THE RELATIONSHIP BETWEEN LEVEL OF IMPLEMENTATION OF THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS' CURRICULUM AND EVALUATION STANDARDS AND 5TH GRADE LOUISIANA EDUCATIONAL ASSESSMENT PROGRAM MATH SCORES

DISSERTATION

Presented to the Graduate Council of the
University of North Texas in Partial
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Gregory A. Jones, B.A., M.A.
Denton, Texas

August, 1996

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This study examined the relationship between levels of implementation of the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards and 5th Grade Louisiana Educational Assessment Program Math Scores with the effects of race of students accounted for. Secondary areas of interest were the relationship between LEAP mathematics scores with the effects of race of students accounted for and the teacher characteristics of years experience and educational attainment and of the relationship between level of implementation of the Standards and teacher characteristics.

The population, from which a sample size of 250 was randomly drawn, was comprised of 1994-95 Louisiana public school teachers who taught in a regular 5th grade or departmentalized math class. Survey research was used to place the responding teachers at one of the five levels of implementation.

Hierarchical Multiple Regression was used to analyze the question of primary interest. Race of the students was found to have accounted for nearly 9% of the variance in LEAP mathematics scores. This figure was statistically significant. The independent variable Level of Implementation of the Standards produced ambiguous results. Students of Level 1 (non-implementers) teachers were found to have statistically significantly higher LEAP scores than did students of Level 2 teachers. The Level 1 students had scores which were non-statistically significantly higher than did those of Level 3 and 5. Students of Level 4 teachers had scores which were significantly higher than those students whose teachers were at Level 2 and 5.

No significant relationship was found to exist between student LEAP mathematics scores and teacher characteristics of years experience and educational attainment nor between levels of implementation of the Standards and the same two teacher characteristics.

Despite these findings, in light of the amount of research pointing to their value, implementation of Standards is still highly recommended.

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CHAPTER I

INTRODUCTION

The National Council of Teachers of Mathematics' Curriculum and Evaluation Standards for School Mathematics were developed as a result of two 1983 conferences convened "in response to the perceived crisis in education" (Romberg, 1993, p. 36). ANation at Risk and Educating Americans for the Twenty-First Century each contained a dozen or so very similar recommendations for the improvement of mathematics education in America.

A draft document was prepared in 1986 by the Commission on Standards for School Mathematics. The commission, with its diverse makeup, formed four working groups; one each for grades K-4, 5-8, 9-12, and one to address evaluation. The draft was developed from a variety of sources: reports, background papers, research reports, curriculum documents, and various calls for reform.

Ten thousand copies of the draft were distributed in 1987. In 1988, after receiving more than 2,000 suggestions from mathematicians, parents, teachers, and business leaders, the commission reconvened to revise the document. In 1989, after further review and editing, it was published (Romberg, 1993).

Frye (1989) said that while the Curriculum and Evaluation Standards for School Mathematics generated much excitement, there were also many questions. Among the most frequent were: What are the Standards? and, Why does NCTM think that the Standards are necessary?

Frey answered the first question as follows:

The Standards are definitive statements about what we value in mathematics education. They describe the criteria for the curriculum of a quality mathematics program, the instructional conditions necessary for mathematics to be learned, and the methods of evaluating students progress and curricular programs. Each curriculum standard for the levels K-4, 5-8, and 9-12 includes the content to be learned, the expected student outcomes, a discussion of the content, and examples that illustrate the particular focus. The evaluation standards describe the methods of gathering evidence to assess both students' performance and mathematics programs. The Standards document is not a list of behavioral or performance objectives, and it is not a series of scope-and-sequence charts. Instead it is the benchmark of a challenging, but achievable, mathematics program for all students (p. 312).

Each standard included three parts. The first was a statement of what mathematics the curriculum should include. The second was a description of student activities associated with that mathematics and last was a discussion that included instructional examples. For example, "Standard 10: Statistics" stated:

In grades 5 - 8, the mathematics curriculum should include exploration of statistics in real-world situations so students can--

- systematically collect, organize, and describe data;
- construct, read, and interpret tables, charts, and graphs;
- make inferences and convincing arguments that are based on data analysis;
- evaluate arguments that are based on data analysis;
- develop an appreciation for statistical methods as powerful means for decision making (NCTM, 1989, p. 105).

"Statistics in real world situations" describes the mathematics the curriculum should include. The five preceeding action statements specified the "expected student activities associated with doing mathematics" (NCTM, 1989, p. 9).

Two general principals guided development of each standard. One was the belief that "activities should grow out of problem situation; and second, learning occurs through active as well as passive involvement with mathematics" (NCTM, 1989, p. 9). "Our ideas about problem situations and learning are reflected in the verbs we use to describe student actions throughout the Standards" (NCTM, 1989, p. 10).

Statement of the Problem

The problem of the proposed study was the identification of the impact of national standards on student achievement.

Purposes of the Study

The primary purpose of the study was to examine the relationship between levels of implementation of the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards and 5th grade Louisiana Educational Assessment Program [LEAP] math scores. A secondary purpose was an examination of the impact of selected teacher characteristics on teachers' implementation of the Standards and on student mathematical achievement.

Rationale

When asked about the necessity of new standards, Frey (1989) said they were a reaction to low standardized math test scores and to the increasing impact technology was having on society as well as the changing workplace. Ravitch (1992) followed this line of thought by stating that "the sources of the impetus for standards were disappointment with U.S. performance in international assessments...." She cited another purpose of standard setting as increased academic achievement for all children. Patrick (1993) added that student achievement as measured by the National Assessment of Educational Progress [NAEP] fell far short of the standards set forth by Goal Three of Goals 2000 which stated:

> American students will leave Grades, 4, 8, and 12 having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography; students will learn to use their minds well so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy (U.S. Department of Education, 1991).

In a 1991 report, O'Neil discussed The Association for Supervision and Curriculum Developments's [ASCD] Panel on U.S. Achievement in Mathematics and Science. One of the issues examined was the poor performance of U.S. students on mathematics and science achievement tests at the international level. To this end, the panel recommended support for international standards.

Markham (1993) stated that in order for reform of the educational system to come about, high standards for achievement that emphasized performance must be implemented. While consensus about the form these standards should take did not exist, there was agreement that expectations for student performance should support critical thinking and active learning.

Research Questions

To carry out the purposes of this study, the following questions were examined:

1. What was the relationship between LEAP 5th grade mathematics scores and level of implementation of the NCTM Standards when race of the students is accounted for?
2. What was the relationship between LEAP 5th grade mathematics scores and teachers' number of years taught and educational attainmentwhen the race of the students was accounted for.
3. What was the relationship between teachers' levels of implementation of the NCTM Standards and teacher characteristics of number of years taught and educational attainment?

Significance of the Study

This study, through its investigation of the relationship between levels of implementation of the Curriculum and Evaluation Standards for School Mathematics and 5th grade math achievement test scores, attempted to provide evidence of the value of implementing these standards. The researcher believed that this study would provide the impetus for further research of a topic which has received widespread attention and effort but whose effects have only been minimally investigated.

Definition of Terms

1. LEAP test

According to the Louisiana Department of Education (1994), the LEAP

> ...measures grade-appropriate, curricula-based proficiencies in core subject areas for high school graduation and for grades 3, 5, and 7. The LEAP tests at grade 3, 5, and 7 measure curricula-based proficiencies in Language Arts and Mathematics. The Language Arts and Mathematics tests are administered each year in April to Louisiana public school students in those grades. The results of grades 3, 5, and 7 Language Arts and Mathematics tests are used as the principal criteria in each school district's pupil progression plan (p. 2).

Limitations

Three limitations encountered in this study were those normally associated with mail questionnaire generated data. Kerlinger (1986) identified inability to check accuracy of responses and the potential for lack of response as two drawbacks. Additionally, Wiersma (1986) added the possibility of difficulty in synthesizing data.

Another potenial limitation involved the accuracy of match between the individual teacher and his or her class' LEAP mathematics scores. Due to the fact that scores were only identified by test administrator, the potential existed that some test scores were not

accurately matched with the teacher who actually taught mathematics to the students in question. While the researcher believed that the possibility that this could occur was very small due to control measures, the possiblility none-the-less existed.

The population in this study was limited to Louisiana 5th grade teachers and students. No claim of generalizability to a larger population was made.

The Population

The population was the 1994-95 academic year 5th grade public school teachers of record from the entire state of Louisiana who were identified as being either a 5th grade regular education teacher or a departmentalized 5th grade mathematics teacher. This population consisted of approximately 1,834 teachers. The students from whom LEAP test data were collected were those who were taught 5th grade math in academic year 1994-95 by the teachers selected in a random sample of the populaion.

The Sample

The sample was randomly picked and consisted of approximately 14 percent of the population. This gave a sample size of 250. It was chosen from a master list provided by the Louisiana State Department of Education, Bureau of Pupil of Accountability.

Procedures for Collection of Data

The sample was chosen by using a table of random of numbers. When the sample was identified, a questionnaire designed to identify level of implementation of the Standards was mailed to each teacher chosen.

A cover letter identifying the purpose of the study and measures taken to ensure confidentiality of response was included as was a stamped, self-addressed return envelope. A post card was sent to non-respondents three weeks after the initial mailing as a second

request for their assistance. Two weeks after the post card, a second copy of the survey was sent to all teachers who were still identified as non-respondents.

The second portion of data collection was procurement, from the Louisiana State Department of Education, Bureau of Pupil Accountability, of 1994-95 academic year 5th grade LEAP mathematics scores that corresponded to the names of the teachers that responded to the request for survey data. This information was provided on computer disks upon request.

Instruments

The instrument used to examine the first question was Section IV of the document developed by Esqueda (1993) [the levels survey]. Demographic information for examining question two was secured by using a modified version of Esqueda's Demographic Information document [the demographic document].

