4-27-2000

Impact of the implementation of the New Jersey Core Curriculum Content Standards on time allocation for elementary mathematics instruction

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IMPACT OF THE IMPLEMENTATION OF THE NEW JERSEY CORE CURRICULUM CONTENT STANDARDS ON TIME ALLOCATION FOR ELEMENTARY MATHEMATICS INSTRUCTION

by
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A Thesis

Submitted in partial fulfillment of the requirements of the
Masters of Arts Degree
of
The Graduate School
at
Rowan University
May 2000

Approved by _____
Professor

Date Approved 4/27/00

Abstract

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Survey of Allocated Time for Elementary Mathematics Classes since the Implementation of the New Jersey Core Curriculum Content Standards.
May 2000
Dr. Eric Milou, Thesis Advisor
Masters Degree in Mathematics Education

The purpose of this study was to investigate the implementation of the New Jersey Core Curriculum Content Standards for mathematics instruction three years after their approval by the State Board of Education. A survey methodology was used. The survey was mailed to the New Jersey school districts that include an elementary school. In addition to demographic information, the districts were asked how much time is allocated to mathematics instruction daily. The districts were also asked how much time is spent in direct instruction, in seatwork, and in problem solving each day, and has there been a change over the last three years. And the districts were asked if they have revised their mathematics curriculum to reflect the mathematics Standards.

The findings indicate that the amount of time allocated daily may have declined since the last federal survey conducted in the state. The findings also indicate that districts are using more cooperative learning and problem solving strategies in their mathematics instruction. Time in seatwork has decreased but time in direct instruction has not changed. The length of the school day has remained constant. Finally, a majority of districts have revised their curriculum to implement the Standards.

Mini-abstract

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May 2000
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This study investigated the implementation of the New Jersey Core Curriculum Content Standards for mathematics instruction three years after their approval. The findings indicated that the amount of time allocated to mathematics instruction has declined, but districts are spending more time on problem solving, seatwork has decreased, and direct instruction has not changed.

Acknowledgements

I wish to express my gratitude to my husband, Charles, whose unfailing support, ability to edit, and knowledge of the education community have been invaluable to me from the inception of this project to the final dotted "i." Thank you also to Randee Smith and Cindy Pache, who are also teachers at Hammonton High School, and whose chance conversation one day gave direction to this study. Thank you to all of the superintendents of schools and their staff members who read my cover letter and took time to complete, and return, the survey.

And finally thank you to Dr. Eric Milou, my thesis advisor. Your patience and positive reinforcement have been very important every step of the way.

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Introduction

Background

The more time students spend doing mathematics successfully the more likely they are to learn mathematics. Fisher, Berliner, Filby, Marliave, Cahen, and Dishaw (1980) found that the amount of time teachers allocate to instruction in a particular curriculum content area is positively associated with student learning in that content area.

How much time is being allocated to mathematics instruction in New Jersey's elementary classrooms? The New Jersey Mathematics Core Curriculum Content Standards (Standards) were adopted on May 1, 1996. The New Jersey Mathematics Curriculum Framework (Framework) was written based on these Standards, and was adopted by the New Jersey State Board of Education in December 1996. The Standards and the Framework call for major changes, both in terms of what mathematics will be taught, and how it will be taught. The Standards describe what all students should know and be able to do upon completion of a thirteen-year education. The Framework describes what a high-quality mathematics education should comprise for all New Jersey students, from kindergarten through grade 12.

> Central to these standards is the development of mathematical power for all students, including the ability to explore, conjecture, and reason logically; to solve nonroutine problems; to communicate about and through mathematics; to connect ideas within mathematics and between mathematics and other intellectual activity. Mathematical power includes the development of self-confidence and a disposition to seek, evaluate, and use quantitative and spatial information in solving problems and in making decisions. Students' flexibility, perseverance,

> interests, curosity, and inventiveness also affects the realization of mathematical power (Rosenstein, Caldwell, & Crown, p. 551).

The amount of time allocated daily for mathematics in our elementary classrooms is an important factor in attaining these goals.

Historically there have been many efforts to bring about improvements in mathematics education, and education in general. Initiatives to improve education in America have ebbed and flowed around public education since Colonial days. Reform initiatives accelerated following the launch in 1957 of the Russian satellite, Sputnik. Public education was poked, prodded, and examined under a microscope and, as a result, more reforms followed in the 1960s, 1970s, and 1980s. Following the publication of *A Nation at Risk* in 1983, national panels were formed to address the issue of the quality of education in the United States. It was at that time that Americans began to realize that we had lost our superiority in world markets and that our educational achievement was mediocre at best when compared to other countries (House, 1987). With so many reform efforts in the history of mathematics education, it would not be surprising to find some lag time before the implementation of the newest reform requirements. Arvidson (1997) found that while many public school mathematics departments were aware of the NCTM guidelines, there was a gap in their subsequent implementation.

Statement of Problem

This study attempts to evaluate the implementation of the Standards on the basis of time allocated for mathematics instruction in our elementary classrooms. Standard 17

of the Mathematics Curriculum Framework outlines as one of it Keys to Success:

> Engagement in mathematics should be expected of all students, and the learning environment should be where students are actively involved in doing mathematics. Challenging problems should be posted and students should be expected to work on them individually and in-groups, sometimes for extended periods of time, and sometimes on unfamiliar topics. They should be encouraged to develop traits and strategies – such as perseverance, cooperative work skills, self-assessment, self-confidence, decision-making, and risk-taking – which will be key to their success in mathematics (Rosenstein, 1996, p. 551).

Implementation of these Mathematics Standards will necessitate a significant commitment of instructional time for mathematics and a re-thinking of just how that instructional time is spent.

Research Questions

The implementation of the Standards and the Framework will dictate major changes in both the mathematics curriculum and the methods of instruction. This research is to identify if there have been changes in elementary mathematics classrooms since the adoption of the Standards and the Frameworks. Specifically, (1) has the amount of time allocated to mathematics instruction changed, (2) how is the time allocated to mathematics instruction spent, and (3) is there a difference among the districts based on demographic considerations?

Need for the Study

The National Center for Educational Statistics (NCES), which is part of the

U. S. Department of Education, Office of Educational Research and Improvement, is charged with the responsibility of collecting, analyzing, and reporting data related to education in the United States. In February of 1997 the NCES released a report entitled, "Time Spent Teaching Core Academic Subjects in Elementary Schools: Comparisons Across Community, School, Teacher, and Student Characteristics." The NCES collected data during the years of 1987-88, 1990-91, and 1993-94 from public and private schools across the country. The NCES surveyed teachers of grades 1 through 4, and their school principals. Perie, Baker, Bobbit (1997), the authors of the NCES report, state that by comparing data from school years 1987-88 to 1990-91 to 1993-94, they were able to discern whether changes had occurred in the proportion of school time spent teaching the core curriculum over the time period of the study.

