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**A STUDY OF CERTIFICATION FOR THE MIDDLE GRADE
MATHEMATICS TEACHER**

by
James E. Thompson

A THESIS

Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
of
The Graduate School
at
Rowan University
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Approved by _____
Professor

Date Approved 11/14/02

ABSTRACT

James E. Thompson

A STUDY OF CERTIFICATION FOR THE MIDDLE GRADE

MATHEMATICS TEACHER

2002

Dr. Eric Milou

Mathematics Education

The purpose of this study is to determine differences and similarities among elementary and secondary certified teachers' beliefs about state certification for the middle grades mathematics teacher.

A mail-in survey was conducted among teachers at forty-eight public schools serving middle grade students in Camden County. A fourteen-item questionnaire obtained opinions from teachers teaching in the middle grades. Teachers responded to items about state certification and individual requirements for obtaining certification.

The data was analyzed, and percents calculated. Teachers did not believe that elementary certification programs adequately prepared individuals to teach middle grades mathematics. The underlying perception is that neither of the current certification programs addresses the distinction of the middle grades students learning as separate from elementary or secondary learning.

MINI-ABSTRACT

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My one regret is that I was unable to complete this assignment in a time that would have allowed me thank her in person. As it happens I came upon a few of life's little set backs and she came upon life's final struggle. Yet as we each dealt with our issues she continued to remind me of the need to see everything through until its completion.

During those final days she made sure her problems were never a priority. She made it a point to constantly remind me that the completion of my thesis was imperative. So completing this document became more than just another assignment. It was the fulfillment of a promise I made at a time when academics were the last thing on my mind.

And as I search for the words that might adequately sum up her importance in seeing this task through I continually go back to these five.

“I did it, Thanks mom!”

In Memory of Anne Glinka
1946-2002

CHAPTER 1

Introduction to the study

Introduction

This study will look into the current certification trends of middle school mathematics teachers in the state of New Jersey. This chapter will include the statement of the problem, the research, the significance of the problem, the limitations of the study, definitions of the terms and the procedures for implementing the study.

Background

The number of middle schools in the nation has increased significantly in recent years. In 1971, there were 2,080 public middle schools and 7,750 public junior high schools. Twenty-five years later, there were approximately three middle schools for every junior high, with 10,499 middle schools and 3,707 junior highs in 1996 (Digest of Education Statistics, 1998). This figure included 7-8 as junior high schools.

However, this substantial increase in middle schools has not been accompanied by a similar increase in the number of institutions offering special middle level teacher preparation programs. Traditionally, there's been a misfit between teacher-preparation programs for elementary or secondary certification and the actual three-tiered way schools are organized. States need special middle level licensure that recognize the importance of teachers of young adolescents having the specialized knowledge, skills, and dispositions needed to be highly successful (McEwin & Dickinson, 1995).

Instead many states like New Jersey offer elementary school licenses and secondary school licenses that include overlaps with the middle grades, (e.g., K-8, 7-12). This practice has resulted in most middle level teachers being prepared with a focus on content areas only or on teaching young children only. Even in schools with structural components of middle schools in place, such as common planning time and adjacency of rooms to enable team teachers to plan together, full benefits of programs designed specifically for young adolescents can not be realized without specially prepared middle level teachers. The lack of professionally prepared teachers stems from a limited number of specialized middle level preparation programs, special graduate courses in middle level education, and advanced degree programs for future leaders of middle level reform (NCATE-Approved Curriculum Guidelines, 1991).

The nature of teacher preparation programs is driven by state licensure requirements. In a 1992 national licensure study, 33 states reported specialized middle level teacher licensure/certification (Valentine & Mogar, 1992). Previous surveys reported full certification and/or endorsement in 28 states in 1987, 15 states in 1978, and two states 1968. Despite the steady but slow growth rate, many states do not require teachers to hold middle level licensure to teach in the middle grades. Overlapping licensure regulations enable teachers trained at elementary or secondary level to teach middle grades. McEwin and Dickinson (1995) noted, "For example, one state's current plan includes the following options: grades pre k-3; 1-8, 4-8, 7-9 and 7-12. Given these choices, while considering future employment possibilities, many prospective teachers select programs leading to licensure in grades 1-8 or 7-12 because these grade spans make them more 'marketable'" (p.11).

