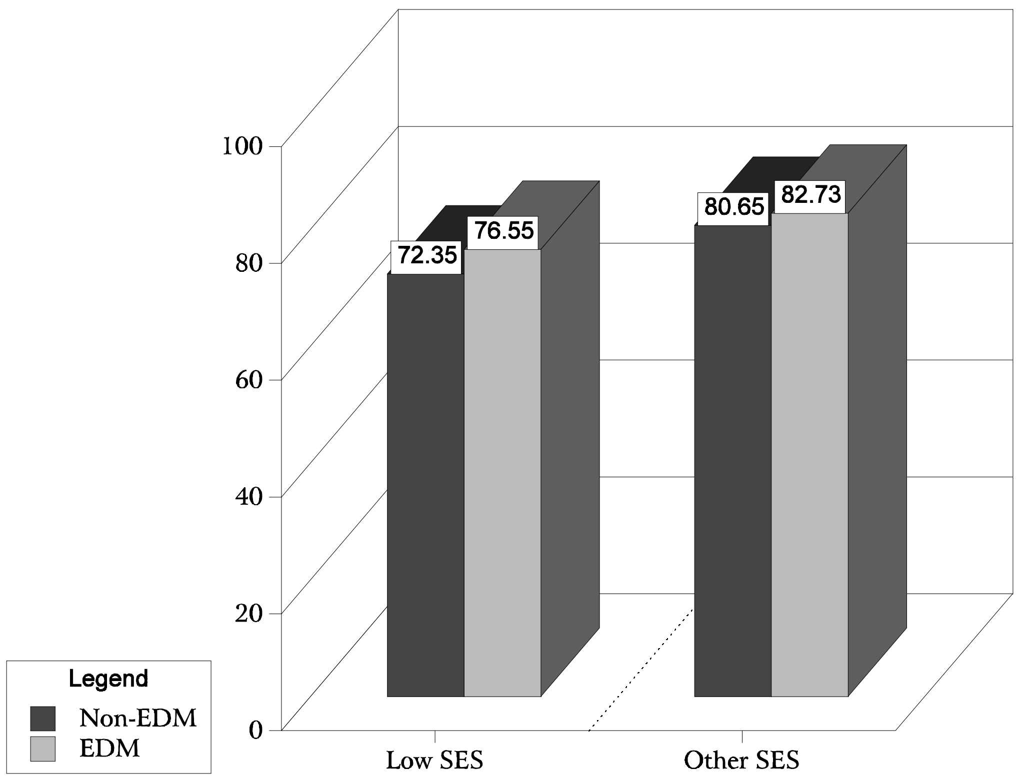


Figure 10. Comparison of the mean 1999 Texas Assessment of Academic Skills mathematics score of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*) divided by socioeconomic status. EDM = *Everyday Mathematics*, SES = socioeconomic status.

students and the non-*Everyday Mathematics* students at the .01 level. All grades showed higher scores for the students taught by the *Everyday Mathematics* curriculum. In the third grade the difference was almost 3 points, on an average, in the fourth grade the average *Everyday Mathematics* student scored 4.33 points higher, and in the fifth grade the average score was almost 4 points higher for *Everyday Mathematics* students. A graphic illustration of these results are seen in Figure 11.

Table 15

Descriptive Statistics of 1999 Texas Assessment of Academic Skills Mathematic Scores in Each Grade Level

Group	*N*	Means	Standard deviation	Standard error means
		Third grade		
Everyday Mathematics	232	74.21	12.48	.82
Non-*Everyday Mathematics*	1,007	71.24	16.55	.52
Total	1,239	71.79	13.59	.44
		Fourth grade		
Everyday Mathematics	316	80.22	10.53	.59
Non-*Everyday Mathematics*	845	75.89	12.97	.45
Total	1,161	77.07	12.50	.38
		Fifth grade		
Everyday Mathematics	184	82.25	9.77	.72
Non-*Everyday Mathematics*	852	78.33	13.34	.46
Total	1,036	79.76	12.86	.34

Summary of Research Question 2

In reviewing all of these comparisons by ethnicity, gender, socioeconomic status, and grade level, all but one of the *t*-tests showed statistically significant *t* values. These reject the null hypothesis. In other

Table 16

Results of t-Tests ("Everyday Mathematics" vs. Non-"Everyday Mathematics") 1999 Texas Assessment of Academic Skills Mathematics Score by Grade Level

Grade	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Third	2.570	.010	1,237	2.97	1.16
Fourth	5.317	.000	1,159	4.33	.81
Fifth	3.777	.000	1,034	3.92	1.04

Note. The statement of the null hypothesis is: H_o: $t < 1.645$, $\alpha .05$; H_o: $t < 3.291$, $\alpha .001$.

words, the likelihood that the differences in the scores of the compared groups were a result of chance is extremely slight.

The single test of equality of means which showed no significant difference was in the Hispanic comparison. The Hispanic students taught by the *Everyday Mathematics* curriculum had almost the same academic achievement, as measured by the Texas Assessment of Academic Skills mathematics test, as did the Hispanic students taught by the district-approved curriculum.

Research Question 3

The third research question is as follows:

Are there significant differences between the mathematics scores in each domain (concepts, operations, and problem solving) of the Texas Assessment of Academic Skills of students who have been taught using the *Everyday*

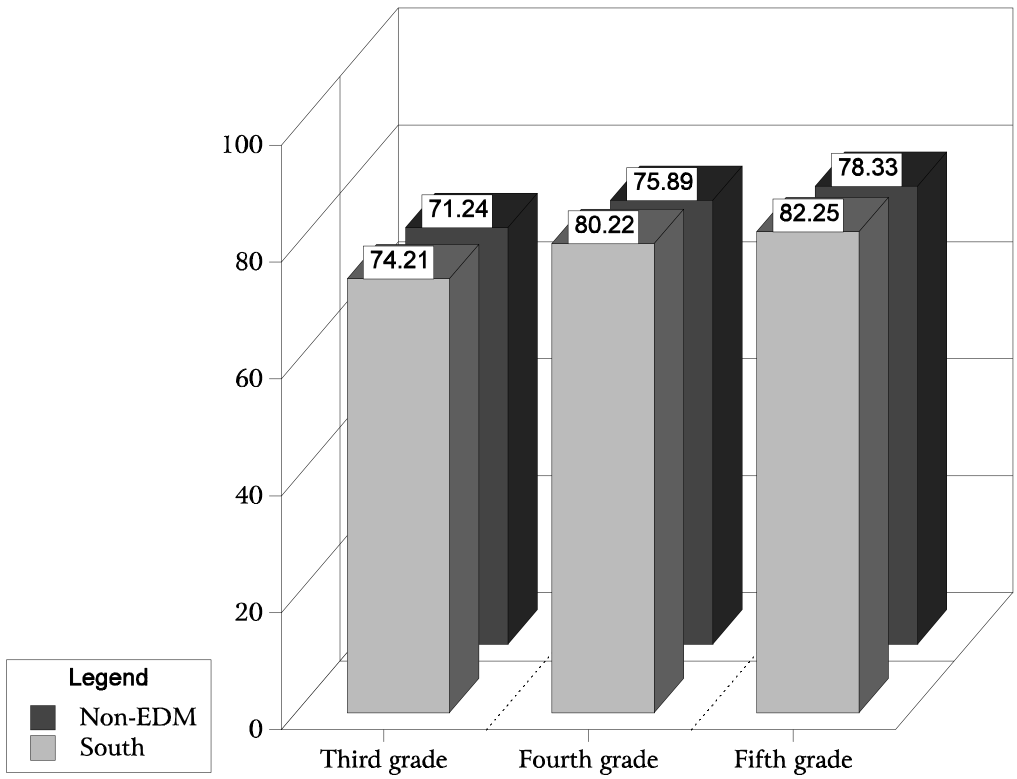


Figure 11. Comparison of the mean 1999 Texas Assessment of Academic Skills mathematics score of the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*) when divided by grade level. EDM = *Everyday Mathematics.*

Mathematics curriculum and those of students taught using the approved curriculum in this North Texas urban school district?

The hypothesis for this question is as follows:

There are no significant differences in the scores in each of the three domains of concepts, operations, and problem solving on the 1999 Texas Assessment of Academic Skills mathematics test of students taught using

Everyday Mathematics and students who were taught using the district-approved curriculum.

This is the null hypothesis and in order to test this the scores on each domain of the Texas Assessment of Academic Skills mathematics test of students taught using the *Everyday Mathematics* curriculum are compared to the scores on each domain of the Texas Assessment of Academic Skills mathematics test of students taught using the district approved curriculum. In order to accomplish this comparison a *t*-test of equality of means was done on the scores of each domain. The data were formed into three additional columns. The first column is the domain "concepts" and is the sum of the scores on objectives 1 through 5 of the Texas Assessment of Academic Skills test. The next column is the domain "operations" and is the sum of the scores on objectives 6 through 9. The third additional column is the domain "problem solving" and is the sum of objectives 10 through 13.

Comparison of All "Everyday Mathematics" Students With All Non-"Everyday Mathematics" Students

The first comparison on scores in each domain of the 1999 Texas Assessment of Academic Skills mathematics test was done with all students in the study. The descriptive statistics are seen in Table 17 and *t*-test results are found in Table 18.

The first *t*-test rejected the null hypothesis. The difference in the scores in the domain of concepts in this study is attributable to something other than chance. The students who were taught by *Everyday Mathematics* curriculum

Table 17

Descriptive Statistics of 1999 Texas Assessment of Academic Skills Mathematic Scores by Domain

Group	*N*	Means	Standard deviation	Standard error means
		Concepts		
Everyday Mathematics	732	17.51	2.55	.09
Non-*Everyday Mathematics*	2,704	16.75	3.11	.06
		Operations		
Everyday Mathematics	732	13.08	2.93	.11
Non-*Everyday Mathematics*	2,704	12.20	3.53	.07
		Problem-solving		
Everyday Mathematics	732	9.73	3.59	.13
Non-*Everyday Mathematics*	2,704	8.63	3.60	.07

Table 18

Results of t-Tests "Everyday Mathematics" Versus Non-"Everyday Mathematics" of Domain Scores of 1999 Texas Assessment of Academic Skills Mathematics Test

Domain	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Concepts	6.056	.000	3,434	.76	.12
Operations	6.283	.000	3,434	.89	.14
Problem solving	7.349	.000	3,434	1.10	.15

Note. The statement of the null hypothesis is: H_o: $t < 1.96$, $\alpha.05$; H_o: $t < 3.291$, $\alpha.001$.

scored .76 of a point higher on average than students who were taught using the district-approved curriculum.