Two of the findings of the report, "Time Spent Teaching Core Academic Subjects in Elementary Schools: Comparisons Across Community, School, Teacher, and Student Characteristics" are of particular interest:

- Public school teachers of grades 1-4 spent approximately 68 percent of their school time, or almost 22 hours per week, on core curriculum. The teachers spent approximately 16.2 percent of that time on Arithmetic/Mathematics, or approximately 5.2 hours per week (Perie, 1997, p. 8).
- Although new standards of excellence were implemented in the late 1980s and early 1990s, the percentage of school time spent on core curriculum in grades 1-4 remained relatively unchanged from 1987-88 to 1993-94 (Perie, 1997, p.10).

The NCES reported that the national average school week was 32 hours per week. The NCES also reported that for New Jersey, elementary teachers in New Jersey spent 21.7 hours of our 29.9-hour school week on core curriculum, which is 72.2 percent of available time. This use of time ranked New Jersey fifth in the nation for percent of time spent on core curriculum.

Although the results were published in 1997, the NCES survey was conducted two years prior to the adoption of the New Jersey Core Curriculum Standards and the New Jersey Mathematics Curriculum Framework. Since the adoption of the Standards and the Framework, what changes have occurred in Mathematics instruction in New Jersey elementary classrooms?

Limitations

The limitations of this study are those that are normally associated with a mail survey. There is the possibility of an insufficient response to the survey, the timeliness of the respondents, the timeline for completion of the thesis, and the honesty of the responses. Another limitation of a mail survey is the lack of follow up by observation in actual elementary classrooms.

Definition of Terms

Allocated time – The total time designated for instruction on arithmetic or mathematics instruction during the school day is allocated time.

Direct Instruction – All teacher-led instructional activities are direct instruction.

Seatwork – Traditionally seatwork is the independent practice completed by students at their desks with little or no interaction with their teacher.

Problem Solving – A problem is a situation, quantitative or otherwise, that confronts an individual or group of individuals, that requires resolution, and for which the individual sees no apparent or obvious means or path to obtaining a solution. Problem solving emerges as a process. It [problem solving] is the means by which an individual uses previously acquired knowledge, skills, and understanding to satisfy the demands of an unfamiliar situation. (Krulik & Rudnick, 1996, p. 3)

School day – For the purposes of this study the school day shall mean the total amount of time that the school is in session for students.

Chapter Two

Review of Literature

The National Center for Educational Statistics is conducting a longitudinal study of time spent teaching the core academic subjects in elementary schools across the nation. Perie, Baker, and Bobbitt (1997) reported after the 1993-94 study that public school teachers of grades 1 – 4 spent approximately 68% of the school week teaching core curriculum, or about 22 hours a week. About one-fourth of the time, or approximately 5.2 hours per week, was spent on Arithmetic/Mathematics. Perie et al. (1997) found that the amount of time spent on core curriculum subjects has remained relatively constant over the three years of the study – 1987-88, 1990-91, and 1993-94.

In spite of numerous calls for reform in education and new standards of excellence of the late 1980s and the early 1990s, the amount of time spent teaching the core subjects of English, Language Arts, Reading, Mathematics, Social Studies, and Science remained constant (Perie, 1997). An expectation has emerged among the public and the educational community alike that the best schools are the ones that spend the most time teaching the core academic subjects (National Commission on Excellence in Education, 1983). If teachers could spend more time teaching the core subjects, many believe that students would have a better opportunity to learn the skills necessary to compete in the international job market (Perie, 1997). Particularly in mathematics,

educators surveyed have express concern that too little time is allocated for teaching mathematics (Al-Tammar, 1991).

We are reminded "the best time to learn mathematics is when it is first taught, and the best way to teach mathematics is to teach it well the first time " (Everybody Counts, 1987, p. 13). Several studies have shown that instruction in the core academic subjects at the earliest level is important, and that exposure to subjects at the elementary level is related to courses taken at the secondary level. The more content they are taught early in elementary school, the more students learn, and consequently the better they perform on later achievement tests (Everybody Counts, 1987).

The Mathematics Curriculum Framework (1996) outlines teaching behaviors that would advance the teaching of mathematics much closer to the goal of "teaching it well the first time." Teachers are encouraged to create regular opportunities for students to work in groups on mathematical tasks, to work cooperatively with other students, to ensure ample time for the students to think through a problem, to allow time to study a few topics in depth.

The Professional Standards for Teaching Mathematics (1991) proposed by the NCTM paints a picture of what mathematics classrooms need to become. These Standards envision five major shifts:

> First, toward classrooms as mathematics communities – away from classroom as simply a collection of individuals. Second, toward logic and mathematical evidence as verification – away from the teacher as the sole authority for right answers. Third, toward mathematical reasoning – away from merely memorizing procedures. Fourth, toward conjecturing, inventing, and problem solving – away from an emphasis on mechanistic answer finding. Fifth, toward connecting mathematics, its ideas, and its applications - away from treating mathematics as a body of isolated concepts and procedures (NCTM, 1991, p. 3).

As early as 1980, the NCTM in its Agenda for Action recommended that teachers use diverse instructional strategies, materials, and resources. This organization further recommended that teachers use small group as well as large group work, that they provide for opportunities for discovery and inquiry as well as basic drill, and that lessons use manipulatives to illustrate or develop a concept or skill.

In another study, Watts (1991) found that elementary school teachers and principals agreed with reform movements that current content and instructional emphases in mathematics should be changed from computational to problem-solving based so that students' higher-level thinking and reasoning skills may be developed. Furthermore, Suydam (1987) tells us that the most effective teachers are those who provide many examples. She also identifies as effective teachers those who ask many questions to give students opportunities to participate actively, who pose many questions that require an explanation, who divide seatwork into smaller assignments, and who provide many opportunities to practice both new and already taught material.

Similarly, the National Council for Accreditation of Teacher Education, in their Program Standards for Elementary Teacher Preparation, states:

> Research has discovered a great deal about effective teaching and learning: We now that students learn best when new ideas are connected to what they already know and have experienced; when they are actively engaged in applying and testing their knowledge using real-world problems; when their learning is organized around clear, high goals with lots of practice reaching them; and when they can use their own interests and strengths as springboards for learning (p. 6).

If we are to implement the teaching behaviors identified in particular in the Standards and the Framework, it will necessitate a reconsideration of how time is allocated for mathematics instruction in the elementary classroom. The importance of time to learning was recognized for more than a century by many educators who have

carried out many descriptive studies designed to determine how school time was being allocated to different subjects (Borg, 1980).