The levels survey had 25 items and used a 7-point Likert scale. Its intent was to assess the "state of innovation of the users"(p. 36). Five levels of implementation were identified: I. Non-Use; II. First Use/Preparation; III. Initial Awareness; IV. Externalizied Use; and V. Modified Use. The survey was developed based on information published Loucks, Newlove, and Hall and the Research and Development Center for Teacher Education at the University of Texas.

Research Design

This study was primarily designed to determine the existence of a relationship between levels of implementation of the Standards and 5th grade LEAP math achievement when the effects of race had been accounted for. A secondary purpose of the design was an attempt to determine the relationship between student mathematics achievement and selected teacher characteristics when the effects of race of the students had been accounted for. The independent variable for the first question was level of implementation of the Standards.

Student LEAP mathematics scores were the dependent variable. For both the second and third question, teacher characteristics was the independent variable. Student LEAP mathemaics scores were the dependent variable for quesiton two with level of implementation of the Standards serving as the dependent variable for the third question.

Testing of Research Questions

The first and second questions were examined through hierarchical multiple regression. The third question was assessed with a variation of loglinear analysis called logit analysis.

CHAPTER II

SYNTHESIS OF RELATED LITERATURE

A Rediscovery of American Schools

Historically schools have been at or near the center of America's social and moral fabric. Early in our history, schools were established for a fundamental reason--to save souls. The "Old Deluder Satan Act" of 1647 required towns of with a population of fifty or more families to hire a teacher for instruction in reading and writing (Armstrong, Henson, and Savage, 1989). The theory was simple--if a child was able to read the bible, he or she would be more equipped to avoid the wiles of Satan.

Beginning in the mid 1700's there emerged a different but equally compelling reason to have an educated populace. A new political philosophy, democratic representation, was unfolding. In Thomas Jefferson's mind, the base of a democratic America was composed of an educated electorate. Tyrants would not be tolerated by educated men.

The 1850's saw yet a third reinforcement of education as an integral part of American life. Large numbers of immigrants from Europe began to arrive on America's shores. The problem was how to assimilate these millions. Leaders wondered how they would learn English and the skills needed for a newly industrialized America. The answer, quite simply, was education. High schools would be built for the entire nation.

Immigration began to slacken by World War II and possession of a high school education was a commonplace thing. Two events around 1950 occurred that began a three decade erosion of the position of schools in American life. The first was an expansion of the economy unparalleled by any in the nation's history. The second was the growth of mass media.

During the 1950s and 1960s the economy was booming and good jobs were plentiful. The gap between blue and white collar jobs began to decline. Many an uneducated blue collar worker was making the equivalent, or ated white collar workers. The result was a loosening of the link between education and prosperity.

Youth were being exposed to outside sources of information during this time that were previously unknown. Magazines such as Life, The Saturday Evening Post, and Reader's Digest appeared and prospered. Radio and television grew by leaps and bounds and provided compelling amounts of information not found in school. Society had become the avenue for general learning.

By the 1980s a new situation emerged. The link between education and economic prosperity began to reappear. A new society was forming--one based on information and technology not formerly in existence. Dramatic new demands were suddenly being placed on schools. Higher levels of learning were seen as a key to meeting the competition from abroad. Knowledge had become the key economic resource in a rapidly changing world. Schooling had suddenly achieved new prominence. Improving education to meet these new demands was described as a national priority by many top level business executives. Many of the executives surveyed believed that higher educational standards were the key to competing internationally (Thompson, 1984).

The early and middle 1980s saw a series of educational reform acts appear. These were spurred by several dissatisfactions. Among them were an apparent decline in Scholastic Aptitude Test scores and a lagging behind foreign students of American youth in international competitions.

Among the frequently seen themes of these reports were recommendations for more rigorous academic programs, sound core programs, and a reduction in elective courses. Others called for more talented teachers, reorganized high schools, and lengthened school

days and years. Regardless of the report or the area of education addressed, there seemed to be a common thread--standards should be increased.

The Call For Reform

In his fiscal year 1983 report to Congress ("Annual Report", 1984), the Secretary of the United States Department of Education made the following statement regarding a recently prepared report by the National Commission on Excellence in Education [NCEE]:

> The Commission concluded that our Nation is at risk because our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. The Commission concluded that the educational foundations of our society are being eroded by a rising tide of mediocrity that threatens our very future as a Nation and as a people.
>
> The Commission's concern went far beyond matters of industry and commerce to the intellectual, moral, and spiritual strengths of our people which knit together the very fabric of our society. The report noted that individuals in our society who do not possess the levels of skill, literacy, and training essential to the new era will be effectively disenfranchised, not simply from the material rewards that accompany competent performance, but also essentially from effective participation in our national life. (p. 2)

The report the Secretary referred to was, of course, A Nation at Risk: The Imperative For Educational Reform [NAR]. Goldberg (1984) summarized Secretary Bell's comments by identifying three essential messages he believed the NCEE wished the American people to hear.

The first message was found in the report's title: the nation was at risk. The second message asserted that excellence was not the norm in American education, rather it was mediocrity. The third essential message the NCEE sent was that America did not have to

put up with the "rising tide of mediocrity." It claimed that we can, should, and must do better.

Five broad recommendations were made by the NCEE with regard to improving American education. The first dealt with content. The commission recommended that all students be required to lay a foundation in what it described as Five New Basics consisting of four years of English, three years of mathematics, three years of science, three years of social studies, and one-half year of computer science. The second concerned standards and expectations. The commission recommended that more rigorous and measurable standards and higher expectations for academic performance and student conduct be adopted by schools, colleges, and universities. The third recommendation dealt with time. The NCEE recommended that more time be allocated to learning the Five New Basics. This would require a more effective use of the school day by adopting a longer school day or a lengthened school year. The fourth recommendation called for higher standards for teacher candidates as well as higher pay. Finally, the commission called for citizens nationwide to hold elected officials and educational leaders accountable for providing the leadership necessary to achieve the proposed reforms.

A Nation at Risk was not the only report of the early to middle 1980s that addressed the state of education in America. Several others, most by well known educators or committees led by prominent persons, discussed the various problems facing education and made recommendations as to what should be done to solve the problems. Henson (1986) provided a succinct description of four such reports.

The first of the four, A Place Called School was published in 1983 by John Goodlad. It was based on an eight year study of thirty-eight schools and was seen by many as running in direct opposition to many of the other reports. While many called for adding hours to the school day or days to the school year, Goodlad believed that schools only utilized 75% of the school time as it was and that adding more time would not likely result

in more learning. He suggested instead that better use should be made of the existing school hours. He also suggested that rather that continue to add facts to the curriculum, schools should begin to include sets of concept for each subject. He also recognized that substantial improvement would not occur without the work of teachers and proposed that in small schools without curriculum supervisors, the principal should take the lead in instructional supervision.

High School by Ernest Boyer was in agreement with the reports stating that we ask too little of our schools and students. However, Boyer recognized American schools as among the best in the world. He saw communication skills as the greatest area of need and recommended a language proficiency test as a prerequisite to entering high school. His core curriculum included arts, foreign language, history, science, mathematics, and technology. Apart from many of the others, Boyer placed importance on the teaching of art. Like Goodlad, Boyer had no use for a vocational education track. He believed that vocational training could be achieved for all students through a general education program.

Mortimer Adler's The Paideia Proposal was primarily a result of the discussions of twenty-two educators. Calling for rather a progressive curriculum, The Paideia Proposal recommended beginning with textbooks and lectures, progressing through skills based exercises and finally on to Socratic questioning of literature and the arts. Like the others, Adler saw no benefit from a specific vocational program. Adler saw the mind as a muscle to be exercised and as a vessel to be filled by the acquisition of knowledge and drill and exercise and finally through the higher level questioning. Tanner (1984) called Adler's Manifesto a curious artifact of perennialist/essentialist notions on the school curriculum and the nature of the learner" (p 10).

The 1983 report Action for Excellence was produced by the Education Commission of the States' Task Force on Education for Economic Growth. Not surprisingly, this report saw improvement of schools as the responsibility of business and persons outside

education. The report called for a strengthening of all disciplines - not just math and science - as well as increased use of technological advancements. Action for Excellence saw the student as a unit of improvement and placed high emphasis on motivation - a position opposite of most of the other reports which saw education as something that simply happened to students. Like several of the others Action for Excellence called for longer school days and longer school years. With regard to teachers, it called for increasing teacher certification, selection, and dismissal standards.

As could be expected, each of these reports, by and large, represented the interests or goals of the individuals comprising the panels or committees preparing them.

National Goals

In 1989, President George Bush and the governors of the states came together for the purpose of discussing plans to change the educational standards of the United States so that we would no longer be "a nation at risk." They planned to establish a system of national goals to increase the effectiveness of the educational system as well as to produce students who would be productive members of society capable of strengthening the American economy. Six national goals resulted from the meeting. These goals, proclaimed the President and the governors, would move American education toward excellence (Flood and Lapp, 1993).

The six national goals were:

1. All children in America will start school ready to learn.
2. The high school graduation rate will increase to at least 90%.
3. American students will leave Grades 4, 8, and 12 having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography; students will learn to use their minds well so they may be prepared for responsible citizenship, further learning, and productive employment in our modern

economy.

4. American students will be the first in the world in science and mathematics achievement.

5. Every adult American will be literate and will possess the knowledge and skill necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

6. Every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning (US Depament of Education, 1991, cited in Flood and Lapp, 1993).

Not long after these goals were established, America 2000: An Education Strategy was published. It outlined four plans to achieve the six national goals (cited in Flood and Lapp, 1993):

1. Schools will be better and more accountable.
2. Schools will be completely reformed.
3. Education will become a priority in the workforce.
4. Communities will need to participate to help America reach its goal of educational excellence.