The second *t*-test also rejected the null hypothesis. The difference in the scores in the domain of operations in this study is attributable to something other than chance. The students who were taught by the *Everyday Mathematics* curriculum scored .81 of a point higher on average than students who were taught using the district-approved curriculum.

The third *t*-test again rejected the null hypothesis. The difference in the scores in the domain of problem-solving of the students in this study is attributable to something other than chance. The students who were taught by the *Everyday Mathematics* curriculum scored 1.1 points higher on average than students who were taught using the district-approved curriculum.

Summary of comparison of scores in each domain. In summarizing the results of the three *t*-tests of the domains of the Texas Assessment of Academic Skills test, there are statistically significant differences in the means of the domain scores between the *Everyday Mathematics* students and students taught using the district-approved curriculum. The differences in the means in each domain are found in Table 19. This is graphically displayed in Figure 12.

The differences in means of scores on domains show that the problem-solving domain has a higher difference than the other two domains. All differences are favorable to the students who were taught using the *Everyday Mathematics* curriculum.

Table 19

Summary of the Difference in Mean Domain Scores on 1999 Texas Assessment of Academic Skills Mathematics Test Between "Everyday Mathematics" and Non-"Everyday Mathematics" Students

Class type	Concepts	Operations	Problem-solving
Everyday Mathematics	17.51	13.09	9.73
Non-*Everyday Mathematics*	16.75	12.20	8.63
Difference	.76	.81	1.10

Grade-level breakdown. In order to better understand the differences in the domain scores of the two groups--*Everyday Mathematics* and non-*Everyday Mathematics* students--comparisons were made by each grade level. The Texas Assessment of Academic Skills test is designed to increase in number of problem-solving questions and in difficulty as the grade levels rise. Group statistics for the third grade by domain are found in Table 20 and *t*-test results are given for the third grade by domain in Table 21.

Group statistics for the fourth grade by domain are found in Table 22. Third-grade *t*-test results are displayed by domain in Table 23.

Group statistics for the fifth grade by domain are found in Table 24. Fifth-grade *t*-test results are displayed by domain in Table 25.

These statistics and results show that in every grade level and in each domain the *Everyday Mathematics* students, on an average, scored higher at a

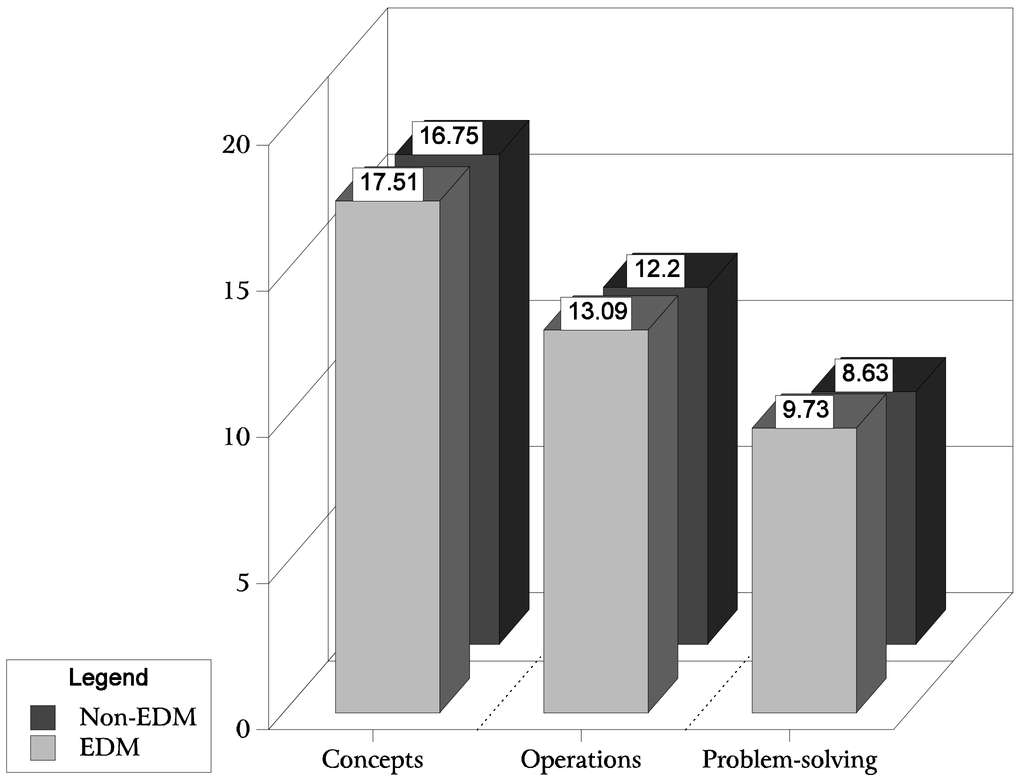


Figure 12. Comparison of the mean scores on the 1999 Texas Assessment of Academic Skills mathematics test when divided by domain between the experimental group (*Everyday Mathematics*) and the control group (non-*Everyday Mathematics*). EDM = *Everyday Mathematics*.

statistically significant level. In each grade level, the problem-solving domain had the greatest difference.

Research Question 4

The final research question is as follows:

What are the relationships between gender, ethnicity, prior mathematics achievement, socioeconomic status, and the curriculum used and the Texas

Table 20

Third-Grade Level Descriptive Statistics by Texas Assessment of Academic Skills Mathematics Domain

	Third grade			
Group	*N*	Means	Standard deviation	Standard error means
		Concepts		
Everyday Mathematics	232	16.97	2.45	.16
Non-*Everyday Mathematics*	1,007	16.47	3.22	.10
		Operations		
Everyday Mathematics	232	12.16	2.86	.19
Non-*Everyday Mathematics*	1,007	11.71	3.41	.11
		Problem-solving		
Everyday Mathematics	232	6.18	1.48	.13
Non-*Everyday Mathematics*	1,007	5.76	1.83	.11

Table 21

The t-Test Results ("Everyday Mathematics" vs. Non-"Everyday Mathematics") of Third grade 1999 Texas Assessment of Academic Skills Domains

Domain	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Concepts	2.209	.020	1,237	.50	.23
Operations	1.879	.060	1,237	.45	.24
Problem-solving	3.259	.001	1,237	.42	.13

Note. The statement of the null hypothesis is: H_o: $t < 1.645$, α.05; H_o: $t < 3.291$, α.001.

Table 22

Fourth-Grade Level Descriptive Statistics by Texas Assessment of Academic Skills Mathematics Domain

Group	Fourth grade *N*	Means	Standard deviation	Standard error means
		Concepts		
Everyday Mathematics	316	17.88	2.52	.14
Non-*Everyday Mathematics*	845	17.06	3.00	.12
		Operations		
Everyday Mathematics	316	13.42	3.05	.17
Non-*Everyday Mathematics*	845	12.37	3.67	.13
		Problem-solving		
Everyday Mathematics	316	10.88	2.86	.16
Non-*Everyday Mathematics*	845	9.90	3.14	.11

Table 23

The t-Test Results ("Everyday Mathematics" vs. Non-"Everyday Mathematics") of Fourth Grade 1999 Texas Assessment of Academic Skills Domains

Domain	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Concepts	4.306	.000	1,237	.82	.19
Operations	4.563	.000	1,237	1.06	.23
Problem-solving	4.851	.000	1,237	.98	.20

Note. The statement of the null hypothesis is: H_o: $t < 1.645$, $\alpha .05$; H_o: $t < 3.291$, $\alpha .001$.

Table 24

Fifth-Grade Level Descriptive Statistics by Texas Assessment of Academic Skills Mathematics Domain

Group	Fifth grade			
	N	Means	Standard deviation	Standard error means
	Concepts			
Everyday Mathematics	184	17.56	2.60	.19
Non-*Everyday Mathematics*	852	16.78	3.06	.10
	Operations			
Everyday Mathematics	184	13.70	2.53	.16
Non-*Everyday Mathematics*	852	12.61	3.48	.11
	Problem-solving			
Everyday Mathematics	184	12.24	3.18	.23
Non-*Everyday Mathematics*	852	10.77	3.40	.12

Table 25

The t-Test Results ("Everyday Mathematics" vs. Non-"Everyday Mathematics") of Fifth Grade 1999 Texas Assessment of Academic Skills Mathematics Domains

Domain	*t*	Significance (2-tailed)	*df*	Mean difference	Standard error difference
Concepts	3.211	.001	1,034	.78	.24
Operations	4.014	.000	1,034	1.09	.27
Problem-solving	3.771	.000	1,034	1.48	.27

Note. The statement of the null hypothesis is: H_o: $t < 1.645$, α.05; H_o: $t < 3.291$, α.001.

Achievement of Academic Skills mathematic scores of third-, fourth-, and fifth-grade students in a large North Texas urban school district?

The previously stated hypothesis was as follows:

There is no statistically significant correlation between the type of mathematics curriculum used in the classroom in combination with ethnicity, socioeconomic status, gender, and prior mathematics ability and the Texas Assessment of Academic Skills mathematic scores of students in a large North Texas urban school district.

In order to test this hypothesis, a multiple regression model was developed. This question was posed to analyze the relationship in the variables that tend to make a difference in student achievement. The variables of ethnicity, socioeconomic status, gender, and prior mathematics ability were unchangeable. The changeable variable was the type of curriculum by which the student was taught.

Multiple Linear Regression Model

The multiple linear regression model outcomes on a criterion variable are predicted using multiple predictor variables. For this study the model has mathematics score on the Texas Assessment of Academic Skills as the outcome or criterion variable. The predictor variables are the type of mathematics curriculum that was taught, prior mathematics ability, gender, ethnicity, and socioeconomic status. The equation for this is: $Y = B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + a$, with Y being the predicted Texas Assessment of Academic Skills mathematics score, *B* being the regression coefficient, *X* being the variable, and *a* being the regression constant.