How is time spent in an elementary classroom? Rosenshine (1980) looked at the time students spent engaged in mathematics activities. He found that seatwork and students working alone remained a dominant pattern. Approximately seventy-five percent of the time that students were doing math was spent as seatwork or working alone. And when students are judged to be "poor" in mathematics, they are given even more practice and less time for exploration. While students judged to be "good", were given time to explore and discuss ideas (Romberg, 1983).

Evidence from many sources, national and international, shows that the least effective mode for mathematics instruction and learning is the explain-practice pattern that is found in many mathematics classrooms (Agenda for Action, 1980, Everybody Counts, 1987, Lo, Wheatley, and Smith, 1994, Suydam, 1987). Presentation and repetition help students do well on standardized tests and for tasks involving lower-order skills, but they are generally ineffective as teaching strategies for long-term learning, for higher-order thinking applications, and for creative problem-solving (Everybody Counts, 1987).

Several researchers have found that the amount of time teachers allocate to instruction is positively associated with student learning. They also found that increases in engaged time are not associated with more negative attitudes toward mathematics (Fisher, 1980; Rosenshine, 1980; Suydam, 1987). But the teachers who have to implement the Standards could have some trouble. Prawat (1992) reports:

> If teachers are to alter their teaching of mathematics, they may need to re-examine a whole network of beliefs extending far beyond their views about the craft of

> teaching, narrowly defined; they may need to change their views about the nature of knowledge and how one acquires that knowledge (p. 210).

Slavin (1997) points out that any educator or school reformer knows that important changes in student performance only come about if teachers consistently use better methods and materials each day. This change requires large amounts of high-quality professional development and a process of school change unfolding over a period of years.

The NCTM's Professional Standards for Teaching Mathematics (1991) agree that for teachers to be able to change their role and the classroom environment, administrators, supervisors, and parents must expect, encourage, and support the kind of teaching described in these standards. Teachers cannot respond simultaneously to several different calls for change. Change is difficult, and will necessitate an extended time for training and practice.

Calliari and Ivory (1994) identified the paradox of educational reform, that teachers are seen as a cause of some of our educational problems, and at the same time they are seen as our hope for reform. We must acknowledge that what teachers know and do is the most important influence on what students learn (NCATE, 1998).

It comes down to a question of time. The Office of Educational Research and Improvement (1996) tells us that time is pervasive, time crops up when you thought that you were focusing on other things. And when time is considered, a question to be answered is when are the Standards being implemented? Arvisdon (1997) used a random survey of mathematics departments of 310 high schools to determine how they had aligned themselves with reform beliefs and practices. He found that the majority of

mathematics departments were aware of the NCTM guidelines, but that there was a gap in their subsequent implementation. In contrast, Petrella (1991) found that approximately fifty percent of the teacher and administrator respondents to his survey admitted to no knowledge of the major recommendations of the NCTM Standards.

Which may explain why the New Jersey Mathematics Coalition has asked its members to complete a questionnaire on how the implementation of the Standards is progressing in their school or district. The Coalition asked how the members' schools or districts have implemented the Standards, and what the Coalition and the State Department of Education can do to assist the local school districts to implement the Standards (Coalition Newsletter, 1999). At this writing, the results of this survey were not available.

Chapter Three

Methodology

This study uses a survey to determine the amount of time allocated to mathematics instruction in the elementary classrooms of New Jersey, as well as how that time is spent. Appendix A contains a copy of the survey. The purpose of the survey is an attempt to evaluate the implementation of the New Jersey Core Curriculum Content Standards on the basis of time allocated for mathematics instruction and how that time is used.

Through this study all New Jersey elementary school districts were requested to participate in a survey to determine the amount of time allocated daily in elementary classrooms for Mathematics instruction. Questions were designed to determine how implementation of the Standards and the Mathematics Curriculum Framework has impacted the time allotted to mathematics instruction and instruction methods in elementary school classrooms. The report on survey results will not identify responding districts, to encourage the respondents to be honest in their responses.

A cover letter and survey were mailed to the Superintendent of every elementary and K-12 district in the state. The cover letter asked for their participation in this study, and assured them that the report on the results would not identify any responding districts. Appendix A contains a copy of the cover letter. The survey contains fourteen questions designed to obtain information on the amount of time and use of time allocated

for mathematics instruction in New Jersey elementary school classrooms, as well as demographic information.

There are certain limitations inherent in a mail survey. First, there is the element of time. What if insufficient responses are returned by my deadline? Second, is the identification of the appropriate respondent, should it be the local Superintendent, or the Curriculum Coordinator, or both. Third, is the question of the honesty of the responses, which is an important issue for a mailed survey. Since the report on the survey response is designed to be a general discussion of the results without identifying any of the respondents, it was hoped that the respondents would answer the questions honestly.

Chapter Four

Introduction

This study evaluated the implementation of the Core Curriculum Content Standards for mathematics instruction in the elementary classrooms of New Jersey. The evaluation was based on two factors – first how much time is allocated for mathematics instruction each day, and second, how is that time used. The time frame being evaluated for change was the three years since implementation of the Standards.

Demographic Results

The survey was mailed to every school district in New Jersey that includes an elementary school. Appendix A contains a copy of the cover letter and of the survey used. There are 148 districts in the Southern Region, 163 districts in the Central Region, and 190 districts in the Northern Region meeting this criterion. The survey was sent to the superintendents of these 501 school districts. Two hundred and six districts, more than 41%, responded to the survey in time to be included in the analysis. The responses were grouped by region and the response rate for each region was calculated. The information is contained in Table 1. The results by regions show a strong response from the Southern region school districts. Appendix B contains a map of New Jersey and identification of counties by region.

Respondents were requested to classify their districts by grade range as either

K-12, K-8, or K-6. Table 2 follows with the percentages of the responses to this question. The majority of the districts responding were K-8 districts.

Table 1. Identification of the response rate by region.

Region	Number of Districts	Number of Responses	Percent of Response
Southern	148	82	55%
Central	163	63	39%
Northern	190	61	32%

Table 2. Response to question on classification of districts by grade range.

Grade Range	Number	Percent
K-12	80	39%
K-8	88	43%
K-6	29	14%
Other	9	4%

The respondents were asked to identify their student population, using the following ranges: less than 500, from 500 to 999, from 1000 to 1999, from 2000 to 2999, and more than 3000 students. Table 3 follows with the percentages of the responses of this question. The highest percentage, 28%, of the respondents was districts with student populations of less than 500 children. The next highest student population, 23%, was the largest category of more than 3000 children.

The respondents were asked to identify their districts as rural, suburban, or urban. Additionally, four districts classified themselves as either rural/suburban or as suburban/urban. Table 4 follows with a breakdown of these responses. A clear majority of the respondents identified their districts as suburban.