National Standards

A thread common to all of the various reform reports was a call for higher standards. While the call was clear, the definition of just exactly what "higher standards" or "world class standards" were, was not so clear. According to O'Neil (1993) the national discussions regarding standards over the last few years saw several definitions. Examples included "what students needed to know and be able to do, the essential core knowledge in a particular subject area, a passing score on an assessment, or a model demonstration worthy of emulation (much as an expert figure skater or diver sets the standard)" (p. 4).

The term was used with reference to what the content should be and to the assessment of whether the content was learned.

In 1992 the National Council on Education Standards and Testing attempted to shed some light on the subject with the following:

> National standards should be developed that include content standards (what students should know and be able to do), student performance standards (the level(s) of student competence in the content), and system performance standards (to assess the success of schools, districts, states, and the nation as a whole in helping all students attain high performance standards (p. 4-5, cited in O'Neil, 1993).

Sizer and Rogers (1993) defined standards as "images of excellence, examples of what we consider 'good enough' in a particular set of circumstances" (p. 25).

In addition to defining standards, Porter (1994) provided seven properties he thought standards should have. First, he wrote, standards were not prescriptions, rather they should be at the level of principles. They should serve as guides that stimulate action. Second, he believed that standards should be derived from a national consensus and should not be federal in nature. Third, standards should be voluntary - every state need not subscribe to them even though they are nationals standards in theory. The fourth characteristic was that standards should not be static. They were instead to be dynamic with a process of review and renewal. Fifth, standards should be "world class" - that is they should be demanding. This reflected back to the international comparisons origin of many standards setting projects. Sixth, standards were to be shared and widely accepted. Finally, standards should promote equity in education.

As varied as the definitions of standards, were the reasons given for having standards. Among the more common reasons:

- Lack of adequate standards (Alexander, 1994) - It was necessary to replace the low-level standards that were implicit in most tests and textbooks with those which would

raise expectations of pupil achievement and teacher performance and provide uniform pupil outcome data (Kirst, 1994).

- Definitive standards communicate that all students can achieve - Clear standards were necessary for ensuring equal educational opportunities (Alexander, 1993).
- Low level standardized tests - Standardized tests in place were excessively oriented to low-level skills. Most were not geared to the high standards of our foreign economic competitors, most particularly in Europe and Asia (Kirst, 1994).
- Lack of incentive - Most American tests rarely contained high-stakes consequences. Employers rarely looked at transcripts and the state assessments that students took were not used for admission to colleges and universities (Kirst, 1994).
- Standards are a catalyst to reform - Standards brought clarity and coherence to reform efforts which have been fragmented and incoherent (Alexander, 1993).
- The standards movement will revitalize the classroom - Standards would unleash creativity and innovation rather than standardize teaching (Alexander, 1993).

In a very clear, concise statement, Rutter (1983) stated that:

> ...if it can be shown that the schools (emphasis added) have indeed produced or caused the superior outcomes, so that the good results are not simply a function of their having an intake of above average pupils from more favored family backgrounds, then clearly there is the potential for all schools to do the same and for standards to be raised thereby (p. 5).

Not everyone was in total agreement with the need for national standards. In fact, it was safe to say that some were deadset against them. Porter (1994) stated that one fundamental reason for this was that for every strength, critics saw a potential weakness.

Another reason for the sharp differences in opinion was that very little of the debate was based on empirical evidence. Most claims, both for and against, were based on speculation and hypotheses.

Fulk, Mantzicopoulos, and Hirth (1994) minced no words when they contended "that national performance standards would have detrimental effects on schools in the United States" (p. 366). They listed several different areas of education and groups of children which would suffer these detrimental effects.

The first group they described was that which included young at-risk children. They recalled the February, 1990 statement by the nation's governors declaring school readiness a national goal. However, a survey by the Carnegie Foundation reported that one-third of the kindergarten teachers surveyed reported that one-third of the kindergartners lacked the social, emotional, physical, and cognitive competencies to succeed in school. Many of the children who began early were either retained or placed in extra year programs between kindergarten and first grade. Studies (Mantzicopoulos and Morrision, 1992 and Niklson, 1987) showed however that young at-risk children received no academic benefit from an additional year in school.

A second group that was identified as likely to be impacted was low-achieving students. The authors claimed a clear implication of national performance standards was that those students who did not meet the standards would be remediated to pass the performance tests or would be retained to catch up to more able students. However, they cited research (Holmes and Matthews, 1984; Jackson, 1975; Smith and Shepard, 1989a) which "overwhelmingly denounces school retention as an ineffective practice for increasing student achievement" (p. 367). National standards - particularly national standards measured by standardized tests - would most likely label low-achieving students as failures. As a result, they would be excluded from desperately needed resources.

Not only would children suffer according to Fulk et al. They cited negative effects of national performance standards on areas of curriculum and instruction. Increased use and abuse of standardized tests, increased pressure on teachers, and enormous economic and fiscal consequences were among those discussed.

In an incredibly insightful 1984 article, Cross criticized the reform movement by stating:

> If we are not more thoughtful about the goal of high-quality education and how to attain it, we will spend the 1980s correcting for the permissiveness of the Sixties and Seventies, and we will spend the 1990s correcting for the over-regulation of the 1980s (p. 168).

> The school reform movement of the 1980's focused primarily on mechanical solutions that are imposed from the top and that can be implemented quickly. Tight control and careful specifications may define minimal standards, but they may also stifle the spirit of innovation and experimentation that researchers are finding so essential to excellent organizations (p. 170).

Cross further stated, "It is simply unrealistic to think that all students can learn from the same materials, to the same standards of performance, in the same amounts of time, taught by the same methods" (p. 171). She concluded by stating that we created a generation of learners who were increasingly dependent on others to define acceptable learning standards.

Riley (cited in Flood and Lapp, 1993) voiced what is perhaps the most widely felt fear of national standards. In a 1986 article he expressed concern that for students entering school with skills not equal to those of their peers or those who fell behind after entering school, higher standards could create barriers rather than positive challenges.

On the argument in favor of or against national standards, Porter (1989) said it quite eloquently:

> For every perceived benefit of external standard setting, there is a possible cost as well. Standards may assure student achievement, but that which is achieved may not be most important (i.e., facts and skills, not higher order thinking and problem solving). Standards may ensure that instruction covers important content, but in so doing may sacrifice depth of coverage for breadth of coverage. Standards may assure worthwhile

content for poorly motivated and low aptitude students, but stifle the learning experiences of more gifted students. Standards may motivate students to work harder by holding them accountable, but in holding students accountable, teachers may come to accept less responsibility themselves for what students learn.

These trade-offs to standard setting arise in part because excellence is not the opposite of minimum competence. Excellence is the standards that we wish to set for schools, teachers, and student learning, but minimum competence appears to be what we know how to specify and demand (cited in Porter, 1994, p. 443-444).

The Projects

Among the many projects underway are :

The New Standards Project: A joint effort on the part of the National Center on Education and the Economy, the Learning Research and Development Center, this project is working towards alignment of content standards with the emerging and existing standards of professional organizations.

The Standards Project for the English Language Arts: This project is a joint effort on the part of the National Council of Teachers of English, the International Reading Association, and the Center for the Study of Reading. It includes specific standards for teaching and learning and classroom vignettes illustrating their application.

The National Science Education Standards: These standards are being written in the areas of curriculum, teaching, and assessment and are an effort by the National Committee on Science Education and Assessment with coordination by the National Research Council.

Other areas seeing standards setting efforts are the arts, physical education and the various fields in the discipline of social studies.

The NCTM Standards

Lastly, and for this study most importantly, in 1989 mathematics educators led the way with the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards. These standards, as indicated previously, were a consensus about what math students should learn.

With the creation of the Standards, a fundamental shift in the teaching and learning of mathematics was implied. This shift moved toward a classroom environment that promoted the development of all students' abilities. NCTM recommended five shifts to create such an environment:

- toward classrooms as mathematical communities--away from classrooms as simply a collection of individuals;
- toward logic and mathematical evidence as verification--away from the teacher as the sole authority for right answers;
- toward mathematical reasoning--away from merely memorizing procedures;
- toward conjecturing, inventing, and problem solving--away from an emphasis on mechanistic answer finding; and
- toward connecting mathematics, its ideas, and its applications--away from treating mathematics as a body of isolated concepts and procedures (National Council of Teachers of Mathematics as cited in Lacampagne, 1993, p. 1-2).

The Vision

The Standards' vision was expressed in this 1989 NCTM statement: "All students need to learn more, and often different, mathematics.... Instruction in mathematics must be significantly revised" (cited in Romberg, 1993, p. 37).

Romberg (1993) saw five implications in this statement:

1. Teaching mathematics to all students emphasizes that anyone who is to be a productive citizen in the 21st century must be mathematically literate--including not only

talented white males but all underrepresented groups.

2. More mathematics implies that all students need to learn more than how to manipulate arithmetic routines. At present, nearly half of American students never study any mathematics beyond arithmetic.

3. Often different mathematics indicates that all students need to learn concepts from algebra, geometry, trigonometry, statistics, probability, discrete mathematics, and even calculus.

4. To learn means more than to memorize and repeat. Learning involves investigating, formulating, representing, reasoning, and using appropriate strategies to solve problems, and then reflecting on how mathematics is being used.

5. Revised instruction implies that teachers and students need to envision mathematics classrooms as discourse communities where conjectures are made, arguments presented, strategies discussed, and so forth (p. 37).

Evaluation

Lester and Kroll (1991) offered the following discussion of the evaluation portion of the Standards.

The new vision of the Standards required a change in the methods for evaluation of instructional practices and in procedures used in testing. According to NCTM, an evaluation program that was properly aligned with the proposed curriculum standards would include the use of calculators, computers, and manipulatives in addition to written tests.