The initial step in the regression model is determining the correlation coefficient (R), which is a Pearson product-moment correlation coefficient between the criterion variable and the linear combinations of the predictor variables. From this, a multiple correlation coefficient (R^2) is determined. This is the proportion of the variation in the criterion variable that can be attributed to the variation of the combinations of the predictor variables. A third figure, adjusted R^2, is the multiple correlation coefficient that allows for the number of variables and the number of cases in the study. Because of the relatively low number of variables and the high number of cases, the adjusted R^2 should be very close to the R^2. For this model the R, R^2, and adjusted R^2 are shown in Table 26.

Table 26

Model Summary

Model	R	R^2	Adjusted R^2	Standard error of the estimate
1	.679	.461	.459	10.48

Note. Predictors: (constant), 1998 Iowa Test of Basic Skills mathematics score, mathematics class type, gender, ethnicity, and socioeconomic status. Criterion variable: 1999 Texas Assessment of Academic Skills mathematics score.

It can be said, therefore, that approximately 46% of the variation in the students' Texas Assessment of Academic Skills scores of these students can be attributed to the combination of students' ethnicity, the mathematics curriculum by which they were taught, the gender, the socioeconomic status, and the students' prior mathematics ability. As anticipated, there was insignificant difference between the R^2 and the adjusted R^2 values.

Next, it was necessary to determine whether the multiple R value was statistically significant. In a test of the null hypothesis that the R of the population equals zero, the F distribution was the test statistic. The critical value for F for 8 and 3,427 degrees of freedom is 4.86 at the .01 level of significance. The test resulted in the statistics shown in Table 27.

Table 27

F Value of the Regression Model

Model 1	Sum of squares	*Df*	Mean square	*F*	Significance
Regression	321,568.923	8	40,196.115	365.899	.000
Residual	376,476.187	3,427	109.856		
Total	698,045.109	3,435			

Note. Predictors: (constant), 1998 Iowa Test of Basic Skills mathematics score, mathematics class type, gender, ethnicity, and socioeconomic status. Criterion variable: 1999 Texas Assessment of Academic Skills mathematics score.

The *F* value of 365.899 was extremely high and the level of significance was low. This means that the null hypothesis is rejected. It could be stated that $R = .679$ would have occurred by chance if the null hypothesis were true. Therefore, the conclusion can be drawn that there is a significant relationship between the criterion variable, the Texas Assessment of Academic Skills mathematic scores, and the predicator variables and that it is highly unlikely that this relationship is the result of chance.

Next in this regression model, the significance of the predictor variables should be determined. In this analysis the *B* coefficient was significant at the .001 level if the *t* value was greater than 3.4. The results of the test for determining the significance of the predictor variables are seen in Table 28.

Table 28

B Values for the Predictor Variables

Model 1	*B*	Standard error	*t*	Significance
Constant	59.795	.687	87.022	.000
Gender	(1.234)	.358	(3.444)	.001
African-American	(3.921)	.534	(7.336)	.000
Hispanic	.688	.596	1.153	.249
Asian	1.151	1.474	.781	.435
Native-American Indian	(.474)	2.447	(.194)	.846
Everyday Mathematics	3.849	.438	8.784	.000
Socioeconomic status	1.788	.457	3.915	.000
ITBS	.307	.007	45.961	.000

Note. ITBS = Iowa Test of Basic Skills. Dependant variable: 1999 Texas Assessment of Academic Skills mathematics score.

As shown in Table 28, it can be said that gender, African-American ethnicity, mathematics curriculum (*Everyday Mathematics*), socioeconomic status, and prior mathematics ability (as measured by the Iowa Test of Basic Skills) are statistically significant contributors to the 1999 Texas Assessment of Academic Skills mathematic scores. The ethnic designations of Hispanic, Asian, and Native-American Indian do not have significant differences, which cannot be attributed to chance. Thus, it can be said that in the population, the correlation between the criterion variable, the 1999 Texas Assessment of Academic Skills mathematics score, and each of the predictor variables of gender, African-American ethnicity, mathematics curriculum (*Everyday Mathematics*), socioeconomic status, and prior mathematics ability (1998 Iowa Test of Basic Skills mathematics score) was different from zero.

The constant is an Anglo female of low socioeconomic status. In order to predict a score on the Texas Assessment of Academic Skills test, one could use the formula: Y = -(1.234)(Gender, 1 for male, 0 for female) + -(3.921)(1 for African-American, 0 for all others) + 3.849 (1 for an *Everyday Mathematics* student, 0 for a non-*Everyday Mathematics* student) + 1.788 (1 for other socioeconomic status, 0 for low socioeconomic status) + .307 (the 1998 Iowa Test of Basic Skills mathematics score) + 59.795 (which is the constant), Y would then be the predicted score of the person.

This regression model can be used to predict future performance on the Texas Assessment of Academic Skills mathematics test. However, it is also useful to determine the difference that some factors would make in the performance of the Texas Assessment of Academic Skills mathematics test. Being of African-American ethnicity in this model has a significant impact on the achievement of students. Second only to that, the mathematics curriculum used is correlated to student achievement as measured by the Texas Assessment of Academic Skills mathematics test. Socioeconomic status and gender make a difference, with low socioeconomic status students having lower achievement than other socioeconomic status students and males doing poorer than females.

The regression model can also help in understanding the students who can be helped by the use of different mathematics curricula. It is shown in this analysis that the effect of the use of the *Everyday Mathematics* curriculum can almost overcome the deficit with which African-American students begin, compared to students of other ethnic designation. It more than makes up for the difference in mathematic scores of low socioeconomic students when compared to those of other students.

Summary of Analysis of Data

With the amount of data accumulated, there was the possibility of overanalyzing. However, the tests of data conducted were in line with the research questions and hypotheses presented. This analysis viewed the data as a whole in the multiple regression model and examined the difference in the students through the various *t*-tests.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, RECCOMENDATIONS, AND SUGGESTIONS FOR FURTHER STUDIES

The purpose of this study was to examine the use of a *Standards*-based mathematics curriculum and its effects on student achievement. It attempted to determine whether or not *Everyday Mathematics* is more effective in improving student achievement than the approved curriculum that was being taught in a large North Texas urban school district. This study attempted to gather information about effective methods and programs for teaching mathematics. It also compared the two types of mathematics curricula--one based on national mathematics standards and one based on a traditional method of teaching mathematics. This should provide information about the relationship between student achievement and the application of national standards to classroom material and practices for mathematics.

Summary of the Study

The process of this study began with the identification of students in the third, fourth, and fifth grades in a large North Texas urban school district who had been taught during the 1998-99 school year using the *Everyday Mathematics* curriculum. A group of comparison students was also formed who were similar to the *Everyday Mathematics* students in grade level, ethnicity, socioeconomic status, and prior mathematics ability. These students were taught during the 1998-99 school year using the district-approved curriculum. Prior mathematics ability was measured by the mathematics score on the April 1998 administration of the Iowa Test of Basic Skills.

The mathematic scores on the April 1998 Iowa Test of Basic Skills were compared between the two groups. This was important to establish that the two groups were fairly equal in mathematics ability at the beginning of the 1998-99 school year. The mean score on the Iowa Test of Basic Skills mathematics section for *Everyday Mathematics* students was 55.89, and the mean score for students who were taught with the district-approved curriculum was 55.94. These are almost identical, and when a test of equality of means was conducted, there was no statistically significant difference. By this measure, these two groups began the 1998-99 school year with an equal mathematical ability.

Data were gathered on the students from the school district's central database. The information included grade level, gender, ethnicity, socioeconomic status, school identification number, 1998 Iowa Test of Basic Skills score in mathematics, and 1999 Texas Assessment of Academic Skills mathematics score (broken down by the 13 objectives and the total mathematics score).

The 1999 Texas Assessment of Academic Skills matheamtics score was the outcome measurement. This test is a criterion-referenced test that measures a student's mastery of the expected learning during the school year.

The Texas Assessment of Academic Skills test is aligned with the Texas Essentials of Knowledge and Skills, a set of learning objectives developed by the Texas Education Agency for each grade level and subject area.

The analysis of data centered on a comparison of the1999 Texas Assessment of Academic Skills mathematic scores of students taught using the *Everyday Mathematics* program to the 1999 Texas Assessment of Academic mathematic scores of students taught using the district-approved curriculum. A multiple regression model was formed, with ethnicity, gender, socioeconomic status, prior mathematics ability, and type of mathematics curriculum used as the predictor variables. The 1999 total mathematics score on the 1999 Texas Assessment of Academic Skills test was the criterion variable. Comparisons were made between groups of students in relationship to the three domains of the Texas Assessment of Academic Skills test, grade level, gender, ethnicity, and socioeconomic status.

Findings

The findings of this study are presented by the research questions. The statistical tests used were matched to the question and the data used in each of the test from the same data set for this study.

Research Question 1

Are there significant differences between the mathematics scores on the Texas Assessment of Academic Skills test of students who have been taught using the *Everyday Mathematics* curriculum and those of students taught using the approved curriculum in a North Texas urban school district?

A *t*-test of equality of means, an independent sample comparison of means, was conducted using the 1999 Texas Assessment of Academic Skills scores as the test variable and the class type, *Everyday Mathematics* or non-*Everyday Mathematics,* as the grouping variable. The result rejected the null hypothesis. Therefore, there is a significant difference between the scores on the 1999 Texas Assessment of Academic Skills matheamtics scores of students taught using the *Everyday Mathematics* curriculum and the 1999 Texas Assessment of Academic Skills mathematics score of students taught using the district-approved curriculum. The students in the *Everyday Mathematics* classes scored an average of 3.9 points higher on the Texas Assessment of Academic Skills mathematics test.

When the data are viewed by percentage of students who passed the test, the figures are more impressive. Students in this study who were taught using the district-approved curriculum passed the Texas Assessment of Academic Skills mathematics test at the rate of 72.3%, whereas 81.4% of *Everyday Mathematics* students passed the Texas Assessment of Academic Skills mathematics test. This means that, in this study, over 9% more students passed the state's high-stakes test when in classes taught by the *Standards*-based curriculum.

In 1999 schools were deemed low performing if 50% of the student population failed any portion of the Texas Assessment of Academic Skills test. Thus, to have an increase of 9% on a section of the test is highly significant.

Research Question 2

Are there significant differences in the mathematic scores on the Texas Assessment of Academic Skills when groups (*Everyday Mathematics* students vs. non-*Everyday Mathematics* students) are examined with regard to ethnicity, gender, socioeconomic status, and grade level?