Table 3. Response to question on classification by student population.

Range	Number	Percent
Less than 500	57	28%
500 to 999	37	18%
1000 to 1999	39	19%
2000 to 2999	24	12%
more than 3000	47	23%

Table 4. Response to question on identification by district population.

Type	Number	Percent
Rural	59	29%
Suburban	117	57%
Urban	26	13%
Dual	4	2%

* Due to rounding, the sum of percents does not equal 100.

There are thirty districts in New Jersey that are classified as Abbott districts, and are considered to be special needs districts. Ten of these districts responded to the survey. Table 5 follows with a breakdown of the responses to this question.

The typical respondent district was a suburban district with less than 500 students in Kindergarten through eighth grade, and in the southern region of New Jersey.

Table 5. Response to question on Abbott district status.

Response	Number	Percent
No	198	95%
Yes	10	5%

Instructional Results

Superintendents of schools were asked to provide information on the allocation and use of time for mathematics instruction in the elementary classrooms of their district. First, they were asked how much time (in minutes) is allocated daily for mathematics instruction. Table 6 shows the response to the question of how much time is allocated daily. The responses were tallied into convenient time periods. Two-thirds of the districts responding to the survey reported that they either allocate 40 to 49 minutes, or 60 to 69 minutes. A total of 88% of the responding districts fell into three time categories – 40 to 49 minutes, 50 to 59 minutes, or 60 to 69 minutes.

The daily average of the all responses to this question was determined, approximately 51.7 minutes, and then multiplied by five days. The result was that only 4.3 hours are allocated to mathematics instruction during a five-day period. This differed considerably from the national average of 5.2 hours weekly, which was reported by Perie (1997). The New Jersey Mathematics Coalition issued a report in 1997, entitled Are We Measuring Up?, in which the U. S. Department of Education's School and Staffing Survey (SASS) data for 1994 is quoted. The SASS identified the hours of mathematics per week as 5.6 hours for grades 1-3, and 5.4 hours for grades 4-6. Using this result, it appeared that the amount of time allocated to mathematics instruction in elementary classrooms in New Jersey might have decreased in the last three years.

Second, the superintendents of schools were asked, of the time spent daily on mathematics instruction, approximately how much time (in minutes) is spent on direct instruction. For the purposes of the survey, direct instruction was defined as teacher-led instructional activities. Table 7 identifies the number of responses tallied into time

Table 6. Response to the question of how much time is allocated daily for arithmetic/mathematics instruction.

Time Period	Number	Percent *
30 to 39 minutes	2	1%
40 to 49 minutes	69	33%
50 to 59 minutes	46	22%
60 to 69 minutes	69	33%
70 to 79 minutes	7	3%
80 to 89 minutes	5	2%
90 to 120 minutes	3	1%
No Response	5	2%

* Due to rounding, the sum of the percents does not equal 100.

periods. Seventy-five percent of the respondents reported that they spend from 15 minutes to 45 minutes in direct instruction. But more than half of those respondents fell into two categories, either 20 to 25 minutes or 30 to 35 minutes. The superintendents of schools were also asked if the time spent on direct instruction is an increase, decrease or no change from three years ago. Table 8 identifies the type and percent of change over the last three years in the amount of time spent on direct instruction. Nearly half of the respondents reported no change in the amount of time allocated daily for direct instruction.

Third, the superintendents of schools were asked, of the time spent daily on mathematics instruction, approximately how much time (in minutes) is spent on seatwork. For purposes of the survey, seatwork was defined as independent practice completed by students with little or no interaction with their teachers. Table 9 identifies the number of responses tallied into time periods. Most of the responses, one hundred

Table 7. Response to the question of how much time is allocated daily for direct instruction of arithmetic/mathematics.

Time Allocated	Number of Responses	Percent*
10 minutes	1	0%
15 minutes to less than 20 minutes	14	7%
20 minutes to less than 25 minutes	53	26%
25 minutes to less than 30 minutes	23	11%
30 minutes to less than 35 minutes	42	20%
35 minutes to less than 40 minutes	15	7%
40 minutes to less than 45 minutes	13	6%
45 minutes	10	5%
50 minutes to 55 minutes	4	2%
60 minutes	2	1%
70 minutes	1	0%
80 minutes	1	0%
Varies	15	7%
No response	12	6%

* Due to rounding, the sum of the percents does not equal 100.

Table 8. Response to the question of change in time allocated for direct instruction during the last three years.

Change	Number	Percent
Increase	49	24%
Decrease	32	16%
No Change	100	49%
No Response	25	12%

and forty three, or 69%, fell into a broad time period of 10 minutes to less than 25 minutes. They were also asked of the time spent on seatwork, is this an increase, decrease or no change from three years ago. Table 8 identifies the type and percent of change over the last three years in the amount of time spent on seatwork. Nearly half reported no change, but of those reporting a change, an overwhelming majority reported a decrease in the time spent on seatwork. However, there seemed to be some confusion

over the definition of seatwork. Several respondents noted that they were including time in cooperative groups in their seatwork response. Other respondents called the seatwork their students do guided practice. Another district stated that their students do not do "traditional" seatwork, and then listed a series of seatwork activities that actually fit into the problem-solving category of activities. Several districts stated that seatwork in their schools included "hands-on activities."

Table 9. Response to the question of how much time is allocated daily for seatwork.

Time Allocated	**Number of Responses**	**Percent**
Less than 5 minutes	2	1%
5 minutes to less than 10 minutes	14	7%
10 minutes to less than 15 minutes	60	29%
15 minutes to less than 20 minutes	50	24%
20 minutes to less than 25 minutes	33	16%
25 minutes	5	2%
30 minutes	5	2%
40 minutes	3	1%
50 or more minutes	1	0%
Varies	20	10%
No response	13	6%

*Due to rounding, the sum of the percents does not equal 100.

Table 10. Response to the question of change in time allocated for seatwork in the last three years.

Change	**Number**	**Percent**
Increase	5	2%
Decrease	75	36%
No Change	98	48%
No Response	25	12%

Fourth, the superintendents of schools were asked, of the time spent daily on mathematics instruction, approximately how much time (in minutes) is spent on problem

solving. For the purposes of this survey, problem solving is a process by which individual students or a group of students uses previously acquired knowledge, skills, and understanding to solve an unfamiliar problem. Table 11 identifies the number of responses tallied into time periods. Sixty-three percent of those responding reported that their students are engaged in problem solving activities from 10 minutes to 25 minutes daily. And one-fourth reported that their students spend 20 to 25 minutes daily in problem solving activities. One district commented that problem solving has become the focus of their mathematics instruction. Two districts mentioned that the new mathematics textbook series currently in use focuses on problem solving. There was some confusion on the definition of problem solving activities because one district reported approximately 50 minutes allocated time daily with almost all of that time spent in direct instruction and yet 50% to 60% of the time was also spent on problem solving activities. Some districts said that problem solving was included in seatwork.