The evaluation standards proposed a more broad conception of the reason for evaluation than was evident in the past. Four reasons were cited for collection of evaluation information:

- To make decisions about the content and methods of instruction
- To make decisions about classroom climate

•To help communicate what is important

•To assign grades (p. 27).

Making decisions about instruction

Data gathered from observations, analysis of student work and student procedures; writings about mathematics could be used to diagnose strengths and weaknesses. The more varied the types of data teachers gather, the better instruction could be modified to meet student needs.

Making decisions about class climate

A classroom climate which encouraged students to be actively involved in the learning process was essential if the evaluation goals of the Standards were to be met. Among the factors affecting climate were: whether the teacher conveyed to the students whether he or she enjoyed mathematics, whether problem solving was an integral part of the class, and whether students were given the opportunity to explore without being graded.

Student attitudes and beliefs were probably the most significant indicators of an appropriate classroom climate. Interviews, observations, and self-reports were sources of data for making judgments about students attitudes and beliefs.

Communicating What Is Important

Generally speaking, students would consider important those aspects of instruction that were emphasized and assessed regularly by the teacher. Problem solving, reasoning, communication, and connections were emphasized by the Standards as important goals for any mathematics class. If teachers used evaluation techniques that indicated their importance, students would more likely value progress in these areas.

Assigning grades

The following guidelines were found to be helpful when assigning grades:

•Advise students in advance when their mathematics work will be graded.

•Use a grading system that considers the thinking process used, not just the answers.

•Be aware that pupils may not perform as well when they are to be graded.

•Use as much evaluation data and as many different techniques as possible to help in the assignment of grades.

•Consider using a testing format that matches the instructional format used in class (p. 277).

There were many different techniques that were useful in accomplishing these goals. Four of the most important were: (1) observing and questioning, (2) assessing students' mathematical work, (3) using students' writing for assessing, and (4) assessing students' work through individual portfolios.

Technology

Demana and Waits (1990) described the final major component of the Standards as one that assumed that: (1) all students in grades 9-12 would have access to graphing calculators, (2) all math classrooms would have a computer for demonstration available at all times, and (3) all students would have the opportunity to use computers in their mathematics studies. They claimed these assumptions were important for a variety of reasons. One was simply that the need for a high degree of skill in algebraic and mathematical manipulation in the workplace was virtually eliminated by technology. With this elimination, the time for pencil and paper drill was vastly reduced and schools could redirect their efforts. More time could be spent on increasing the students' ability to solve open-ended, realistic problems and help the students' increase their appreciation for the utility and value of mathematics.

They justified the emphasis on technology very simply: it was here to stay. The ability to use technology and to think mathematically would determine the success tomorrow of today's student. With the rapid increase in the abilities of technology, the current

generation of students would soon hold in their hand the power of today's mainframe computers.

The reform call has been heard from the national level all the way down to the smallest school district. Nationally, the standards have been part of presidential campaigns; several states have produced frameworks based on them while others are currently in the process of creating them. While it is hard to judge the actual extent of implementation at the local level, it is known that many districts have created committees to address the new standards.

Record membership in the various mathematics organizations has been reported and the professional status of math teachers has been enhanced. The creation of the Mathematical and Sciences Education Board, called for by the Standards, is providing the mathematics community with a national voice. Finally, mathematics teachers are being asked to serve on state and national committees as well as to testify before various committee hearings. The Curriculum and Evaluation Standards for School Mathematics have proposed a vision and a strategy for districts to follow to construct a curriculum that will lead American education into the 21st century (Romberg, 1993).

Research Findings

The stated primary purpose of this study is to determine the relationship between levels of implementation of the NCTM Standards and 5th grade LEAP math scores. While no research has been found that directly provides evidence that higher levels of implementation of the Standards are positively related to 5th grade LEAP scores, there are several instances in which portions of the NCTM Standards have been used as a treatment in quasi-experimental studies. Following is a summary of several of these studies.

In 1989, Zech conducted a study to determine the effect of instructional materials designed for the purpose of implementing learning strategies and activities recommended by the NCTM Standards' recommendations on the mathematical achievement of high

school consumer mathematics students. The study was quasi-experimental in design and was composed of four high school consumer mathematics teachers in three urban, mid-western high schools. The control group taught from a traditional consumer mathematics textbook while the treatment group taught using instructional materials based on NCTM's recommendations. 82 students of the 138 total were in the treatment group with the remaining 56 in the control group.

Four tests--Procedural Skills Test, Conceptual Understanding Measure, Application Skills Test, and Student Attitude Survey--were constructed to measure mathematical achievement. Results showed that students in the treatment group achieved at significantly higher levels on all variables studied than did those in the control group. Among the researcher's recommendations was the immediate implementation of the NCTM Standards' recommendations for instructional activities and strategies within the subject area studied.

Hestad (1991) investigated the effects of implementing eight mathematical card games, which met the NCTM Standards, on third grade student's mathematics achievement. The teachers were volunteers from a suburban Chicago school district. The eight week long program was comprised of eight intact third grade classrooms and consisted of 160 total students.

The intact classes were divided into control and treatment groups of 4 classes each. Control teachers taught using traditional methods while treatment teachers attended four attended workshops designed to teach creative ways to implement the card games. Peer coaching and video taping of lessons was also used.

The pretest/post-test consisted of seven items from the 1986 NAEP Public Release Item Bank for Third Grade. Analysis of posttest scores revealed that the students in the experimental group (having used the game) scored significantly higher than did the control group. The study concluded that the card games could be used to introduce new skills as

well as for maintaining old ones and recommended research into creative ways of implementing the NCTM Standards.

In a more recent study, Christou (1993) investigated the effectiveness of instruction in problem solving according to the Standards on mathematical problem solving achievement of male and female, urban and rural, middle school students in Cyprus. Four intact urban and four intact rural sixth grade classes comprised the sample. Christou taught both groups a unit on mathematical problem solving.

The treatment group received instruction consistent with the Standards' recommendations while the control group received traditional problem solving instruction comprised of demonstration of the solution and subsequent assignment of independent practice. The data were analyzed using a three-way analysis of variance with a posttest (California Achievement Test) as the dependent variable, and gender, type of school (rural vs. urban), and method (Standards vs. traditional) as the independent variables. Christou found that students instructed in problem solving along the general recommendations of the NCTM Standards scored significantly higher on the post-test when compared to the control group that had received traditional instruction. Interviews aimed at finding out how students thought about problem solving conducted after the instruction reinforced the statistical findings.

These studies address the direct impact of implementation of particular recommendations of the NCTM Standards but do not investigate the level to which those interventions were implemented. This study will attempt to further the understanding of this unanswered question.

CHAPTER III

DESIGN AND METHODOLOGY

Subjects

The subjects for this study were drawn from the population of academic year 1994-95 5th grade public school teachers of record who were identified as being either a 5th grade regular education teacher or a 5th grade mathematics teacher from the entire state of Louisiana. This population consisted of 1,834 teachers. The sample used for the study was randomly picked and consisted of approximately fourteen percent of the population. This gave a sample size of 250. It was chosen from a master list provided by the Louisiana State Department of Education. The students from whom LEAP test data were collected were those who were taught 5th grade math in academic year 1994-95 by the teachers selected in the random sample.

Research Design

Research Question One

What is the relationship between 5th grade LEAP mathematics scores and levels of implementation of the NCTM Standards when the effects of the race of the students are accounted for?

This study's primary focus was on the relationship between levels of implementation of the and 5th grade Louisiana Educational Assessment Program mathematics scores. Survey research methodology was used to accomplish this goal.

The independent variable for this question was level of implementation of the Standards. Five levels of implementation were identified by Esqueda (1993): Non-Use, First Use Preparation, Initial Awareness, Externalized Use, and Modified Use.

The dependent variable was students' score on the mathematics portion of the LEAP test.

Race and gender of the students were proposed to serve as the covariates. A significant amount of research exists that points to a strong relationship between race of American students and achievement. Williams (1989) stated that whites performed better than blacks on the Scholastic Aptitude Test while Kohr et al. (1989) discussed the findings of the 1981-84 Pennsylvania Educational Quality Assessment Program which found that whites had higher mathematics achievement than did blacks.

With respect to using gender as a covariate--there did not seem to be a consensus of opinion as to whether or not it had any effect on math achievement. Calles (1993) discussed research conducted at the State University College of Technology at Delhi, New York which found that females typically had higher math achievement than their male counterparts. In direct contradiction to this is the report by Schmuck and Schmuck (1994) which claimed that recent research showed performance of girls was lower than that for boys in math and verbal skills. Kohr et al. (1989) took the middle ground and claimed that there were no replicable gender differences as related to mathematics achievement.

Research Question Two

What is the relationship between 5th grade LEAP mathematics scores and teachers' number of years taught and educational attainment when the effects of the race of the students are accounted for?

Research question two was designed in an attempt to examine the relationship between 5th grade students' mathematical scores and selected characteristics of their respective teachers. The independent variables for this question were the teacher characteristics of:

- educational attainment.--undergraduate or graduate
- years experience as a teacher--0-7, 8-14, and 15 plus

The dependent variable for this question was, as in question one, 5th grade students' scores on the mathematics portion of the LEAP test.

Research Question Three

What is the relationship between teachers' levels of implementation of the Standards and the teacher characteristics of educational attainment and years of experience.

Research question three was designed in an attempt to assess the relationship between teachers' level of implementation of the Standards and the teacher characteristics of educational attainment and years experience as a teacher. These characteristics served as the independent variables for this question while teacher level of implementation of the *Standards* was used as the dependent variable.