To answer this question, a series of *t*-tests were conducted. The 1999 Texas Assessment of Academic Skills mathematic scores of African-American *Everyday Mathematics* students were compared to the scores of African-American students who were taught using the district-approved mathematics curriculum. *Everyday Mathematics* Anglo students were compared to non-*Everyday Mathematics* Anglo students, Hispanics to Hispanics, males to males, and females to females. Comparisons were made among high socioeconomic students, low socioeconomic students, third graders, fourth graders, and fifth graders.

The first comparison for examinination was between African-American students who were taught with the *Everyday Mathematics* program and African-American students taught by the district-approved curriculum. There was a statistically significant difference between the Texas Assessment of Academic Skills scores of these two groups. The *Everyday Mathematics* students had an average score of 76.11, whereas the non-*Everyday Mathematics* students had an average score of 70.75.

Although the difference in average score of 5.36 is significant, when viewed in terms of the percentage of students who passed the mathematics section of the Texas Assessment of Academic Skills test, the results are more impressive. The African-American students in this study who were taught using *Everyday Mathematics* passed at the rate of 74.7%. The African-American students in this study who were taught using the district approved curriculum passed at a rate of 62.2%. This is a difference of 12.5%. Again, with the knowledge that this Texas high-stakes test determines the ranking among Texas public schools, this increase is important.

The second comparison in this study was between Anglo students. There was a statistically significant difference between the Texas Assessment of Academic Skills mathematic scores of Anglo students who were taught with the *Everyday Mathematics* program and the Texas Assessment of Academic Skills mathematic scores of Anglo students taught by the district-approved curriculum. The *Everyday Mathematics* students had an average score of 84.91, whereas the non-*Everyday Mathematics* students had an average score of 81.31. When converted into the percentage of students that passed the Texas Assessment of Academic Skills test, 96.2% of students taught with the *Standards*-based mathematics passed, and 86.3% of students taught with the more traditional math passed. This is an difference of 9.9% of students who passed the Texas Assessment of Academic Skills mathematics test when taught using *Everyday Mathematics*.

The next comparison of Texas Assessment of Academic Skills mathematic scores was between Hispanic students in the study. This *t*-test of equality of means showed no statistically significant difference between Hispanic students taught by teachers using *Everyday Mathematics* and Hispanic students taught by the district-approved curriculum. In this study only a 0.1% difference existed between the Hispanic students who passed the mathematics section of the Texas Assessment of Academic Skills test, with 81.3% of *Everyday Mathematics* students and 81.2% of non-*Everyday Mathematics* students obtaining passing scores.

The two other ethnic groups, Native-American Indians and Asians, had numbers of students that were too small to compare. These two groups have small representations in the district.

The scores of students divided by gender were also compared. The Texas Assessment of Academic Skills mathematic scores of girls in this study taught with *Everyday Mathematics* were compared to the scores of girls taught with the district-approved curriculum. The differences in the scores using a *t*-test were statistically significant. The *Everyday Mathematics* female students averaged 78.92, and the non-*Everyday Mathematics* students averaged 75.57, a difference of 3.35 points. The percentage of *Everyday Mathematics* female students who passed the 1999 Texas Assessment of Academic Skills mathematics test was

81%. Females who were taught with the district-approved curriculum passed at a rate of 73.5%. This is a difference of 7.5%.

Similarly, the scores of male students in this study were compared. A statistically significant difference existed between the means of the 1999 mathematic scores of males who were taught using the *Everyday Mathematics* curriculum and males taught with the district approved curriculum. The *Everyday Mathematics* male students averaged 78.71, and the non-*Everyday Mathematics* male students averaged 74.26, with a difference of 3.45 points. When converted into the percentage of students who passed the Texas Assessment of Academic Skills test, 81.8% of the males in this study taught with the *Standards*-based mathematics passed, and 71.0% of the males taught with the more traditional mathematics passed. This is a difference of 10.8%.

Next compared were the scores of students divided into groups by socioeconomic status. The Texas Assessment of Academic Skills mathematic scores of students of low socioeconomic status taught with *Everyday Mathematics* were compared with the scores of students of low socioeconomic status taught with the district-approved curriculum. The differences in the scores using a *t*-test were statistically significant. The *Everyday Mathematics* students averaged 76.55, and the non-*Everyday Mathematics* students averaged 72.35, a difference of 4.2 points.

The percentage of *Everyday Mathematics* students of low socioeconomic status who passed the 1999 Texas Assessment of Academic Skills mathematics test was 75.8%. Students of low socioeconomic status who were taught with the district-approved curriculum passed at a rate of 66.2%. In the low socioeconomic group who were taught with the *Standards*-based curriculum, 9.6% more students passed the Texas Assessment of Academic Skills mathematics test in 1999.

Similarly, the scores of students of other socioeconomic status (those not qualified for free or reduced-price lunch) were compared. A statistically significant difference was found between the means of the 1999 mathematic scores of other socioeconomic students who were taught using the *Everyday Mathematics* curriculum and those taught with the district-approved curriculum. The *Everyday Mathematics* students averaged 82.73, and the non-*Everyday Mathematics* students averaged 80.65, with a difference of 2.08.

The percentage of *Everyday Mathematics* students of other socioeconomic status who passed the 1999 Texas Assessment of Academic Skills mathematics test was 91.1%. Students of other socioeconomic status who were taught with the district-approved curriculum passed at a rate of 85.8%, with 5.3% more students passing.

When scores were compared by grade levels, *Everyday Mathematics* students versus non-*Everyday Mathematics* students, statistically significant differences were found in the third, fourth, and fifth grades. When the differences are viewed in terms of the percentage of students who passed the Texas Assessment of Academic Skills mathematics test, the results revealed the following: in the third grade, 70.7% of the *Everyday Mathematics* students passed, whereas 65.1% of the non-*Everyday Mathematics* students passed, a difference of 5.6%, in the fourth grade. There was a 9.7% difference in the number of *Everyday Mathematics* students passing the 1999 mathematics portion of the Texas Assessment of Academic Skills test. *Everyday Mathematics* students passed at a rate of 85.4%, whereas non-*Everyday Mathematics* students passed at a rate of 74.7%. The percentage of fifth-grade *Everyday Mathematics* students who passed the test was 88.0%, and the percentage of non-*Everyday Mathematics* students who passed the test was 78.4%. Students in this study taught with *Everyday Mathematics* had a 9.6% higher passing rate.

Research Question 3

Are there significant differences between the mathematics scores in each domain (concepts, operations, and problem-solving) of the Texas Assessment of Academic Skills of students who have been taught using the *Everyday Mathematics* curriculum and those of students taught using the approved curriculum in a North Texas urban school district?

In order to answer this question, the data had to first to be arranged into the domains of the Texas Assessment of Academic Skills test. The results of the Texas Assessment of Academic Skills test are reported by individual objectives and by a total score. The 13 individual objectives are grouped into three domains--concepts, operations, and problem-solving. The scores of the two groups in these domains were compared using an independent sample *t*-test of equality of means.

The results of the comparison of means showed that there were statistically significant differences in the two sets of scores. The students in this study who were taught using the *Everyday Mathematics* curriculum had higher scores in all three domains. Each grade level had a different number of questions and levels of mastery in the three domains of the Texas Assessment of Academic Skills mathematics test. This was a factor that needed to be considered. To do this, the groups were divided by grade level, which were then subjected to analysis by *t*-tests. The results of these tests showed significant differences in all grade levels and in all domains. Only the third-grade comparison in the domain of operations was not significant at the .05 level.

In all of the domains for all grade levels, the students in this study who were taught using the *Standards*-based mathematics curriculum scored higher than those students who were taught using the district-approved mathematics curriculum. The differences between third-grader scores in the domains were not as great as the differences in the fourth- and fifth-grader scores.

Research Question 4

What are the relationships between gender, ethnicity, prior achievement, socioeconomic status, and the curriculum used and the Texas Assessment of Academic Skills mathematic scores of third-, fourth-, and fifth-grade students in this large North Texas urban school district?

This question was answered by creating a multiple regression model with the data. The predictor variables were--the different ethnic designations represented in the district, gender, socioeconomic status, the type of class (*Everyday Mathematics* or the district-approved curriculum), and prior mathematics ability. The criterion variable was the total Texas Assessment of Academic Skills mathematics test score.

This model revealed that the predictor variable accounted for 46% of the variance in the Texas Assessment of Academic Skills mathematics test scores. Although prior mathematics ability was an important factor, the factors of African-American ethnicity and type of classroom were significant factors in the Texas Assessment of Academic Skills mathematic scores. Socioeconomic status and gender were statistically significant factors but to a lesser extent than the previous two predictor variables.

Three variables showed little significance as predictor variables. The two groups of Native-American Indians and Asians had an insufficient number of cases to be measured. The Hispanic ethnicity had no difference in the mean scores on the Texas Assessment of Academic Skills test to be a significant enough factor in the multiple regression model.

This analysis of data shows that there is a significant relationship between the 1999 Texas Assessment of Academic Skills mathematic scores of the students in this study and the type of mathematics curriculum used, regardless of whether the student was African-American or not, and regardless of gender, socioeconomic status, and prior mathematics ability. These factors, when combined, account for about half of the variance in the Texas Assessment of Academic Skills mathematic scores.

Conclusions

The analysis of the data gathered in this study shows that the use of *Everyday Mathematics* by the third-, fourth-, and fifth-grade students in a large North Texas urban school district can produce a higher level of student mathematics achievement as measured by the state high-stakes test of student mastery of academic skills and knowledge. In all student categories of Anglo, African-American, male, female, low socioeconomic status, high socioeconomic status, third grade, fourth grade, and fifth grade, there is a difference in student achievement as measured by the 1999 Texas Assessment of Academic Skills mathematics test. The single group that did not show a significant difference was Hispanic students.

It is significant that this study found no difference in the Texas Assessment of Academic Skills mathematic scores of Hispanic students. Hispanic students make up approximately 50% of the students in this large North Texas urban school district. Over one-half of these students are identified as speakers of other languages (Dallas Public Schools, 1999). Because the *Standards*-based mathematics curriculum is word rich, it is possible that language barriers slow student progress in achievement when *Everyday Mathematics* is used. It is important to recognize that while *Everyday Mathematics* did not help Hispanic students, it did not decrease student achievement in this ethnic group.