The superintendents of schools were also asked of the time spent on problem solving, is this an increase, decrease or no change from three years ago. Table 12 identifies the type and percent of change over the last three years in the amount of time spent on problem solving. Sixty percent of the respondents reported an increase in the amount of time their students are engaged in problem solving activities.

The results on the issue of a change in the amount of time allocated for mathematics instruction in the New Jersey elementary classrooms is inclusive. Certainly the use of that time is in flux. Nearly half of the responding districts report no change in the time spent on direct instruction, but nearly one-fourth report an increase in such time.

Table 11. Response to the question of how much time is allocated daily for problem solving activities.

Time Allocated	Number of Responses	Percent*
Less than 10 minutes	5	2%
10 minutes to less than 15 minutes	44	21%
15 minutes to less than 20 minutes	35	17%
20 minutes to less than 25 minutes	51	25%
25 minutes to less than 30 minutes	9	4%
30 minutes to less than 35 minutes	15	7%
35 minutes to less than 40 minutes	6	3%
40 minutes	3	1%
50 minutes	1	0%
60 minutes	1	0%
Varies	20	10%
No response	16	8%

* Due to rounding, the sum of the percents does not equal 100.

Table 12. Response to the question of change in time allocated for problem solving activities in the last three years.

Change	Number	Percent
Increase	123	60%
Decrease	1	0%
No Change	58	28%
No Response	24	12%

Nearly half reported no change in time spent on seatwork and more than a third reported a decrease. Sixty percent of the responding districts report an increase in the time spent on problem solving, which would indicate a response to the implementation of the Core Content Curriculum Standards.

An additional finding of the question of how much time is allocated daily to mathematics instruction is that 184 districts, or 89 %, reported that they spend

60 minutes or less. During a typical five-day school week, not more than five hours are spent on mathematics instruction. This is less than the national average of 5.2 hours reported in the 1997 study by the NCES. There were 17 districts, or 8%, that report daily time allotments that indicate they spent more than 5.2 hours weekly on mathematics instruction.

Additionally, the superintendents of schools were asked to identify the length of their school day. Table 13 tallies the responses into time periods. An overwhelming majority of school districts, 75%, have a school day of more than six hours but less than seven hours. The respondents also were asked if this was an increase, decrease or no change from three years ago. Table 14 identifies the type and percent of change over the last three years in the length of the school day. Sixty-six percent of the school districts reported no change in the length of their school day in the last three years.

Table 13. Response to the question on the length of the school day.

Length of Day	**Number of Responses**	**Percent***
Less than 5 hours	1	0%
5 hours to less than 5 hours 30 min	8	4%
5 hours 30 min to less than 6 hours	17	8%
6 hours to less than 6 hours 30 min	81	39%
6 hours 30 min to less than 7 hours	74	36%
7 hours and more	16	8%
No Response	9	4%

* Due to rounding, the sum of the percents does not equal 100.

Table 14. Response to the question of change in the length of the school day in the last three years.

Change	Number	Percent
Increase	46	22%
Decrease	2	1%
No Change	136	66%
No Response	22	11%

Finally, the superintendents of schools were asked if their school district has revised the mathematics curriculum to reflect the New Jersey Core Curriculum Content Standards. Table 15 follows with a breakdown of the responses to this question. A clear majority of the respondents, 69%, reported that their mathematics curriculum has been revised since the implementation of the Standards.

Table 15. Response to the question on revision of curriculum to meet the Standards.

Status	Number	Percent*
Completed	142	69%
In Process	54	26%
Scheduled	5	2%
Not Scheduled	1	0%
No Response	4	2%

*Due to rounding, the sum of the percents does not equal 100.

The question of demographic differences among the school districts is addressed by analyzing the results by region, and also by rural, suburban, and urban grouping. A comparison was also made for Abbott districts and the regional results. The times reported by the responding districts as spent on direct instruction, seatwork, and problem solving did not always total the amount of time reported as allocated for mathematics

instruction daily. When compiling the results of the survey, the times given were used without consideration of their sum.

The responding districts were placed into their regions for analysis of regional results. Table 16 shows the results of this analysis. The times are given as averages and are rounded to the nearest whole minute. The averages for direct instruction, seatwork, and problem solving do not total the average for the time allocated because of the reason stated above. Among the regions, the time allocated for mathematics instruction was about the same. This was also true for the time spent in seatwork, and problem solving. There was a difference of five minutes between the Central Region and the Southern Region in the time spent on direct instruction. There was an eight-minute difference between the length of the school day in the Northern Region and the length in the Central Region.

The ten Abbott districts had average times for seatwork and problem solving that matches the regional results. There was a difference of five minutes for allocated time and six minutes for direct instruction between the Abbott average and the highest result by region. There was also a difference of ten minutes in the length average Abbott district compared to the length of the longest school day, which is in Northern Region. Table 17 shows the Abbott Districts' daily averages in minutes, by category.

Table 16. Report of average time spent daily by region by category.

Region	**Allocated Time**	**Direct Instruction**	**Seatwork**	**Problem Solving**	**Length of School Day**
South	53 minutes	30 minutes	14 minutes	18 minutes	6 hours 15 minutes
Central	54 minutes	25 minutes	17 minutes	19 minutes	6 hours 13 minutes
North	53 minutes	29 minutes	14 minutes	20 minutes	6 hours 21 minutes

Table 17. Report of average time spent daily in Abbott districts by category

	Allocated Time	Direct Instruction	Seatwork	Problem Solving	Length of School Day
Abbotts	49 minutes	24 minutes	17 minutes	17 minutes	6 hours 11 minutes

Finally an analysis was done on the average time spent daily for each category by the districts when grouped by residential type. The results showed a three-minute difference or less among the residential types for direct instruction, seatwork, and problem solving. There was a five-minute difference between the time allocated for mathematics instruction by rural districts and by urban districts, and a twenty-three minute difference in the length of the school day for those same residential types. A twenty-two minute difference existed between the length of the school day for the suburban and the urban schools. The results follow in Table 18.

Table 18. Report of time spent by residential type by category.

Type	Allocated Time	Direct Instruction	Seatwork	Problem Solving	Length of School Day
Urban	57 minutes	31 minutes	18 minutes	17 minutes	6 hr. 36 minutes
Suburban	55 minutes	29 minutes	14 minutes	19 minutes	6 hr. 14 minutes
Rural	52 minutes	28 minutes	16 minutes	16 minutes	6 hr. 13 minutes

While these differences seem small on a daily basis, a five-minute difference each day is a difference of 900 minutes over the school year of 180 school days. That is a difference of 15 hours for the year. That is more than three additional weeks of mathematics instructional activities using one average of 52 minutes for allocated time.