Procedures for Collection of Data

In August, 1995 the investigator made contact with the Louisiana Department of Education, Bureau of Pupil Accountability, to inquire as to the feasibility of two requests. The first request was for the State to produce a statewide master list of those teachers who had taught fifth grade during the 1994-95 academic year. It was also requested that this list provide a mailing address for each teacher if such a list was available. Academic year 1994-95 was chosen for the simple reason that they were the most current scores available.

The second request was for the Bureau of Pupil Accountability to produce fifth grade LEAP test mathematics scores for the same year and match each student's score to his or her respective teacher. Both requests were answered in the affirmative. The only potential problem was that the student scores were not identified by their teacher names but by the test administrator. This potential problem was controlled by only including in the statistical analysis those surveys completed by teachers answering affirmatively to the survey question asking whether or not they had taught math to the class to which they had administed the 1994-95 academic year LEAP mathematics test. This control was

apparently successful as several surveys were returned indicating that the teacher in question had not taught math to the class to which he or she had administered the mathematics portion of the LEAP.

In January, 1996 the Louisiana Department of Education, Bureau of Pupil Accountability provided a master list of teachers from the 1994-95 academic year who had been identified as fifth grade teachers. The list further categorized each teacher as to their function--regular education teacher, mathematics teacher, language arts teacher, etc. For the purposes of this study, only those who were listed as either a regular education classroom teacher or as a departmentalized mathematics teacher were of interest. The list also provided the name of the teachers' schools as well as the school addresses.

Upon receipt of the list, all teachers identified as being either a fifth grade regular classroom or departmentalized math teacher were numbered successively from 1 - 1,834. Those teachers on the list that were not to be included in the population were simply ignored.

The sample was chosen by using a table of random numbers located in table 1 of the appendix in Yamane's Elementary Sampling Theory (1967). Starting at the beginning of the table, each successive four digit number was logged. When 250 numbers, without repetition, had been chosen, the teachers and their addresses from the master list who had corresponding numbers were entered into a data base.

Each teacher identified as part of the sample was mailed a survey with cover letter. A stamped, self addressed envelope was included to facilitate return of the survey when they had completed it. The cover letter identified the purpose of the study and measures taken to ensure confidentiality of responses.

Three weeks after the initial mailing, a post card was sent to each non-respondent reminding them of my need for their assistance in completion of this project. Approximately two weeks after the post card was mailed, a second copy of the survey was

sent to those individuals who had still not responded. Three weeks after the second survey had been mailed, data collection was stopped. No more surveys were returned after that point. A total of eighty-nine usable surveys were returned for a usable return rate of 35.6 percent.

In May, 1996 the researcher provided Dr. Hae Seong Park of the Louisiana Department of Education, Bureau of Pupil Accountability the names and schools of the usable responses. A computer disk containing the LEAP mathematics scores of the students of seventy five of the eighty nine teachers was delivered for analysis one week later. According to Dr. Park, the fourteen missing teachers, for reasons unknown to him, did not exist in his computer files.

Instruments

The instrument used to examine the first research question was Section IV of the instrument developed by Esqueda (1993) [the levels survey]. Information regarding teacher characteristics for examining questions two and three was secured by using a modified version of Esqueda's Demographic Information Document [the demographic document].

The levels survey had 25 items and used a 7-point Likert scale. Its intent was to assess the "state of the innovation of the users" (p. 36). It was developed based on information published by Loucks, Newlove, and Hall at the Research and Development Center for Teacher Education at the University of Texas.

Esqueda offered three pieces of evidence of validity: (a) high correlation between each item and the level to which it was assigned; (b) a decrease in correlation between subscales as the distance between them increased; and (c) evidence of the independence of the level subscales.

Evidence of reliability was provided by the internal consistency coefficient alpha. Cronbach's formula yielded a reliability coefficient of 0.86.

Five levels of implementation were identified:

- I Non-Use
- II First-Use Preparation
- III Initial Awareness
- IV Externalized Use
- V Modified Use

These levels were extracted from the eight levels described in Hall and Lord's Levels of Use [LoU] Chart by using z-score calculation and box plot analyses.

As a check for evidence of validity for purposes of this study, Section VI of Esqueda's survey was used [the interview document]. This document was an informal interview consisting of four questions with a stated objective of gathering sufficient information about an individual to assign him or her a level of use. A visual examination of the responses was done to provide an estimate of the strength of the relationship between each individual's questionnaire and his or her interview document. Three individuals at each level of implementation were interviewed to conduct this validity check. Evidence of the face validity of the interview document was provided through its review by three persons involved in the Concerns Based Adoption Model research.

Procedures for Analysis of Data

Research Question One

What is the relationship between 5th grade LEAP mathematics scores and levels of implementation of the NCTM Standards?

When the levels surveys were returned, each was placed into one of the five previously identified categories in the following manner:

The data obtained from the Levels of Use section of the survey were analyzed to compute a raw scale score for each level. This involved manually entering, for each respondent, the raw score response to each question into one of the eight categories as identified in Table 1. The questions from the survey were grouped as follows:

Table 1 Survey item groupings by level

Level	**of Use**	**Item Number**
0	Non-Use	3, 12, 21
I	Orientation	6, 14, 23
II	Preparation	7, 13, 15
III	Mechanical Use	4, 8, 16, 17
IVA	Routine	1, 11, 25
IVB	Refinement	5, 19, 24
V	Integration	2, 10, 18
IV	Renewal	9, 20, 22

When all surveys had been entered into the worksheet, the raw scale scores for each individual, at each of the eight levels, were converted into a z-scores. An individual's highest z-score determined his or her level of use (see Table 2).

Table 2 Sample Teacher Categorization

Level of Use	**0**	**I**	**II**	**III**	**IVA**	**IVB**	**V**	**VI**
Teacher 135	1.2	.35	.68	1.1	1.4*	.23	.49	1.0
This teacher would be placed at level IVA								

These eight levels were further refined into the following five final levels of use by using z-score calculation and box plot analyses.

Table 3 Final Transformation of Levels

Level of Use	Level Name	Former Level
I	Non-Use	0
II	First Use Preparation	I and II
III	Initial Awareness	III and IVA
IV	Externalized Use	IVB and V
V	Modified Use	VI

The LEAP scores that corresponded with each individual teacher were then placed into the appropriate level of implementation. These scores provided the dependent variable data to be analyzed in an attempt to answer question one. Hierarchical multiple regression was used to determine whether or not an accurate prediction of LEAP fifth grade math scores could be made by teachers' levels of implementation of the NCTM Standards.

Independent variables were given priorities by the investigator before their contribution toward prediction of the dependent variable was assessed. Essentially this meant that the higher priority (in this case race and gender) variables were assessed and their effects were removed before the lower priority independent variable of level of implementation of the Standards assessed. In the heirarchical multiple regression, the high-priority independent variable served as co-variates for the low-priority independent variable (Tabachnick & Fidell, 1989).

In analysis of the critical value of the Multiple R, the level of significance below which the null hypothesis would be rejected was set at the .10 level. .10 was chosen over .05 due to the fact that the researcher felt that the consequenses of making a Type II error were minimal.

Research Question Two

What is the relationship between 5th grade LEAP mathematics scores and teachers' number of years taught and educational attainment?

Heirarchical multiple regression was also used in this question in an attempt to determine whether or not 5th grade student mathematical achievement could be predicted beyond chance by selected teacher characteristics. Using teacher educational attainment and years experience as the low-priority variables and race and gender again as the high-priority independent variables with student LEAP mathematics scores as the criterion variable, a regression equation was generated. In analysis of the Multiple R, the level of significance below which the null hypothersis would be rejected was set at the .05 level. .05 was retained as the level of significance for question two due to uncertainty about the consequences of making a Type II error.

Research Question Three

What is the relationship between teachers' levels of implementation of the Standards and the teacher characteristics of educational attainment and years of experience?

Research question three asked whether or not teacher level of implementation of the Standards could be predicted beyond chance by the characteristics of teacher educational attainment and years experience. Given that both the criterion and predictor variables were categorical, regression was abandoned in favor of a variation of log linear analysis called logit analysis. Tabachnick and Fidell (1989) describe logit analysis as a form of loglinear analysis used to evaluate a collection of categorical variables in which one is identified as dependent and the rest as independent.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The primary purpose of this study was to examine the relationships between levels of implementation of the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards and Fifth Grade Louisiana Educational Assessment Program mathematics scores. Also of interest were the following two questions: (1) whether a relationship existed between student mathematics scores and the teacher characteristics of educational attainment and years of experience with effects of the race of the students accounted for and (2) whether a relationship existed between teacher level of implementation and the previously mentioned teacher characteristics of educational attainment and years of experience. In the original proposal of this study, the teacher characteristics of mathematics background and gender were included as independent variables. However, due to the fact that over 95% of the teachers reported their gender as being female and a similar number reporting that math was neither their major nor minor, these variables were dropped. The small numbers simply did not lend themselves to analysis.

Results of the analysis of the relationship between levels of implementation and mathematics scores as well as the results of the analyses of the relationships between the questions of secondary interest are presented in this chapter. Descriptive statistics were calculated to establish whether the data satisfied the assumptions of the statistical procedures used. Research questions one and two were investigated using hierarchical multiple regression; question three was examined through the use of logit analysis. All

analyses were done using the microcomputer version of Statistics Package for the Social Sciences (SPSS).

Statistical Assumptions

Research Questions One and Two

1. What is the relationship between students' LEAP mathematics scores and level of implementation of the NCTM Standards when the effects of the race of the students are accounted for?

2. What is the relationship between students' LEAP mathematics scores and teachers educational attainment and years of experience when the effects of the race of the students accounted for?

Hierarchical multiple regression was used in an attempt to answer these two questions. The assumptions for multiple regression of Ratio to Cases of Independent Variables , Outliers, Multicollinearity , Normality, Linearity, Homoscedasticity, and Independence of Results were tested and found to be within acceptable limits.