Recommendations

This study examined students that were in a pilot program of the Urban Systemic Initiative in a large North Texas urban school district. A recommendation based on this study is that the *Everyday Mathematics* program be extended to other schools. The significant positive differences in the Texas Assessment of Academic Skills mathematic scores should lead the district to widely expand the use of this *Standards*-based curriculum to many other elementary schools.

The positive significant differences in student achievement seen in the African-American students and low socioeconomic students should further encourage schools that have a large segment of student population of these students to immediately implement *Everyday Mathematics*. Both African-American students and low socioeconomic students tend to have lower scores on standardized achievement tests. The use of *Everyday Mathematics* in this study brings both of these student populations greater gains in student achievement than other specific groups. The use of Title 1 funds can easily be justified in the use of a curriculum that is shown to help minority and socioeconomic disadvantaged students gain ground in student achievement.

It is recommended that the information from this study should be distributed district wide. Principals who choose to initiate the *Everyday Mathematics* program in their schools need to budget in the spring for the training and materials necessary for the coming school year. Principals also need information workshops that could include advice from principals who have already initiated the use of this *Standards*-based mathematics curriculum in their school.

Suggestions for Further Studies

Following the recommendations of this study, further studies are needed to demonstrate the effectiveness of *Everyday Mathematics* in increasing student mathematic achievement. One of the suggested studies would be a comparison of randomly selected schools that would implement the *Standards*-based mathematics curriculum. This future study would add generalizability to the district and add power in terms of statistics. A study of this kind could clarify the deficiencies of this study, overcoming its limitations.

It is also suggested that a study of Hispanic students be conducted to understand what would be effective in improving student achievement. A study of different mathematics curricula, different classroom pedagogues, or staffing patterns might help to explain the findings of this study. It is also recommended that teachers of students who are identified as speakers of other languages be provided with training in implementing English as a second language strategies for mathematics.

The students in this study who have been identified as *Everyday Mathematics* students and non-*Everyday Mathematics* students can be involved in a longitudinal study. It is now possible to study the further progress of these students through future years. It is possible that students could move from school to school, in and out of *Standards*-based programs. The further effects of mathematical programs on the achievement of these students can increase our understanding of mathematics learning.

Everyday Mathematics is only 1 of 13 different curricula that have been developed from the National Council of Teachers of Mathematics *Standards*. It is recommended that the other *Standards*-based curricula be piloted in the district. These researched-based, targeted programs are created from the same set of objectives upon which *Everyday Mathematics* was founded.

This study of the effects of *Everyday Mathematics* on student achievement in a large North Texas urban school district has shown that this *Standards*-based curriculum can improve learning. It is only the beginning of a process that, in the end, should result in helping students better know mathematics.

APPENDIX

Checklist and Interview to determine the Mathematics Curriculum used in the classroom

Teacher's Name- ____________________________ Grade Level- ________________

School- ______________________________ Section(s) taught- _________________

_______ Teacher has completed the training in Everyday Mathematics for the grade level taught.

_______ Teacher taught Mathematics to students.

_______ Teacher had access to complete Teacher Resource Kit.

_______ Students received student material, journal and workbook for use as a consumable.

_______ Students had access to manipulatives used in math activities suggested by Everyday Mathematics curriculum.

How long did you teach mathematics each day for each group of students you taught?

What method or methods of assessment did you use to evaluate students?

Did you use other mathematics curriculum in your classroom? _________

If so, what did you use?	What amount of time did you use this material weekly?

_________ Lesson Plans reflect use of Everyday Mathematics

Summary of Changes in Content and Emphasis in *Standards*-based Mathematics

Increased Attention

Problem Solving

- Pursuing open-ended problems and extended problem-solving projects
- Investigating and formulating questions from problem situations
- Representing situations verbally, numerically, graphically, geometrically or symbolically

Communications

- Discussing, writing, reading, and listening to mathematical ideas

Reasoning

- Reasoning in spatial context
- Reasoning with proportions
- Reasoning from graphs
- Reasoning inductively and deductively

Connections

- Connecting mathematics to other subjects and to the world outside the classroom
- Connecting topics within mathematics
- Applying mathematics

Number/Operations/Computation

- Developing number sense
- Developing operation sense
- Creating algorithms and procedures
- Using estimation both in solving problems and checking the reasonableness of results
- Exploring relationships among representations of, and operations on whole numbers, fractions, decimals, integers, and rational numbers
- Develop an understanding of ratios, proportions, and percent

Patterns and Functions

- Identifying and using functional relationships
- Developing and using tables, graphs, and rules to describe situations
- Interpreting among different mathematical representations

Algebra

- Developing an understanding of variables, expressions, and equations
- Using a variety of methods to solve linear equations and informally investigate inequities and nonlinear equations

Statistics

- Using statistical methods to describe, analyze, evaluate, and make decisions

Probability

- Creating experimental and theoretical models of situations involving probabilities

Geometry

- Developing an understanding of geometric objects and relationships
- Using geometry in problem solving

Measurement

- Estimating and using measurement in problem solving

Instructional Practices

- Actively involving students individually and in groups in exploring, conjecturing, analyzing, and applying mathematics in both a mathematical and real-world context
- Using appropriate technology for computation and exploration
- Using concrete materials
- Being a facilitator of learning
- Assessing learning as an integral part of instruction

Decreased Attention

Problem Solving

- Practicing routine, one-step problems
- Practicing problems categorized by types (e.g., coin problems, age problems)

Communications

- Doing fill-in-the-blank worksheets
- Answering questions that require only yes, no, or a number as responses

Reasoning

- Relying on outside authority (teacher or an answer key)

Connections

- Learning isolated topics
- Developing skills out of context

Number/Operations/Computation

- Memorizing rules and algorithms
- Practicing tedious paper-and pencil computations
- Finding exact forms and answers
- Memorizing procedures, such as cross-multiplication, without understanding
- Practicing rounding numbers out of context

Patterns and Functions

- Topics seldom in the current curriculum

Algebra

- Manipulating symbols
- Memorizing procedures and drilling on equation solving

Statistics

- Memorizing formulas

Probability

- Memorizing formulas

Geometry

- Memorizing geometric vocabulary
- Memorizing facts and relationships

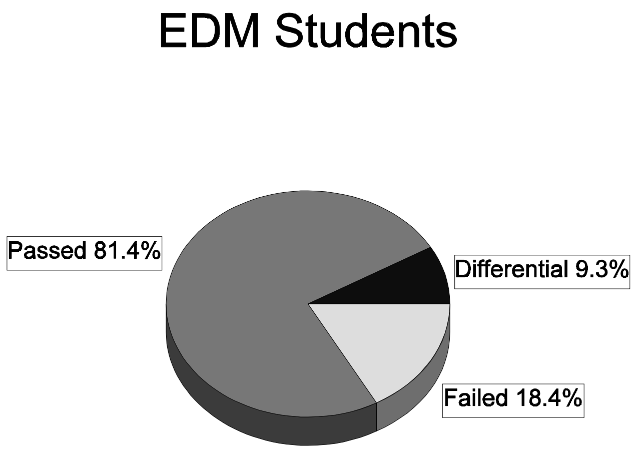
Measurement

- Memorizing and manipulating formulas
- Converting within and between measurement systems

Instructional Practices

- Teaching computations out of context
- Drilling on paper-and-pencil algorithms
- Teaching topics in isolation
- Stressing memorization
- Being the dispenser of knowledge
- Testing for the sole purpose of assigning grades

(National Council of Teachers of Mathematics, 1989, p.70-73)



137*Figure 13.* 1999 Texas Assessment of Academic Skills mathematic results--all *Everyday Mathematics* students. EDM = *Everyday Mathematics.*

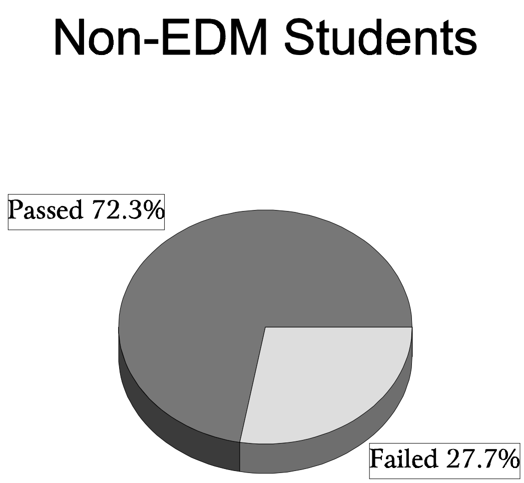


Figure 14. 1999 Texas Assessment of Academic Skills mathematic results--all non-*Everyday Mathematics* students. EDM = *Everyday Mathematics.*

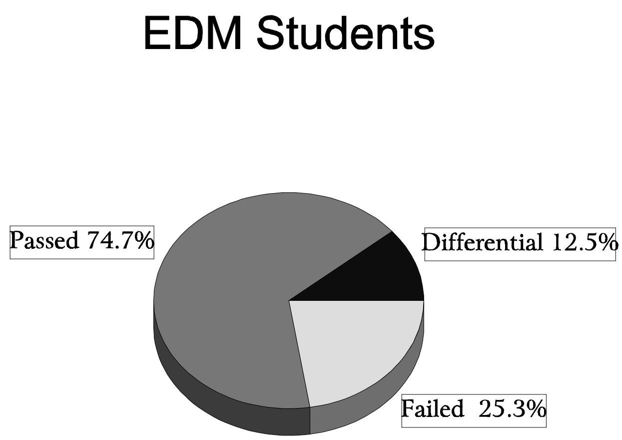


Figure 15. 1999 Texas Assessment of Academic Skills mathematics results--African-American *Everyday Mathematics* students. EDM = *Everyday Mathematics.*

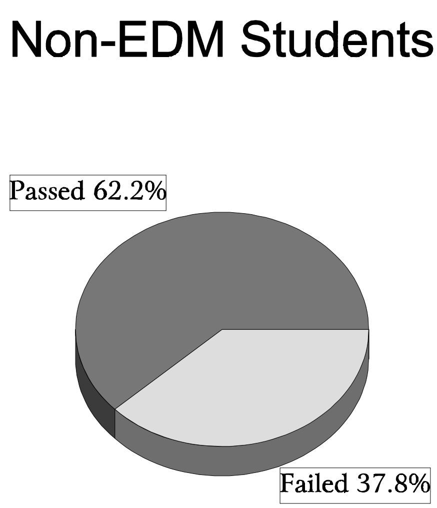


Figure 16. 1999 Texas Assessment of Academic Skills mathematic results--African-American non-*Everyday Mathematics.* EDM = *Everyday Mathematics.*