Chapter Five

Summary

In 1996, the State Board of Education adopted the Core Curriculum Content Standards (Standards) for all curriculum areas. The Mathematics Standards describe a mathematics content that cannot be delivered in the explain-and-practice environment that has been predominant in our elementary classrooms. In order for these Standards to be achieved there will have to be a significant commitment of instructional time and a re-thinking of how that time is spent. Federal surveys of the last half decade have identified that nationally we average 5.2 hours per week on mathematics instruction (Perie, 1997, p. 29) in our elementary classrooms, and in New Jersey we average 5.6 hours per week (Mathematics Coalition, 1997, p. 12).

The Standards and the accompanying Framework, as well as the National Council of Teachers of Mathematics, call for major changes not only in content, but also in instructional practices. But since the launch of the Sputnik in 1957, the public education system in this country has been awash in reform movements. Studies have found that teachers recognize the importance of a problem-solving based curriculum and giving the students many opportunities to participate actively in their own learning (Watts, 1991; Suydam, 1987; NCATE, 1998). Research shows, however, that local response to national calls for reform is slow (Arvidson, 1997; NCTM, 1991; Slavin, 1997; Petrella,

1991). Change is difficult and will necessitate an extended time for professional development and support in order for teachers to acquire the instructional skills and strategies called for in the Standards and Framework (Calliari and Ivory, 1994; NCATE, 1998; Prawat, 1992; Slavin, 1997).

This study was undertaken to obtain baseline information on how much time is allocated for mathematics instruction in elementary classrooms in New Jersey, as well as how that time is spent. A cover letter and survey were sent to the superintendent of school districts that include an elementary school. The superintendents were assured that the results of the survey would not include the identify of any responding district, to encourage the respondents to be honest in their responses. The survey contained fourteen questions designed to obtain information on the amount of time and use of time allocated for mathematics instruction, as well as demographic information.

There are 501 school districts in New Jersey that includes an elementary school. Two hundred and six districts, more that 41%, responded to the survey in time to be included in this analysis. The majority of the responses came from districts in the southern region, and from K-8 districts, typically with less than 500 students. The instructional results show that some changes are being made, although the amount of time allocated for instruction is not one of those changes. The time allocated, as identified by the respondents, is less than the time reported by Perie (1997) in the National Center for Educational Statistics report or by the Mathematics Coalition in their 1997 report, Are We Measuring Up? The time spent on direct instruction is stable, but changes are being made in the amount of time spent on seatwork, which is decreasing, and on the amount of

time spent on problem solving, which is increasing. The length of the school day is also stable.

The state is divided into three regions – North, Central, and Southern (see Appendix B). The differences in the average time allocated for mathematics instruction for each region was only one minute per day. However the differences among the regions between the low and the high averages in the way the time was spent, and in the length of the school day would have a greater impact. The averages of the times reported by the responding Abbott districts showed large numerical differences when compared to the regional results in all categories except time spent on seatwork. The responding districts classified themselves as urban, suburban, or rural. The averages by residential type showed large numerical differences between the low and the high averages for all categories.

Conclusions

As stated earlier, implementation of the Mathematics Standards will necessitate a significant commitment of instructional time for mathematics and a re-thinking of just how that instructional time is spent (Al-Tammar, 1991; Fisher, 1980; Frameworks, 1996; NCTM, 1991; Suydam, 1987; Watts, 1991). In response to the implementation of the Standards, however, there appears to be no significant increase in the amount of time allocated to mathematics instruction in New Jersey's elementary school districts. In fact, the amount of time as reported appears to have decreased since the surveys conducted earlier this decade by the NCES and the U. S. Department of Education (Mathematics

Coalition, 1997; Perie, 1997). Only eight percent of the school districts that responded to this survey reported allocated times that would exceed that times reported in those federal studies.

With nearly seventy percent of the districts reporting that they have completed the revision of their curriculum, it appears that what has changed it how the time is being used. Even though 49% reported no change in the amount of time spent on direct instruction, 40% of the districts reported a change – either an increase or decrease. Nearly half of the districts reported no change in the amount of time dedicated to seatwork, but from some of the comments included in Chapter Four, it appears that some respondents may have defined seatwork differently than the definition provided in my cover letter. Thirty-six percent report a decrease in time spent on seatwork. Many districts have reported that they have adjusted their curriculum and instruction to include problem solving as a feature of the regular school day. Sixty percent of the districts report an increase in the time spent in problem solving, and 28% reported no change in the time spent.

If the Standards are to be implemented then the environment of our mathematics classrooms must change. The time spent on direct instruction must be matched to the instructional activity and will be forced to change. Overall there will have to be a decrease in teacher-lead, direct instruction. For the students to be actively involved in doing mathematics, as called for in the Frameworks, the problem solving activities will have to be the main focus of the learning environment. Hence most of the time the students will work independently or in groups to investigate and solve problems

presented by the teacher, the text, or other students. And seatwork, in the traditional sense, must be kept to a minimum and used only when it would enhance the learning.

Recommendations

Should this study be repeated, more emphasis must be placed on the definitions of direct instruction, seatwork, and problem solving in an effort to get a more accurate breakdown of how the time allocated daily for mathematics instruction is spent. Additionally, the focus of the next study could be a specific grade level, such as third grade, or perhaps fourth grade. It would be worthwhile for this study to be repeated within the next two to three years, to see what progress has been made in the implementation of the New Jersey Core Content Curriculum Standards.

References

Al-Tammar, J. M. (1991). The relevance of the 1989 National Council of Teachers of mathematics standards to long range planning for mathematics education at the elementary school level (K-4) in Kuwait. (Doctoral Dissertation, University of Pittsburgh, 1991). Dissertation Abstracts, International, 52-05, 1672.

Arvidson, M. L. (1997). Reform-based instruction in mathematics: An inquiry into the Relationship among student achievement, teacher attitudes and reform practices. (Doctoral Dissertation, The Graduate University, 1997). Dissertation Abstracts, International, 58-08, 3049.

Ball, D. L. (1990, April). With an eye on the mathematical horizon: Dilemmas of teaching elementary school mathematics. Paper presented at the annual meeting of the American Educational Research Association, Boston.

Ball, D. L. & Wilson, S. M. (1990, April). Knowing the subject and learning to teach it: Examining assumptions about becoming a mathematics teacher. Paper presented at the annual meeting of the American Educational Research Association, Boston.

Borg, W. R. (1980). Time and school learning. In C. Denham & A. Lierberman, (Eds.), Time to learn: A review for teacher preparation study. (pp. 134-146). Sacramento, California: California State Commission for Teacher Preparation and Licensing.