Research Question Three

What is the relationship between level of implementation of the Standards and teacher's number of years taught and educational attainment?

This question was examined using logit analysis. Logit analysis was a better choice than multiple regression due to the fact that there were no parametric assumptions to be met.

Testing of Research Question One

What is the relationship between students' LEAP mathematics scores and level of implementation of the NCTM Standards when the effects of race of the students are accounted for?

Hierarchical regression was employed to determine if level of implementation of the NCTM Standards could improve prediction of student LEAP mathematics scores above and

beyond race of the student. This essentially involved running the regression twice. The first time is with only the covariate race entered. The second time, level of implementation was placed into the equation. The possibility of interaction between level of implementation and race was also analyzed. Analysis was performed by SPSS REGRESSION. Student level data were used for analysis. The total number of students in this study was 2,213

In multiple regression, the overall inferential test is whether the multiple R = 0. In essence, what this asks is whether all correlations between the regression coefficients, the dependent variables, and the independent variables are zero. If they are zero, one would not have a logical basis for performing the statistical analysis.

Table 4 displays the results for the partial model with only the covariate race entered, while tables 5 and 6 show the results of entering level of implementation and the interaction term level*race into the equation.

Table 4 Results of Partial Model Regression With Race Only--Question One

Multiple R = .2973	F = 214.51, p.<.001	R square = .0884	
B = 7.66	β = .2973	t = 14.64, p.<.001	
DF			Source
1			Regression
2212			Residual
2213			Total

Table 5 Results of Full Model Regression--Question One

Multiple R	.2993	R square change		F	Sig F	Source
R square	.0896	.00123		2.99	.0836	Level
F = 72.534	Sig F = .001	.00113	2.75	.0974	Lev_Rac	
DF						
3						Regression
2210						Residual
2213						Total

Table 6 Betas for Full Model Regression--Question One

Variable	β	t	Sig t
Race1	.2263	4.772	.001
Level	-.122	-1.73	.0836
Lev_Rac	.137	1.65	.0974

As can be seen in tables 4 and 5, the Multiple R was statistically significant in both the partial and full models. What this indicated was that the correlations between the regression coefficients, the dependent variables, and the independent variables were not zero and the analysis could proceed.

After step 1, in which race was entered into the equation, approximately 9% of the variation in mathematics scores was accounted for. Following step 2, in which level of implementation was added to the equation, one-tenth of one percent more of the variance in mathematics scores was accounted for. This figure was statisitcally significant.

Finally, after step 3 in which the interaction term was entered, an additional one-tenth of one percent of variance in mathematics scores was accounted for. This figure was also a statistically significant finding.

The means of students' LEAP mathematics scores at each level of implementation are shown in table 7.

Table 7 Means for LEAP Mathematics Scores At Each Level

Level	Mean	N	Std. Dev.	Rank
I	564.79 543	12.95	2	
II	562.41 721	11.52	4	
III	563.88 559	11.57	3	
IV	565.75 279	13.39	5	
V	561.41 125	16.37	1	

For diagnostic purposes only, a one-way ANOVA was computed on the means of the dependent variable, LEAP mathematics scores, at each level of implementation. Interpreting these results must be made with the fact in mind that race was not accounted for in this analysis. What this meant was that the results had be interpreted carefully. Without controlling for the covariate race, the error variance was larger and the test not as precise as if it had been controlled for. In order to attempt to interpret the fact that the ANOVA showed a significant difference in means, a Scheffe' post-hoc test was done. The results are shown in table 9

Table 8 Results of ANOVA on Question One

Variable Mathscore by Level		ONEWAY ANOVA			
Source	D.F.	SS	MS	F	F Prob.
Between	4	3676.60	919.15	5.85	.0001
Within	2209	346688/39	156.94		
Total	2213	350365.00			

Table 9 Results of Scheffe' Post Hoc Test on Question One

SCHEFFE

* Indicates significant differences which are shown in the lower triangle

		5	2	3	1	4
Mean	Level					
561.40	5					
562.40	2					
563.88	3					
564.79	1	*				
565.74	4	*	*			

Level 1 was shown to be statistically significantly higher than Level 2 and Level 4 was statitically significantly higher than Level 5.

Despite the fact that level of implementation added a statistically significant amount to the total variation in LEAP mathematics scores accounted for, its actual minute amount combined with the results of the ANOVA led the researcher to conclude that no educationally significant relationship existed between LEAP mathematics scores and level of implementation of lthe NCTM Standards.

Testing of Research Question Two

What is the relationship between students' LEAP mathematics scores and teachers educational attainment and years of experience when the effects of race of the students are accounted for?

Hierarchical regression was again employed. Table 4 again shows the results of the partial model with only the covariate race entered, while tables 10 and11 show the results of the regression run on the full model with the independent variables of teachers' educational attainment and years experience plus the interaction terms entered.

Table 10 Results of Full Model Regression--Question Two

Multiple R	.3245	R square change	F	Sig F	Source
R square	.1053	.00299	7.38	.006	Exper
F = 43.29	Sig F = .001	.00108	2.66	.102	Educ1
		.00016	.397	.528	Edu_Rac
		.00511	12.60	.0004	Exp_Rac
		.00054	1.32	.250	Exp_Edu
DF					
1					Regression
2212					Residual
2213					Total

Table 11 Betas for Full Model Regression--Question Two

Variable	β	t	Sig t
Race1	.0852	1.157	.2474
Educ1	-.172	-1.63	.1029
Exper	-.243	-2.71	.0066
Edu_Rac	.051	.631	.528
Exp_Rac	.339	3.55	.0004
Exp_Edu	.069	1.15	.250

As could be seen in tables 4 and 10, the Multiple R was statisitically significant in both the partial and full models. Again, this indicated that the correlations between the regression coefficients, the dependent variables, and the independent variables was not zero, and the analysis could proceed.

After step 1 in which race was entered into the equation, again approximately 9% of the variation in mathematics scores was accounted for. Following step 2 in which the

independent variable experience was added to the equation, an additional two-tenths of one percent of the variation in mathematics scores was accounted for. This was a statisitically significant addition. The full model, in which all independent variables and interaction terms had been entered showed that a total of approximately 10% of the variation in mathematics scores had been accounted for. This was also a statistically significant amount.

However, in further analysis of the results of the regression run for question two, evidence of a suppresser variable was found. Multiple runnings of the regression with different combinations of independent variables found the interaction term experience*race to be a suppressor variable. This meant that this interaction term was interpreted as one which enhanced the importance of other independent variables by its suppression of irrelevant variance in the dependent variable or in other independent variables. When variable experience*race was taken from the equation, indications of suppression were removed as was the significance of the amount of variation added by any of the independent variables of educational attainment and years experience. The variation accounted for by the covariate race remained unchanged and it was concluded that no statistically or educationally signficant relationship existed between LEAP mathematics scores and the independent variables educational attainment and years experience.

Testing of Research Question Three

What is the relationship between level of implementation of the Standards and teacher's number of years taught and educational attainment?

An attempt to answer question three was made using logit analysis. A three-way frequency analysis was performed to develop a logit model between teacher level of implementation and teacher characteristics. Predictors were educational background (graduate or undergraduate) and years of experience (1-7, 8-14, and 15 plus).

Eighty-nine teachers provided the data for this question. Pearson chi-square, an indicator of reasonable fit for observed to expected frequencies, was provided. It was determined that the model had adequate goodness of fit. Two measures of association were reported: entropy and concentration, .0546 and .0288 respectively. These figures indicated that no relationship between the dependent variable level of implementation and the predictor variables eduational attainment and years experience.

Discussion

Research Question One

What is the relationship between students' LEAP mathematics scores and teachers' levels of implementation of the NCTM Standards when the effects of the race of the students are held constant?

The results for the covariate race were quite clear. Race, or at least some unknown combination of variables with which race is very highly correlated, matters. A significant proportion of the variance, nearly 9%, in LEAP mathematics scores is attributable to race. This is more than statistically significant in the researcher's mind. It is somewhat disturbing that one variable, out of a list so large that they may never be fully cataloged, can account for nearly one-tenth of the variation in mathematics scores.

However, a comparison of the partial model (Race only in the equation) and the full model (Race, Level, and Level*Race) produced somewhat ambiguous results with regard to question one. It was obvious that the Multiple Rs for both the full and partial models were significant . What was not so clear was the interpretation of the fact that when level of implementation was added to the equation, its minute increase in variation explained in mathematics scores was significant. Also adding to the confusion was an examination of the dependent variable means at each level. A visual examination that revealed a negative correlation between LEAP mathematics scores and level of implementation was supported

by the results of an ANOVA performed on the LEAP means. It was concluded that additional, more influential factors were at work which were neither identified nor included in this study.

Zech (1989) found that instructional materials designed for the purpose of implementing learning strategies and activities recommended by the NCTM Standards had a statistically significnant impact on the mathematical achievement of high school consumer mathematics students. Hested (1991) found that games which met the NCTM Standards also had a statistically significant impact on third graders mathematics achievement. Finally, Christou (1993) found that instruction in problem solving according to the Standards had a statistically significant impact on sixth graders mathematical problem solving achievement. These studies addressed the direct impact of implemtation of particular recommendations of the NCTM Standards but did not investigate the level to which those interventions were implemented.

Research Question Two

What is the relationship between students' LEAP mathematics scores and teachers' educational attainment and years of experience when the effects of race of the students are accounted for?

As expected, after analysis of question one, the results of the partial model for question two again showed the significant factor race (or some unknown combination of variables it is highly correlated with) plays in predicting LEAP mathematics scores. Different in this analysis, however, was the issue of suppressor variables.