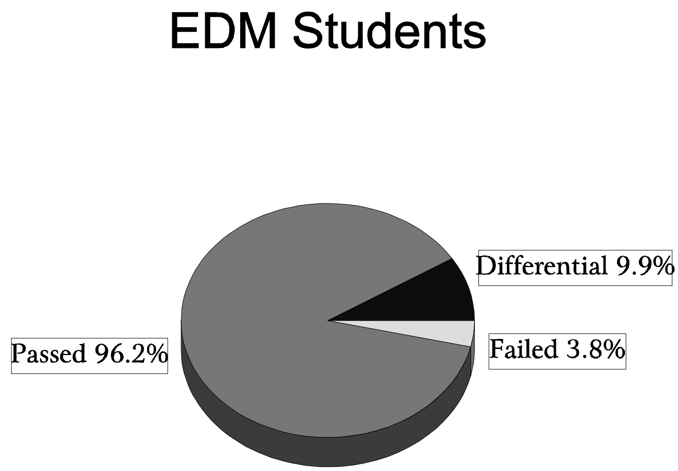


Figure 17. 1999 Texas Assessment of Academic Skills mathematic results--Anglo *Everyday Mathematics* students. EDM = *Everyday Mathematics.*

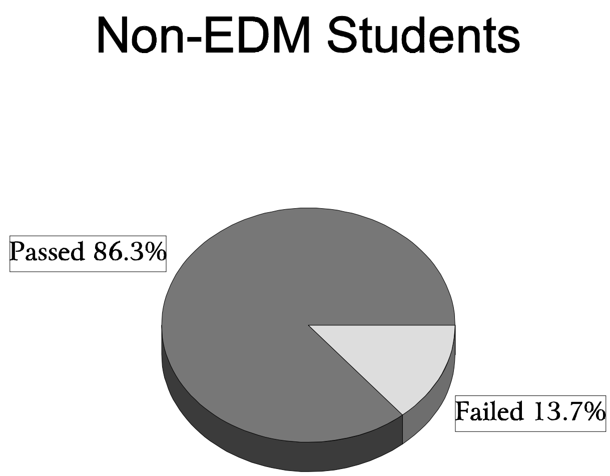


Figure 18. 1999 Texas Assessment of Academic Skills mathematic results--Anglo non-*Everyday Mathematics* students. EDM = *Everyday Mathematics.*

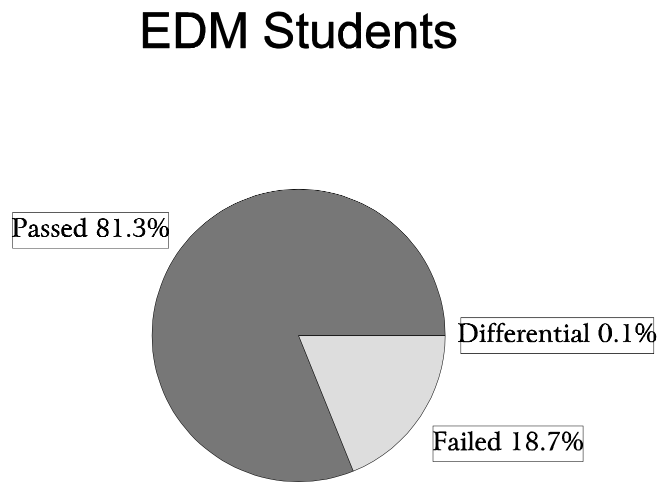


Figure 19. 1999 Texas Assessment of Academic Skills mathematic results--Hispanic *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

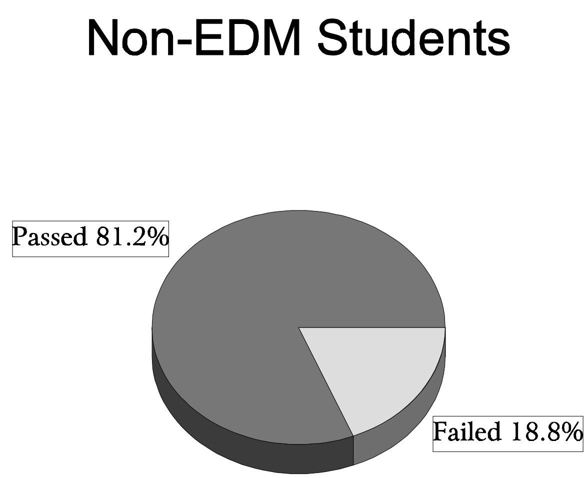


Figure 20. 1999 Texas Assessment of Academic Skills mathematic results--Hispanic *Everyday Mathematics* students. EDM = *Everyday Mathematics.*

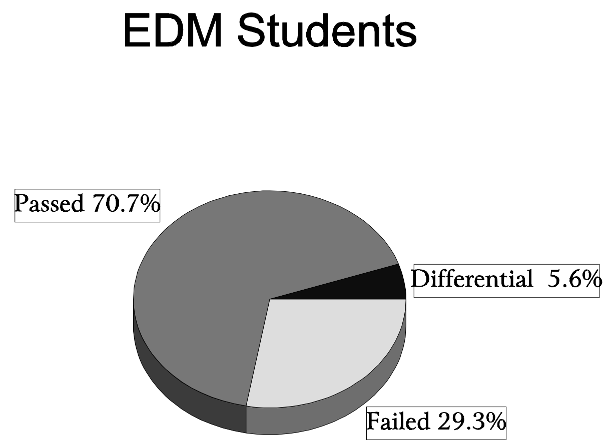


Figure 21. 1999 Texas Assessment of Academic Skills mathematic results--third-grade *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

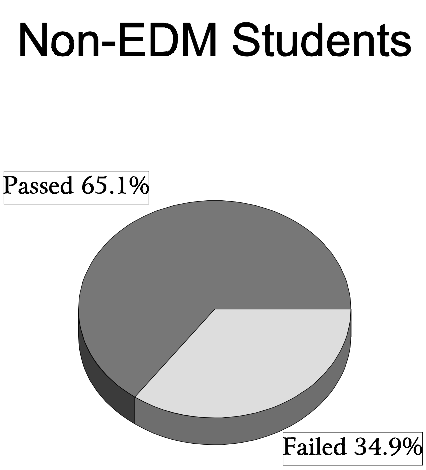


Figure 22. 1999 Texas Assessment of Academic Skills mathematic results--third-grade non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

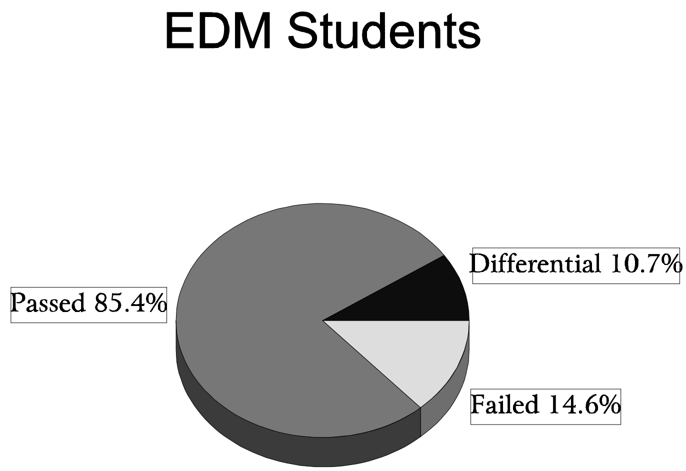


Figure 23. 1999 Texas Assessment of Academic Skills mathematic results--fourth-grade *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

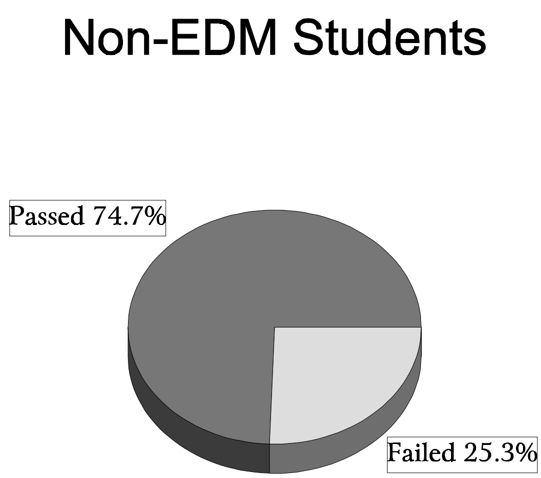


Figure 24. 1999 Texas Assessment of Academic Skills mathematic results--fourth-grade non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

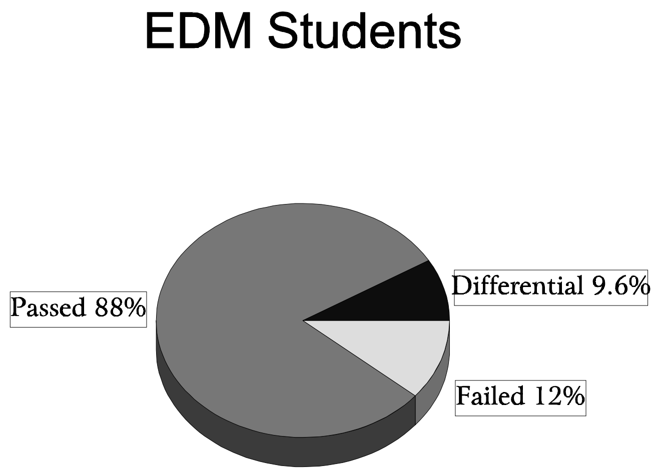


Figure 25. 1999 Texas Assessment of Academic Skills mathematic results--fifth-grade *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