Callieri, C. L. & Ivory, C. M. (1994). Achieving educational reform: A new coalition. In J. Rowan, (Ed.), Occasional Papers: On Collaboration in Education, (pp. 69-73). Rowan College. Glassboro, NJ: The Hollybush Series.

Carroll, W. M. (1997). Results of third-grade students in a reform curriculum on the Illinois State Mathematics Test. Journal of Research in Mathematics Education, 28, 16-20.

Cowen, L. M. (1995). The impact of the NCTM 'Standards" on the professional lives of Elementary educators: A portrait of radical change (National Council of Teachers of Mathematics). (Doctoral Dissertation, Cleveland State University, 1995). Dissertation Abstracts, International, 56-06, 2054.

Fisher, C. W., Berliner, D. C., Filby, N. N., Marliave, R. Cahen, L. S. & Dishaw, M. M. (1980). Teaching behaviors, academic learning time, and student achievement: An overview. In C. Denham & A. Lierberman, (Eds.). Time to learn: A review for teacher preparation study. (pp. 7-33). Sacramento, California: California State Commission for Teacher Preparation and Licensing.

House, P. A. (1987, October). Components of success in mathematics and science. Keynote address to the School Science and Mathematics Association and the Montana Council of Teachers of Mathematics, Billings MT.

Krulik, S. & Rudnick, J. A. (1996). The new sourcebook for teaching reasoning and problem solving in junior and senior high school. Boston, MA: Allyn & Bacon.

Lo, J., Wheatley, G. H., Smith, A. C. (1994). The participation, beliefs, and development of arithmetic meaning of a third-grade student in mathematics class discussion. Journal for Research in Mathematics Education, 25, 35-49.

Mackey, P. E. (1999). Are we measuring up? A baseline report on trends in New Jersey mathematics education. , New Brunswick, NJ: New Jersey Mathematics Coalition.

Madden, N. A., Slavin, R. E., & Simons, K. (1999). Effects of math wings on student mathematics performance. Center for Research on the Education of Students Placed at Risk, Johns Hopkins University. Baltimore, Maryland.

National Commission on Excellence in Education. (1983). A nation at risk: Imperative for educational reform. Washington, D.C.: Author.

National Council for Accreditation of Teacher Education. (1998). Program standards for elementary teacher preparation. Washington, D.C.: Author.

National Council of Teachers of Mathematics. (1980). An agenda for action, Recommendations for school mathematics of the 1980's. Reston, VA.: Author.

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

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

National Council of Teachers of Mathematics. (1998). Principals and standards for school mathematics; Discussion draft, 1998. Reston, VA.: Author.

National Education Commission on Time and Learning. (1994). Prisoners of time. Washington, D. C.: Author.

National Research Council. (1989). Everybody counts. A report to the nation on the future of mathematics education. National Academy Press. Washington, DC.: Author.

New Jersey Mathematics Coalition. (1999). Questionnaire on the mathematics standards. New Jersey Mathematics Coalition Newsletter, viii – 1. (pp. 7-10) New Brunswick, NJ: Author.

New Jersey State Department of Education. (1996). New Jersey Core Curriculum Content Standards. Trenton, NJ.: Author.

Perie, M., Baker,D. P., & Bobbitt, S. (1997). Time spent teaching core Academic subjects in elementary schools: Comparisons across community, school, teacher, and student characteristics. Washington, D. C.: National Center for Education Statistics. NCES 97-293.

Petrella, G. (1991). Educator/student perceptions of mathematics and school mathematics as related to the 1989 NCTM Curriculum Standards: A status study (curriculum standards). State University of New York at Buffalo. Dissertation Abstracts, International, 52-89, 992.

Prawat, R. S. (1992). Are changes in views about mathematics teaching sufficient? The case of a fifth-grade teacher. The Elementary School Journal, 93, 195-213.

Romberg, T. A. (1983, April). Allocated time and context covered in mathematics classrooms. Paper presented at the Annual Meeting of the American Educational Research Association. Montreal, Quebec, Canada.

Rosenshine, B. V. (1980). How time is spent in elementary classrooms. In C. Denham & A. Lierberman, (Eds.), Time to learn: A review for teacher preparation study. (pp. 107-125). Sacramento, California: California State Commission for Teacher Preparation and Licensing,

Rosenstein, J. G., Caldwell, J. H., & Crown, W. D. (1996). New Jersey mathematics curriculum framework, based on the New Jersey core curriculum content standards. A collaborative effort of the New Jersey Mathematics Coalition and the New Jersey Department of Education. Trenton, NJ.

Slavin, R. E. (1997). Sand, bricks, and seeds: School change strategies and readiness for reform. Center for Research on the Education of Students Placed at Risk, Johns Hopkins University. Baltimore, Maryland.

Suydam, M. N. (1987). Research on instruction in elementary school mathematics: A letter to teachers. ERIC/SMEAC Mathematics Information Bulletin No. 3, 1-5.

Office of Educational Research and Improvement. (1996). The uses of time for teaching and learning. Washington, D.C.: United States Department of Education: Author.

Watts, L. T. (1991). Teachers' and principals' perceptions, beliefs and attitudes about proposed reform in elementary mathematics teaching, curriculum, and evaluation and learning. (Doctoral Dissertation, State University of New York at Buffalo). Dissertation Abstracts, International, 52-07. 2407.

Wesson, J. B. (1992). The Kramer story: Implementation of a revised primary mathematics program. School Science & Mathematics, 92, 418-421.

Appendix A –

Cover Letter and Survey

Dear Fellow Educator,

I am a graduate student at Rowan University in Glassboro, New Jersey, anticipating graduation in May 2000 with a Masters degree in Mathematics Education. I am also a veteran mathematics teacher at Hammonton High School in Atlantic County. My thesis is a study of the implementation of the Core Curriculum Content Standards as related to time allocated for mathematics instruction in elementary classrooms in New Jersey.

I am contacting all New Jersey elementary school districts and asking a few questions concerning time currently allocated for mathematics instruction. I would really appreciate your help. Would you please take a few minutes and complete the enclosed survey, and then drop it in the mail, using the enclosed self-addressed stamped envelope. Responses from school districts will be confidential and the results of the survey will not mention any school district by name or recognizable demographic.

For the purposes of this survey, allocated time is the total time designated for arithmetic or mathematics instruction each day. Direct instruction is teacher-led instructional activities, and seatwork is independent practice completed by students with little or no interaction with their teachers. Problem solving is a process by which the individual student or a group of students uses previously acquired knowledge, skills, and understanding to solve an unfamiliar problem.