An initial examination of the output produced rather interesting results. The independent variable experience and the interaction term experience*race were shown to have made a significant addition to the variation accounted for. The other independent variable of primary interest in this question, educational background, added an amount of variation that was only marginally non-significant.

However, when the suppressor variable experience*race was removed from the equation and the regression run again, all three of these variables added amounts to the total variation explained that were statistically non-significant.

In light of this finding, the researcher concluded that the linear combination of teachers' experience, educational background, and the associated interaction terms do not add anything above and beyond the predictive ability of race on LEAP Fifth grade mathematics scores. This is not a necessarily troubling finding. If student mathematics scores were, at least in part, a function of teacher characteristics, then those students who were taught by teachers without the desirable characteristics would enter the test with an unfair handicap.

Research Question Three

What is the relationship between level of implementation of the Standards and teacher's number of years taught and educational attainment?

Logit analysis showed that there exists no significant relationship between teacher characteristics of educational attainment and years of experience and level of implementation of the Standards. The two measures of association entropy and concentration, which measure variance accounted for, only equaled five and two percent respectively--an inadequate figure according to Tabachnick and Fidell (1989). The insignificant amount of variance accounted for by even the larger of the two is what lead to the conclusion that there was no relationship among the variables in question.

CHAPTER V

SUMMARY, CONCLUSIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

Summary

This study, as its primary focus, examined the relationship between levels of implementation of the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards and Louisiana Educational Assessment Program fifth grade mathematics scores. Throughout the history of education, higher standards have been the battle cry whenever the populace thinks things are not going as well in the schools as they think they should be. Books are replete with examples of attempts, some good, some not so good, to hold our children to a higher standard and eliminate the mediocrity that occasionally springs up to threaten our very souls. More often than not, these attempts merely pay lip service to those who are making the call. The theory of "the squeaky wheel gets the grease" is often hard at work. Whether or not this is the case with the NCTM Standards remains to be seen.

The literature seems to indicate that the Standards are a worthwhile pursuit. This study, through a quantitative analysis of quasi-empirical data, has attempted to add to the body of knowledge regarding an effort which has received international attention and untold millions of dollars and hours of effort.

Statement of the Problem

The problem of the proposed study was the identification of the impact of national standards on student achievement.

Purpose Of The Study

The primary purpose of the study was to determine the relationship between levels of implementation of the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards and 5th grade Louisiana Educational Assessment Program [LEAP] math scores with the effects of the students' accounted for. Secondary purposes were: (1) to determine the relationship between student LEAP mathematics scores and the teacher characteristics of years of experience and educational attainment with the effects of the students' race accounted for and (2) to examine the relationship between teachers' levels of implementation of the standards and the before mentioned teacher characteristics of years of experience and educational attainment.

Research Questions

To carry out the purposes of this study, the following questions were examined:

1. What was the relationship between LEAP 5th grade mathematics scores and level of implementation of the NCTM Standards when race of the students is accounted for?
2. What was the relationship between LEAP 5th grade mathematics scores and teachers' number of years taught and educational attainment when the race of the students was accounted for.
3. What was the relationship between teachers' levels of implementation of the NCTM Standards and teacher characteristics of number of years taught and educational attainment?

The Population

The population was the 1994-95 academic year 5th grade public school teachers of record who were identified as being either a 5th grade regular education teacher or a 5th grade mathematics teacher from the entire state of Louisiana. This population consisted of 1,834 teachers. The students from whom LEAP test data were collected were those who

were taught 5th grade math in academic year 1994-95 by the teachers selected in a random sample of the population.

The Sample

The sample was randomly picked and consisted of approximately 14 percent of the population. This will gave a total sample size of 250. It was chosen from a master list that was provided by the Louisiana State Department of Education.

Procedures For Collection Of Data

The sample was chosen by using a table of random of numbers located in table 1 of the appendix in Yamane's Elementary Sampling Theory (1967). When the sample was identified, a questionnaire designed to identify level of implementation of the Standards was mailed to each teacher chosen.

A cover letter identifying the purpose of the study, instructions for responding, and measures taken to ensure confidentiality of response was included as well a self-addressed, stamped return envelope. A post card was sent to non-respondents three weeks after the initial mailing as a second request for their assistance. Two weeks after the post card, a second copy of the survey was sent to all non-respondents with a third request for response.

The second portion of data collection was procurement, from the Louisiana State Department of Education, of 1994-95 academic year 5th grade LEAP math scores. This information was provided by the Bureau of Pupil Accountability on computer disks.

Instruments

The instrument used to examine the first question was Section IV of the instrument developed by Esqueda (1993) [the levels survey]. Demographic information for examining question two was secured by using a modified version of Esqueda's Demographic Information document [the demographic document].

The levels survey had 25 items and used a 7-point Likert scale. Its intent was to assess the "state of innovation of the users"(p. 36).

Research Design

This study was primarily designed to determine the existence of a relationship between levels of implementation of NCTM's Standards and 5th grade LEAP math achievement when the effects of the students' race had been accounted for. The design also attempted to indicate whether there existed a relationship between student mathematical achievement and the teacher characteristics of number of years taught and educational attainment as well as between teachers' level of implementation of the Standards and the previously mentioned teacher characteristics. This was accomplished through survey research methodology.

The primary research question in this study had as its focus whether or not Louisiana fifth grade students, whose teachers were higher implementers of the Standards, tended to score higher on the mathematics portion of the LEAP than did their peers who had teachers that were lower implementers.

The LEAP test is a criterion-referenced test administered to fifth grade students (among other grades) in an attempt to assess their mastery of the skills thought necessary for progression to sixth grade. Indeed, the LEAP is a major part of Louisiana school progression plans. It was believed that providing evidence of the value of implementing the *Standards* would lend impetus to the research efforts into a topic which has received more attention and discussion than it has effort at assessing its true value.

Findings and Conclusions

Conduction of this study faced several trials which may, in the end, have prevented the researcher from obtaining a sample of adequate size to make the most valid conclusions possible. One was the design of the study. Mail generated data suffers from several faults,

not the least of which is the potential that data do not accurately reflect the true status of the respondent. Another major shortcoming was the survey response rate. When the final count was done, LEAP mathematics scores were provided on the students of only 75 of the 250 who were sent surveys. Had such a dismal response rate been anticipated, a larger sample would have been drawn.

The population of interest in this study was comprised of Louisiana fifth grade teachers who had taught math to the students taking the LEAP. The fifth graders' math scores were compared among five levels of implementation of the Standards. Findings of the hierarchical regression showed that, as anticipated, fifth grade LEAP math scores were, at least in part, a function of the race of the students--or at least some combination of variables with which race is highly correlated. When race was entered into the regression equation as co-variate, it was found that nearly nine percent of the variance in the scores was accounted for. This was a statistically significant finding and should serve as a wake-up call for those responsible for the education of children, not only of Louisiana, but nationwide. Unfortunately this is not new knowledge. The review of literature found countless citations pointing to research findings saying the same thing. If this study has done nothing else, it has added more evidence of the validity of those findings.

Question One

With regard to the main question asked, whether increased levels of implementation of the Standards was positively related to higher LEAP mathematics scores--the jury still seems to be out. The results of the regression showed that level of implementation did add significantly to the proportion of variance accounted for in LEAP mathematics scores. However, when the amount added--just over one tenth of one percent-- is thought about relative to the contribution of the covariate race, it is hard to imagine that this logically amounts to significant educational contribution.

Three situations, as the researcher saw it, were possible with respect to question one. The first was that the effect of the Standards was "strand specific"; the effect of a particular portion of the Standards was not dependent on implementation of other parts of the Standards. This was a most attractive proposition, particularly in light of the findings of this study. The second alternative was that unknown factors, in combination with race of the students, had more impact on LEAP mathematics scores than did level of implementation of the NCTM Standards. The third, and the one the researcher tended to believe, was a combination of the first two. He believed that the Standards were "strand specfic" with respect to effect of mathematical achievement and also that race and some combination of unknown variables played a significant role in predicting LEAP mathematics scores.

The final conclusion was that an educationally significant relationship did not exist between LEAP mathematics scores and levels of implementation of the NCTM Standards. This was not, however, an indictment of the Standards nor a recommendation that they not be used. To the contrary, enough literature has been published to indicate that implementing the NCTM Curriculum and Evaluation Standards is a worthwhile endeavor.

Question Two

A second question asked whether the was a relationship between student LEAP mathematics scores and selected characteristics of their teachers. Teachers' educational attainment (undergraduate / graduate) and years of experience (early / mid / later) were the variables examined. The bottom line was that these variables were not statistically significant with regard to this question. One would naturally assume that the more experienced teacher with more education would be able to better facilitate student achievement, but this was not the case. There was a moderate correlation between experience and educational attainment (.42), but the regression equation simply did not support logic in this case. Once again, the covariate race played a significant role in

answering this question. Precisely, as in the first question, approximately nine percent of the variation was attributable to race of the students.

Perhaps the fact that no statistical significance was found in this regression analysis was more important than if it had been. It indicated that student achievement was, in this study at any rate, probably not a function of teacher experience and educational attainment. This was, in the researcher's opinion, the way it should have been. A student should not have to enter the test with any more handicaps than can be possibly avoided. This did not, however, hide the bottom line finding of this study. There is a statistically significant relationship between the race of the students and mathematics achievement . If the LEAP results are not affected by race per se, then it is most assuredly affected by some combination of variables with which race is very highly correlated. One of the unfortunate truths in education is that true experimental research is a level of assurance which we probably will never achieve. The students simply bring so many variables with them to the school environment that we as teachers can rarely even identify much less affect them.