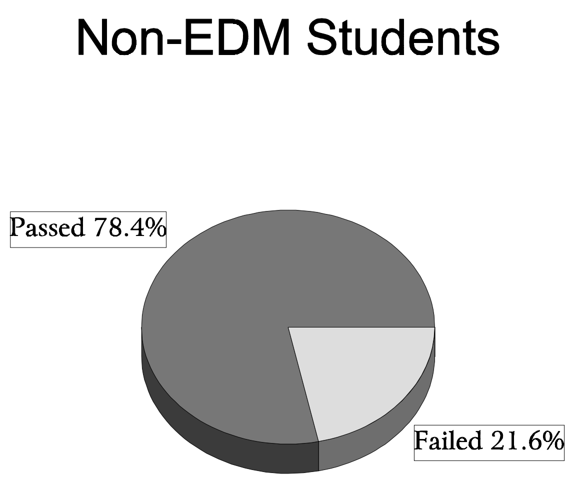


Figure 26. 1999 Texas Assessment of Academic Skills mathematic results--fifth-grade non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

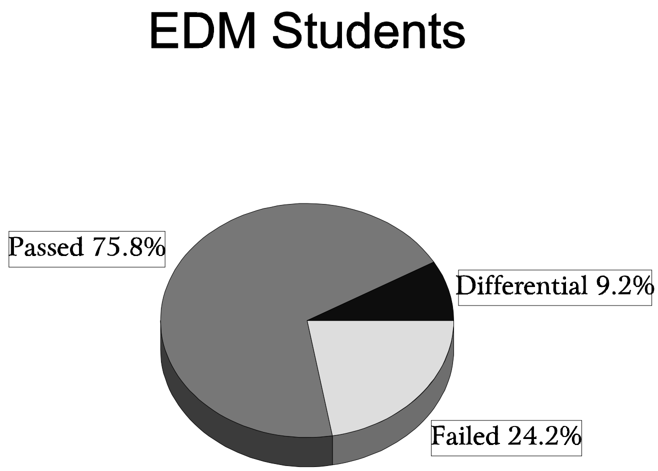


Figure 27. 1999 Texas Assessment of Academic Skills mathematic results--low socioeconomic *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

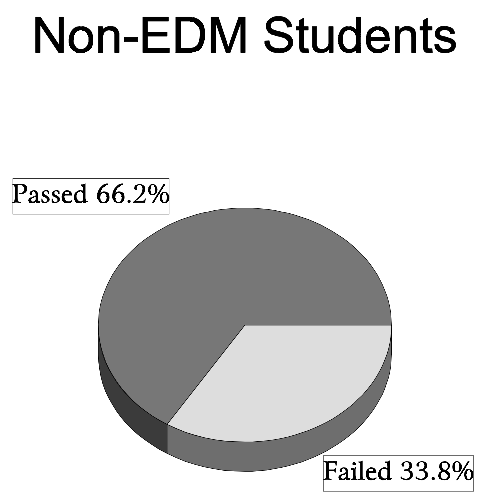


Figure 28. 1999 Texas Assessment of Academic Skills mathematic results--low socioeconomic non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

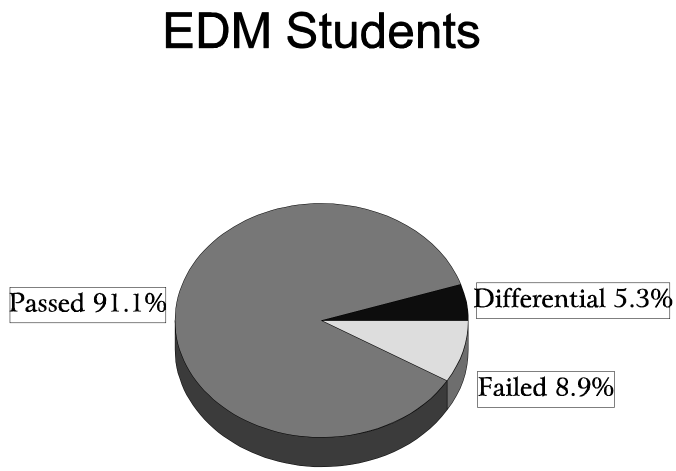


Figure 29. 1999 Texas Assessment of Academic Skills mathematic results--high socioeconomic *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

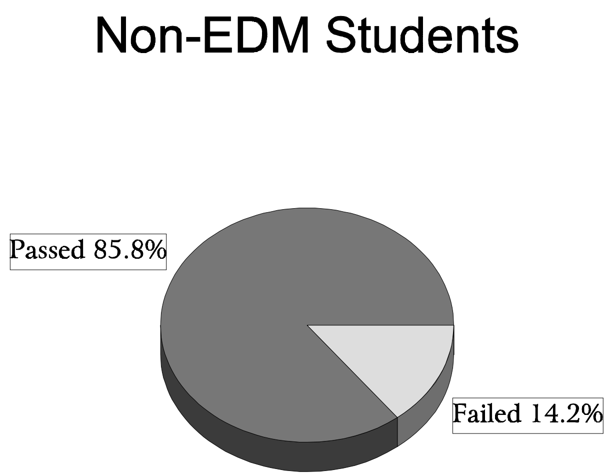


Figure 30. 1999 Texas Assessment of Academic Skills mathematic results--high socioeconomic non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

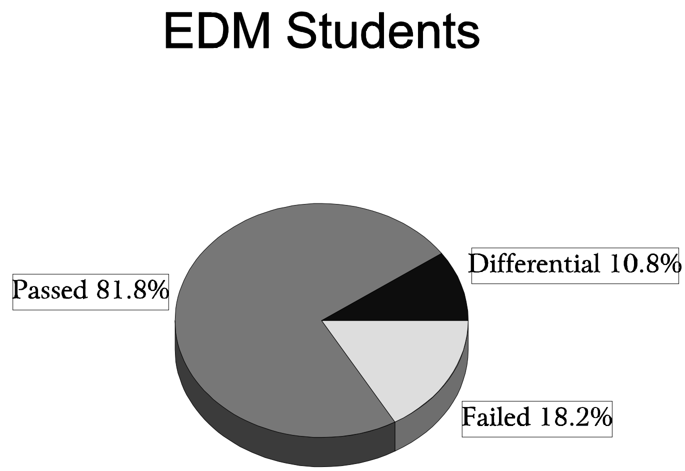


Figure 31. 1999 Texas Assessment of Academic Skills mathematic results--male *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

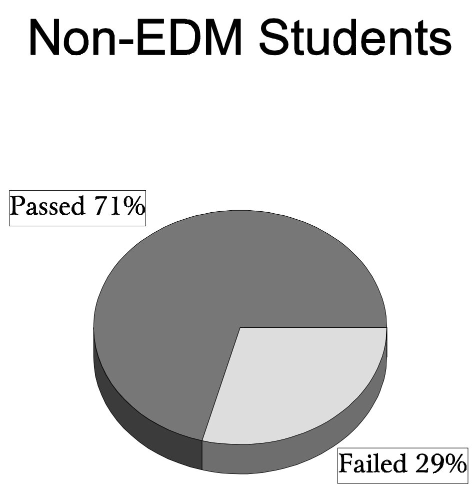


Figure 32. 1999 Texas Assessment of Academic Skills mathematic results--male non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

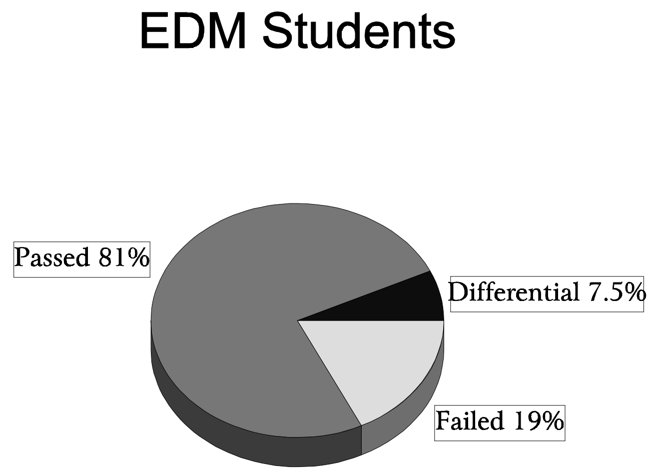


Figure 33. 1999 Texas Assessment of Academic Skills mathematic results--female *Everyday Mathematics* students. EDM = *Everyday Mathematics*.

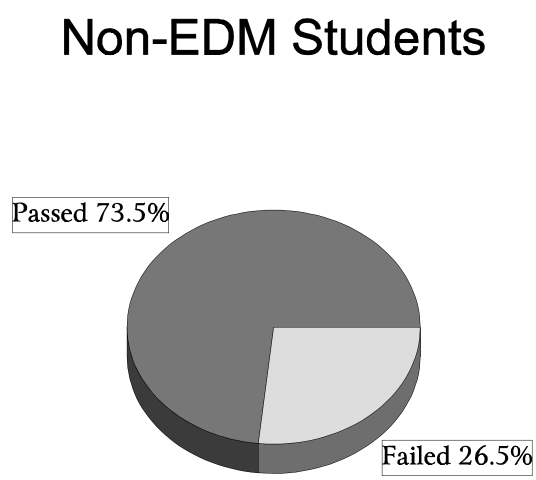


Figure 34. 1999 Texas Assessment of Academic Skills mathematic results--female non-*Everyday Mathematics* students. EDM = *Everyday Mathematics*.

REFERENCES

Baptista, M. T. (1999). The mathematical miseducation of America's youth. *Phi Delta Kappan, 80*(6), 425-433.

Bishop, W. (1999). The California mathematics standards, they're not only right; they're the law. *Phi Delta Kappan, 80*(6), 439-440.

Brandt, R. (2000). *Education in a new era*. Alexandria, VA: Association for Supervision and Curriculum Development.

Briars, D. J. (1999, January). Square one: Promoting systemic math reform. *The School Administrator, 59*(1), 32-36.

Buckeye, D. (1999). *NCTM standards for school mathematics*. Retrieved December 12, 1999 from the World Wide Web: http://www.explorer.scrtec.org/standards.htm

Carroll, W. M. (1996, April). *Mental computational skills of students in a reform mathematics curriculum.* Paper presented at the Annual Meeting of the American Educational Research Association, New York.

Civil, M. (1995, April). *Everyday mathematics, "mathematician's" mathematics, and school mathematics: Can we bring these three together?* Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Clark, A., Gilespie, J., & Kanter, P. (1998). *Everyday counts*. Willington, MA: Houghton Mifflin.

Clements, D. H., Jones, K. W., Moseley, L. G., & Schulman, L. (1999). *Math in my world.* New York: McGraw-Hill.