In 1991, states with middle level licensure/endorsements held 82 percent of all middle level teacher preparation programs. Fifty-seven percent of the special middle level teacher preparation programs were located in only five states, all of which required special licensure for middle level teaching: Georgia, Kentucky, Missouri, North Carolina, and Virginia (McEwin, 1992).

New Jersey's current system gives local school boards the option of selecting applicants with K-8 or 7-12 certifications. Too often however teachers with K-8 certification are selected. Thus, teachers in grades 5-8 often have the same mathematics background as teachers in grades K-4, yet they are expected to teach more complex content (Silver, 1998).

At a time when students' cognitive development begins enabling them to think abstractly, young adolescents expect their teachers to be knowledgeable about their subjects (Davies, 1995). Driven by curiosity and a need to better understand the world around them, they turn to teachers for answers. Teachers whose responses avoid oversimplification and highlight the interconnectedness of the world are respected for their knowledge (Buckner and Bickel, 1991; Johnston and Markle, 1986; NASSP, 1985; NMSA, 1981).

Many middle school mathematics teachers feel growing discomfort with the mathematics they are being asked to teach, much of which had been traditionally at the high school level (Snead, 1998). All 7th and 8th grade students in New Jersey must be taught to solve simple linear equations (New Jersey Mathematics Curriculum Framework, 1996). They must "develop a strong understanding of algebraic concepts and processes from consistent experiences in classroom activities where a variety of manipulatives and

technology are used". Yet, most middle school classrooms remain unchanged from the drill-and-practice classrooms of the 1970s (Niess & Erickson, 1992). The change is coming slowly and unevenly (Garet & Mills, 1995).

Teachers need to develop attitudes and strategies for dealing effectively with changes resulting from the National Council of Teachers of Mathematics (National Council of Teachers of Mathematics [NCTM], 1989) Standards, hereafter referred to as the Standards. The Standards were designed to fundamentally restructure how teachers teach mathematics and what they teach (National Council of Teachers of Mathematics, 1989, p.251).

Teaching mathematics in ways that make it understandable by students requires deep, flexible knowledge on the part of the teacher. Many middle grade teachers have had limited experience teaching more ambitious curricula, helping students deal with complex mathematical tasks, or learning complex mathematics themselves in settings in which innovative pedagogy is used (Silver, 1998). Research has shown that teachers often struggle, at least initially, when they use cognitively complex mathematics tasks in the classroom (Prawat, R.S., 1992; Romagnano, L., 1994; Stein M.K., Grover, B.W., & Henningsen, M., 1996).

To be highly successful, many excellent teachers of young adolescents have to "learn on the job" using trial and error techniques, requiring experimentation and persistence. Such practices require time. Coupled with the resistance of other teachers and personnel, reform efforts have moved slowly, and many schools are unable to be more responsive to the needs and characteristics of young adolescents (Silver, 1998).

Statement of the Problem

New Jersey's teacher licensing/certification perpetuates unprepared middle school mathematics teachers. New Jersey's elementary teaching programs do not contain adequate concentrations in mathematics. New Jersey's secondary mathematics teaching programs do not adequately address pedagogies of the middle school student. No institutions in the state of New Jersey offer special middle school preparation programs.

Significance of the problem

U. S. middle school students' mathematical achievement is below average internationally (Beaton, Mullis, Martin, Gonzalez, Kelly, & Smith, 1996). Many middle school classrooms rely heavily on drill-and-practice. This trend engages students with low-level cognitive activity, such as memorizing and recall. The instruction is oriented neither towards understanding nor toward intellectual challenge (Silver, 1998).

To address this problem the National Council of Teachers of Mathematics has developed a more ambitious mathematics curriculum in the middle grades. Middle grade math teachers are expected to teach more complex content.

CHAPTER 2

Review of the literature

Researchers generally agree that middle school preparation is a prerequisite for quality teacher education and that it should be different from elementary and secondary school preparation. Bean (1993), Levy (1993), and Mac Iver and Epstein (1993) agree quality middle level instruction recognizes the interrelationships among content areas, encourages student-centered experiences and active learning, and promotes cooperative approaches.