Question Three

The third question examined by this study was whether a relationship existed between level of implementation of the Standards and the previously mentioned teacher characteristics of educational attainment and years of experience. The basic idea behind this question was that if one could devise a model for predicting where a teacher would likely be on the implementation scale, then appropriate staff development could be devised to assist them in the efforts to implement. The answer however, in this instance, was a resounding no. Logit analysis of the categorical variables provided data that strongly suggested the fact that no meaningful relationship existed.

Recommendations for Further Research

This study asked one primary question: Is there a relationship between LEAP 5th grade mathematics scores and teachers' level of implementation of the NCTM Standards. The answer to this question must be a qualified "no". This question was answered in the negative because no hard, fast results were obtained that pointed squarely at the utility of the variables of interest to this study in predicting student achievement. The answer had to be qualified due to the fact that there was some evidence, contradictory as it may have seemed, of the relationship between level 4 of implementation of the Standards and higher LEAP mathematics scores.

In light of the findings of this study, the following recommendations are made:

1. It is imperative that the Louisiana Department of Education further investigate the way that race of the students is related to LEAP mathematics scores. This study is by no means an indictment of their program but, as stated, it should serve as a red flag that something is not right.
2. Further research into the relationship between the degree to which the NCTM Standards are being implemented and math achievement should be done. It would be foolish indeed to assume that all teachers are using the Standards to the same degree. A basic question to answer would be whether students receiving instruction the via the Standards, if indeed they have an effect on achievement, are being given an unfair advantage over students who, through no fault of their own, and stuck with the antiquated pedagogical methods of the past.
3. Finally, a concentrated effort should be undertaken to determine whether teachers even have a desire to implement the Standards if given the opportunity. If not, then a great deal of money, time, and effort will have been expended in an attempt to change for change's sake.

APPENDIX A

SURVEY COVER LETTER

Greg Jones
1507 Bittersweet Avenue
Ruston, Louisiana 71270

April 3, 1996

Dear Colleague:

I need your help! I am a former Bienville Parish 5th grade teacher and currently a doctoral candidate at the University of North Texas. I am conducting a research project, the purpose of which is to attempt to determine the existence of a relationship between levels of implementation of the National Council of Teachers of Mathematics' *Curriculum and Evaluation Standards* and LEAP 5th Grade Math Scores.

Enclosed with this letter is a questionnaire that asks a variety of questions about implementation of the NCTM *Standards*. After analyzing your responses I will determine the degree to which the *Standards* are being implemented. Next, I will compare teacher responses to students' LEAP mathematics scores and attempt to identify a relationship between the two. The purpose is to provide evidence that supports (or perhaps contraindicates) implementation of the NCTM *Standards*. Also enclosed is a form requesting class and demographic data. The class information will be used to help ensure the validity of the study. The demographic information will be used in an attempt to determine whether an accurate prediction of teachers' levels of implementation of the *Standards* can be made.

I can not complete this project without your help. Please give me 15-20 minutes of your time and complete the attached survey and class/demographic information request and return them in the enclosed self-addressed, stamped envelope. Your response is completely voluntary and your responses will be kept strictly confidential. You subject yourself to no penalty by refusing to participate.

The code at the top of the survey will be used to match responses with students' LEAP mathematics scores. The list with identification codes and teacher names will be kept strictly confidential and will be accessed by no one other than myself. When the project is completed, the surveys will be destroyed.

If you would like to receive a summary of my findings at the conclusion of the project, please so indicate on the demographic information form. Please contact me at 318-255-4822 if you have questions regarding this request for information.

Sincerely,

Greg Jones

This project has been approved by the University of North Texas Committee for the Protection of Human Subjects

APPENDIX B

SURVEY

LEVELS OF USE QUESTIONNAIRE

For each statement below, "innovation" refers to the Curriculum and Evaluation Standards for School Mathematics (NCTM Standards). The purpose of this section is to determine various states of use, i.e., what the user is doing during the innovation-adoption process. For the items of which you have little or no knowledge, mark "0". Increasingly greater numbers indicate increasingly more knowledge.

For Example

This statement is very true of me at this time	0	1	2	3	4	5	6	**7**
This statement is somewhat true of me now	0	1	2	3	**4**	5	6	7
This statement is not at all true of me at this time	0	**1**	2	3	4	5	6	7
This statement seems irrelevant to me	**0**	1	2	3	4	5	6	7

Please respond to the items in terms of degree of your current use of the NCTM Standards or potential adoption of the Standards by circling the appropriate number.

Levels of Use Items

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Irrelevant	**Not true of me now**		**Somewhat true of me now**			**Very true of me now**	

1. Little preparation is being given to implementation of the Standards.....	0	1	2	3	4	5	6	7
2. I am using the Standards in coordination with other teachers	0	1	2	3	4	5	6	7
3. I do not see in the near future my learning anything about the Standards.....	0	1	2	3	4	5	6	7
4. I am not really sure what I will be doing with the Standards later this year, or what its effects are or will be.....	0	1	2	3	4	5	6	7
5. I am developing intermediate and long-range plans to anticipate possible and needed steps to implement the Standards.....	0	1	2	3	4	5	6	7
6. I am looking at materials pertaining to the Standards and was considering using them in the future.....	0	1	2	3	4	5	6	7
7. I am going to start using the Standards next semester	0	1	2	3	4	5	6	7
8. I am planning for logistic, time, management, resources, related primarily to immediate ongoing use of the Standards.....	0	1	2	3	4	5	6	7

Levels of Use Items (Cont'd)

0 Irrelevant	1	2 Not true of me now	3	4 Somewhat true of me now	5	6 Very true of me now	7

9. I am using the Standards with modifications.....	0	1	2	3	4	5	6	7
10. I am spending time and energy collaborating with others about using of the Standards.....	0	1	2	3	4	5	6	7
11. We have done evaluations, but all the feedback has been good, so we really have not made any changes based on feedback.....	0	1	2	3	4	5	6	7
12. I am not using the Standards and have no plans to.....	0	I	2	3	4	5	6	7
13. I am seeking information and resources related to preparation for use of the Standards in my own setting.....	0	1	2	3	4	5	6	7
14. I have attended a workshop or sat in on a class in which teachers were using the Standards.....	0	1	2	3	4	5	6	7
15. I am looking through all these materials, attending workshops and getting organized to use the Standards	0	1	2	3	4	5	6	7
16. I am trying to master the tasks required to use the Standards often resulting in disjointed and superficial use.....	0	1	2	3	4	5	6	7
17. Most of my effort is going into organizing materials and keeping things going as smoothly as possible every day.....	0	1	2	3	4	5	6	7
18. I am making changes in use of the Standards in coordination with others.....	0	1	2	3	4	5	6	7
19. I discuss some of the things that seem to be working best with my students and I am changing others that are not as effective as I would like.....	0	1	2	3	4	5	6	7
20. I am considering or exploring new ways that could be used to implement the present Standards.....	0	1	2	3	4	5	6	7
21. I have heard of the Standards, but at this time I am not interested in learning any more about them.....	0	1	2	3	4	5	6	7

Levels of Use Items (Cont'd)

0	1	2	3	4	5	6	7
Irrelevant	Not true of me now		Somewhat true of me now			Very true of me now	

22. I have been familiarizing with other departments or persons with the progress of the Standards.....	0	1	2	3	4	5	6	7
23. I have set aside time every week for studying materials about the Standards and talking to people about the possibility of using them.....	0	1	2	3	4	5	6	7
24. I am exploring and experimenting with alternative combinations of the Standards with existing practices	0	1	2	3	4	5	6	7
25. I have made few and little changes in ongoing use of the Standards.....	0	1	2	3	4	5	6	7

PLEASE REMEMBER, THIS INFORMATION WILL BE KEPT CONFIDENTIAL

APPENDIX C

DEMOGRAPHIC INFORMATION

CLASS AND DEMOGRAPHIC INFORMATION

Please indicate the most appropriate response to the following:

1. Did you teach mathematics to the class or classes to which you administered the mathematics portion of the 1994-95 Louisiana Educational Assessment Program? (check one)

_____YES _____NO

2. The number of years that I have taught, NOT including this year is (check one):

_____1-4 _____5-9 _____10-14 _____15-19 _____20+

3. As of April, 1995 the highest degree I had earned was (check one):

_____Less than a Bachelor's

_____Bachelor's

_____Bachelor's plus graduate credits

_____Master's

_____Master's plus graduate credits

_____Doctorate

4. Gender (check one):

_____Female

_____Male

5. Mathematics/mathematics education was undergraduate (check one):

_____Major

_____Minor

_____Neither major nor minor

6. A small portion of those responding will be chosen for a follow-up interview. Please indicate in the space provided, a phone number and best time for this short but very important interview.
(approximately 10 minutes)

Phone number (with area code)_____

Best time for contact_____

APPENDIX D

INTERVIEW DOCUMENT

INFORMAL INTERVIEW

NO 0

YES I

Are you currently looking for information about the *Standards*?

NO

LoU 0, I, II

Have you decided to use it and set a date to begin use?

YES II

NO

Start Here | **Are you using the *Standards*?**

YES

LoU III, IVA

IVB, V, VI

What kind of changes are you making in your use of the *Standards*?

USER ORIENTED III

NONE OR ROUTINE IVA

IMPACT ORIENTED

Are you coordinating your use of the *Standards* with other users, including another not in your original group of users?

NO

YES

Are you planning on exploring new ways to implement the Standards? Do you think NCTM should review the *Standards*?

NO

YES

IVB

VI

Are you planning on exploring new ways to implement the *Standards*? Do you think NCTM should review the Standards?

NO

YES

V

VI

Note: Adapted from Measuring Levels of Use of the Innovation: A Manual for Trainers, Interviewers, and Raters by S.F. Loucks, B.W. Newlove, and G.E. Hall, Texas: The Research and Development Center for Teacher Education, 1975 by Elio Esqueda (1993)

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