Clopton, P., Clopton, J., McKeown, E., & McKeown, M. (1998). *Review of mathematics textbooks for Texas adoption.* Education Connection of Texas, San Antonio. Retrieved December 11, 1999 from the World Wide Web: http://www.fastlane.net/-eca/mathreview.html

Colvin, R. L. (1999). Math wars: Traditional versus real-world applications. *The School Administrator, 59*(1), 26-30.

Council of Chief State School Officers. (1997). *Mathematics and science content standards and curriculum framework.* Alexandria, VA: Author.

Dallas Public Schools. (1996). *Core curriculum 1996-97.* A CD-ROM component of district curriculum, K-12. Dallas: Dallas Public Schools, Office of Curriculum and Instruction.

Dallas Public Schools. (1999). *School snapshots 1998-99.* Dallas, TX: Dallas Public Schools, Office of Institutional Research.

Diegmueller, K. (1995). *Goals 2000, standard-based reform.* Retrieved January 2, 2000 from the World Wide Web: http://www.ed.gov/updates/g2k.html

Education Development Center. (1999). Retrieved August, 24, 1999 from the World Wide Web: http://www.edc.org/mcc/curricula.htm

Everyday Learning Corporation. (1999a). *Engaging lessons and expanding learning*. Retrieved December 29, 1999 from the World Wide Web: http://www.everydaylearning.com/Pages/lessons.html

Everyday Learning Corporation. (1999b). *Everyday mathematics*. Retrieved December 29, 1999 from the World Wide Web: http://www.everydaylearning.com

Everyday Learning Corporation. (1999c). *High expectations and enriched content.* Retrieved December 29, 1999 from the World Wide Web: http://www.everydaylearning.com/Pages/content.html

Everyday Learning Corporation. (1999d). *Results of studies of Everyday Mathematics*. Retrieved August 15, 1999 from the World Wide Web: http://www.everydaylearning.com/Pages/results.html

Everyday Learning Corporation. (2000). *Everyday learning 2000*. Chicago: Author.

Fennell, F., Ferrini-Mundy, J., Ginsburg, H., Greenes, C., Murphy, S., & Tate, W. (1999). *Mathematics: Teacher's edition.* Reading, MA: Silver Burdett Ginn.

Finn, C. (1989, April). *Real reform in education*. A speech given before the United States Congress Joint Committee on Education. Washington, DC: Government Printing Office.

Heid, M. K. (1997). The technological revolution and the reform of school mathematics. *American Journal of Education, 106*, 5-61.

Hiebert, J. (1999). Relationships between research and the NCTM standards. *Journal for Research in Mathematics, 30*(1), 3-19.

Hirsch, E. D., Jr. (1996). Disturbing trends in education. *American Educator, 53*(3), 45-47.

Hoffer, A., Johnson, M., Leinward, S., Lodholz, R., Musser, G., & Thoburn, T. (1992). *Mathematics in action.* New York: Macmillan/McGraw-Hill School Publishing.

Hoyles, C., Morgan, C., & Woodhouse, G. (1999). *Rethinking the mathematics curriculum.* London: Falmer Press.

Jamison, A. (1998). *Applying standards to classroom practices*. Paper presented at the meeting of the National Council of Teachers of Mathematics, Dallas, TX.

Lappan, G., Fey, J., Fitzgerald, W., Friel, S., & Phillips, E. (1998). *Connected mathematics*. White Plains, NY: Dale Seymour Publications.

Marzano, R. J., & Kendall, J. S. (1996). *The fall and rise of standards-based education.* A National Association of State Boards of Education issues in brief. Washington, DC: National Association of State Boards of Education.

Masingila, J. O. (1995, April). *Examining students' perceptions of everyday mathematics practice*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Mathematically Correct. (1998, April). *Toward a cease-fire in the math wars.* Retrieved January 2, 2000 from the World Wide Web: http://www.mathematicallycorrect.com/cease.htm

National Commission on Excellence in Education. (1983). *A nation at risk: An imperative for educational reform*. Washington, DC: National Science Foundation, Directorate for Education and Human Resources.

National Council of Teachers of Mathematics. (1989a). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics. (1989b). *New directions for elementary school mathematics.* Reston, VA: Author.

National Council of Teachers of Mathematics. (1990). *Teaching and learning mathematics in the 1990s.* Washington, DC: U. S. Government Printing Office.

National Council of Teachers of Mathematics. (1991). *Professional standards for teaching mathematics.* Reston, VA: Author.

National Council of Teachers of Mathematics. (1995). *Assessment standards for school mathematics.* Reston, VA: Author.

National Council of Teachers of Mathematics. (1999a). Retrieved November 20, 1999 from the World Wide Web: http://www.nctm.org

National Council of Teachers of Mathematics. (1999b). *Missions and goals.* Retrieved December 11, 1999 from the World Wide Web: http://www.nctm.org/about/general.information/Mission.and.Goals.htm

National Education Goals Panel. (1991). *Goals 2000.* National Council on Excellence in Education. Washington, DC: U. S. Government Printing Office.

National Research Council. (1996). *National science education standards.* Washington, DC: National Academy Press.

National Science Foundation. (1988). *The NSF: A brief history.* Washington, DC: National Science Foundation, Directorate for Education and Human Resources.

National Science Foundation. (1994). *Foundations for the future.* Washington, DC: National Science Foundation, Directorate for Education and Human Resources.

National Science Foundation. (1999). Retrieved December, 1999 from the World Wide Web: http://www.nsf.gov

Noddlings, N. (1997). Thinking about standards. *Phi Delta Kappan, 79*(3), 184-189.

Norman, J., Stein, M., Moussiaux, S., & Clay-Chambers, J. (1998). *The effect of the Detroit Urban Systemic Initiative on perceived instructional practices and curriculum adequacy.* Paper presented at the Annual Conference of the National Association for Research in Science Teaching, San Diego, CA.

O'Brien, T. C. (1999). Parrot math. *Phi Delta Kappan, 80*(6), 434-438.

O'Neil, W. (1995). The role of standards in educational reform. *Rethinking Schools, An Urban Education Journal, 14*(8), 8-18.

Perry, P. J. (1997). *Guide to math materials resources to support the NCTM standards.* Englewood, CO: Teacher Idea Press.

Quirk, W. G. (1998). *The truth about the NCTM standards.* Retrieved December 18, 1999 from the World Wide Web: http://www.wgquirk.com/Genmath.html

Ravitch, D. (1995). *National standards in American education: A citizen's guide.* Washington, DC: Brookings.

Resnick, L. B. (1987). *Education and learning to think.* Washington, DC: National Academy Press, National Research Center.

Romberg, T. A. (1995). *Reform in school mathematics and authentic assessment.* Albany: State University of New York Press.

Schneider, D., Adler, S., Beery, R., Ladson-Billings, G., Frenekes, W., McFarland, M., Marker, G., Montgomery, M., Nickell, P., & Travis, C. (1994). *Expectations of excellence: Curriculum standards for social studies.* Washington, DC: National Council for the social studies.

Schoen, H. L., Fey, J. T., Hirsch, C. R., & Coxford, A. F. (1999). Issues and options in the math wars. *Phi Delta Kappan, 80*(6), 444-453.

Silver, J. (1990). *Contributions of research to practice: Applying findings, methods, and perspectives.* Washington, DC: Office of Educational Research and Improvement.

Silver-Burdett-Ginn School Products. (1999). Retrieved December 15, 1999 from the World Wide Web: www.sbgschool.com/products/math.html

SPSS. (1999). *SPSS Base 9.0 application guide.* Chicago: Author.

Steinberg, L. (1996). *Beyond the classroom.* New York: Simon and Schuster.

Stepanek, J. (1997). *Science and mathematics standards in the classroom.* Seattle, WA: Northwest Research and Evaluational Laboratory.

Suydam, M. N. (1990). Curriculum and evaluation standards for mathematics. *ERIC/SNEAC Mathematics Education Digest*. Washington, DC: Office of Educational Research and Improvement.

Texas Education Agency. (1997a). *TAAS technical digest.* Austin: Author.

Texas Education Agency. (1997b). *Texas essentials of knowledge and skills: Learning standards for children.* Austin: Author.

Texas Education Agency. (1998a). *1998 summary of student performance results.* Austin: Author.

Texas Education Agency. (1998b). *TEKS: Learning standards for Texas students.* Austin: Author.

Texas Education Agency. (1999a). *About the student assessment program.* Retrieved December 15, 1999 from the World Wide Web: http://www.tea.state.us/student.assessment/about/overview.htm

Texas Education Agency. (1999b). *1999-2000 educator's guide to TEKS-based assessment.* Austin: Author.

Texas Education Agency. (1999c). *TEA technical guide to TAAS.* Austin: Author.

Texas Education Agency. (1999d). *Textbook inventory.* Austin: Author.

Texas Education Agency. (2000). *State systemic initiative.* Retrieved March 30, 2000 from the World Wide Web: http://www.tea.texas.gov/ssi.html

Texas Education Code. §§ 39.021-39.023 (1995).

Texas Public Policy Foundation. (1999). Texas school districts reject "fuzzy math" textbooks--major defeat for statewide systemic initiative. *Texas Public Policy Update, 3*(24), 1-14.

Texas Teachers of Mathematics. (1998). *Review of math textbooks for the next Texas adoption.* Austin: Author.

The University of Chicago School Mathematics Project. (1997). *Towards a balanced assessment for Everyday Mathematics.* Chicago: Everyday Learning Corporation.

The University of Chicago School Mathematics Project. (1998a). *Everyday mathematics: Math minutes.* Chicago: Everyday Learning Corporation.

The University of Chicago School Mathematics Project. (1998b). *Everyday mathematics: Resource book.* Chicago: Everyday Learning Corporation.

The University of Chicago School Mathematics Project. (1998c). *Everyday mathematics: Teacher's guide and lesson plans.* Chicago: Everyday Learning Corporation.

The University of Chicago School Mathematics Project. (1998d). *Everyday mathematics: Teacher's reference manual.* Chicago: Everyday Learning Corporation.

The University of Chicago School Mathematics Project. (1998e, Fall). Looking back at *Everyday Mathematics*, *Teacher Links, 8*(3). Chicago: Everyday Learning Corporation.

Urban Systemic Program. (1999). Retrieved November 20, 1999 from the World Wide Web: http://www.ehr.nsf.gov/EHR/ESR/usp.asp