If you have any questions before completing this survey, please feel free to contact me at home at 856-767-1170, or you can contact me at CAIvory@AOL.COM. If you would like to see the results of the survey, please include your complete mailing address or your e-mail address with your response.

Thank you for your time and your help.

Very truly yours,

Angela Napoliello-Ivory

Instructional information – Please complete these questions on allocation of instructional time:

9. How much time (in minutes) is allocated daily to arithmetic/mathematics instruction?

   _____

10. (a) Of the time spent daily on mathematics instruction, approximately how much time

    (in minutes) is spent on **direct instruction**: _____

    (b) Is this an ( ) increase, ( ) decrease or ( ) no change from three years ago? (Please check one)

11. (a) Of the time spent daily on mathematics instruction, approximately how much time (in minutes) is spent on **seat work**: _____

    (b) Is this an ( ) increase, ( ) decrease or ( ) no change from three years ago? (Please check one)

12. (a) Of the time spent daily on mathematics instruction, approximately how much time

    (in minutes) is spent on **problem solving**: _____

    (b) Is this an ( ) increase, ( ) decrease or ( ) no change from three years ago? (Please check one)

13. How long is your school day? _____
    Is this an ( ) increase, ( ) decrease or ( ) no change from three years ago? (Please check one)

14. Has your district revised the mathematics curriculum to reflect the New Jersey Core Curriculum Standards?
    ( ) yes, the curriculum is revised

    ( ) the revision is in process

    ( ) the revision is scheduled for _____

SURVEY OF TIME ALLOCATED FOR MATHEMATICS INSTRUCTION

Demographic Information – please complete the following questions on demographics:

1. Is your district ( ) K-12, ( ) K-8, ( ) K-6, ( ) Other (Please check one)

2. How many students are in your district? ( ) under 500
   (Please check one)
   ( ) 500 – 999
   ( ) 1000 – 1999
   ( ) 2000 – 2999
   ( ) more than 3000

3. How many elementary schools are in your district? _____

4. How many students are in your largest elementary school? _____

5. Is your district considered to be ( ) rural, ( ) suburban, or ( ) urban?

6. Is your district an Abbott district? ( ) yes ( ) no

7. Please identify the county in which your school district is located.

   _____

8. Please identify your district:

   _____

(For follow-up purposes only)

Your name _____

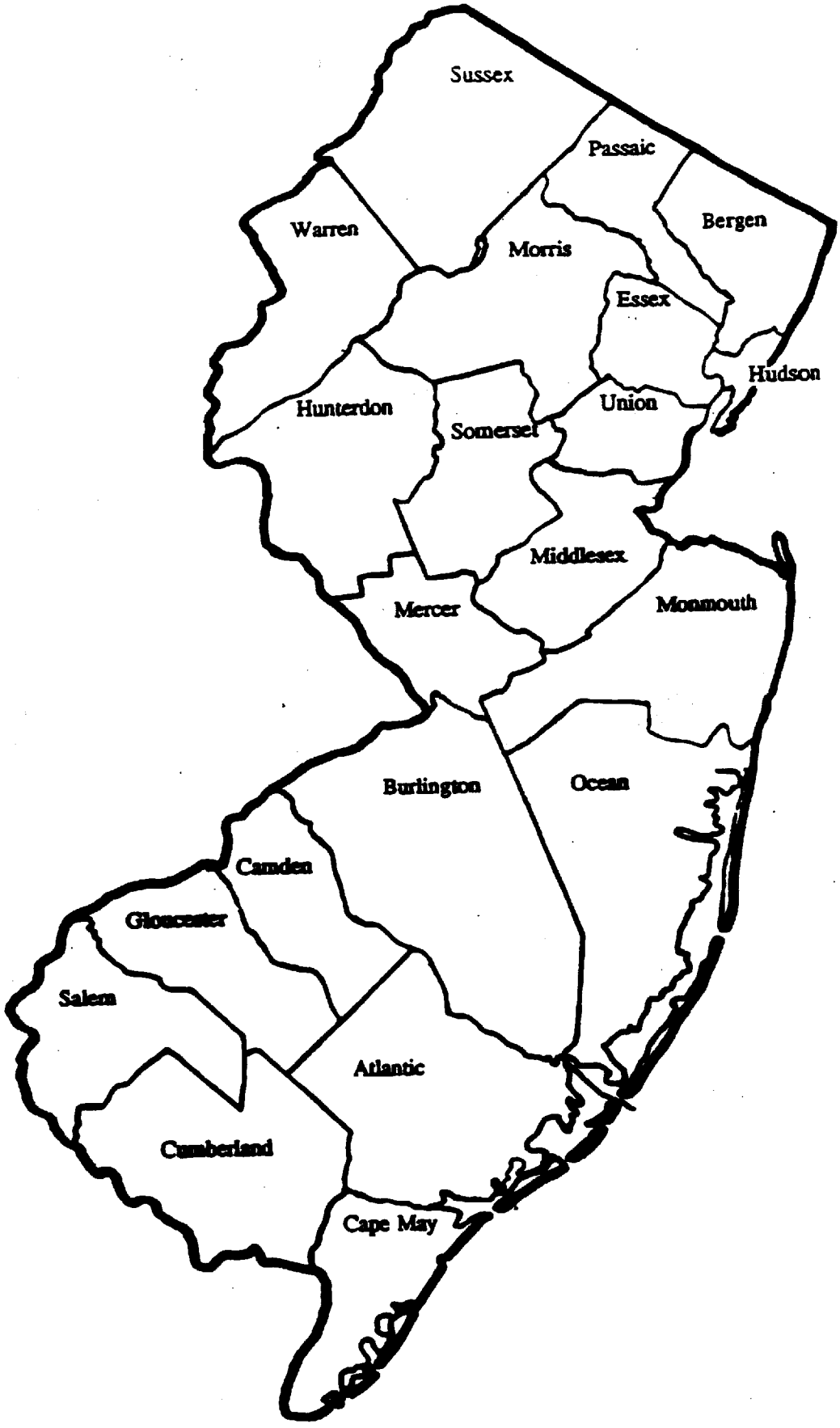
(Please print)

Your title _____

(Please print)

Appendix B –

Map and List of Counties by Region


Sussex
Passaic
Bergen
Warren
Morris
Essex
Hudson
Hunterdon
Somerset
Union
Middlesex
Mercer
Monmouth
Burlington
Ocean
Camden
Gloucester
Salem
Atlantic
Cumberland
Cape May

Identification of Counties by Region

Southern
Atlantic
Burlington
Camden
Cape May
Cumberland
Gloucester
Salem

Central
Hunterdon
Mercer
Middlesex
Monmouth
Ocean
Somerset
Union

Northern
Bergen
Essex
Hudson
Morris
Passaic
Sussex
Warren