Snead (1998) questioned middle school mathematics teachers in Columbia, South Carolina, to determine their professional- development needs. The sample consisted of teachers of middle school mathematics who did not have secondary mathematics certification. Results showed that the teachers felt growing discomfort with the mathematics they were being asked to teach, much of which had been traditionally at the high school level, and wanted help implementing new techniques of instruction and materials.

According to Richard W. Riley (1998), in a speech at The Conference of American mathematical Society and Mathematical Association of America, “the average K-8 teacher takes three or fewer mathematics or mathematics education courses in college”, and “fewer than one half of 8th grade mathematics teachers have ever taken a course in the teaching of mathematics at this level”. Also, “recent studies have shown

that student achievement is most influenced by teacher expertise, accounting for as much as 40 percent of the measured variance in students' mathematics achievement".

Beaton, et al (1996) in the Third International Mathematics and Science Study (TIMSS) concludes the following:

- 1) U.S. 8th-grade students' mathematics achievement is below average internationally.
- 2) Relative to international averages, U.S. 8th-grade students are about average in the areas of algebra; fractions; and data representation, analysis, and probability; and below average in geometry, measurement and proportionality.
- 3) At grade 8, U.S. instruction is quite uniform and is oriented neither towards understanding nor toward intellectual challenge.
- 4) Teachers in the United States lack structured, sustained opportunities to improve their practice.

Mandeville (1997) did a study of over 9000 seventh grade students from 33 matched pairs of schools whose teachers differed on level of mathematics preparation. The purpose of the study was to assess the interaction effect of teacher mathematics preparation and the thinking level of mathematics problems on student performance. The main conclusion of the study is that seventh grade students tend to perform better on higher level thinking tasks in mathematics when teachers who teach them the subject have advanced certification in it. Specifically, the differences between the performance

of seventh grade students taught by teachers with more specialized mathematics training and those taught by teachers with less specialized training were both statistically and practically significant and favored the students of the teachers with more specialized training when performance was measured by high level mathematics problems and not statistically significant when performance was measured by low or intermediate level mathematical problems. The finding support contention that the mathematics background of middle grade mathematics teachers has an important influence on the development of their students' high level mathematics thinking.

The Carnegie report (1989) recommends that middle schools be staffed with teachers who are expert at teaching early adolescents and who have the training necessary for the assignment. According to Davies (1995) middle school students expect their teachers to be knowledgeable about their subjects.

Tooke (1997) suggests that if middle school teachers were better prepared to manage their middle school classrooms the statistical correlation between their mathematics background and the attainment of their students would be consistent with that of high school mathematics teachers. That is, if preservice middle school math teachers were given specific training for managing classes at that level, their mathematics knowledge would be more fully and effectively communicated to their students.

Scales (1992) substantiates the assumption that most middle level teachers have had little or no special middle level professional preparation in his eight-state survey of fifth through eighth grade teachers conducted in 1991. Only 17 percent of the middle grades teachers had received special middle level preservice preparation. The sample

population of this study consisted of middle level teachers without regard to whether or not they taught in a middle school per se.

Epstein and Mac Iver (1990) surveyed principals of schools, regardless of school configuration, which housed Grade 7. They found drill and practice and passive rather than active student involvement still dominated. They concluded that, "The data show clearly that in present practice there are not commonly agreed upon 'best' or 'essential' practices for middle grades education in this country" (p.8)

Results of research on the special preparation and training needs of middle school level teachers as perceived by teachers and administrators in a suburban school district. Seger (1996) indicated that personnel received their training in middle school concept area through formal in-service opportunities and/or on the job experience. The majority of the participants in this study endorsed and expressed a need for the following: a special preparation program for middle school teachers containing field experience at the middle level; training in the unique developmental needs of the early adolescent; and, special training in a variety of instructional strategies.

Sparapani, et al (1991) indicates that teachers might have knowledge of early adolescent development and of appropriate instructional strategies, but that some teachers may not fully understand how to use what they know. The findings of a survey of junior high and middle school teachers in four states and four socioeconomic categories

Lavelly (1990) as part of a job analysis of teaching conducted for the validation of a battery of initial certification subject area tests 320 practicing Florida elementary teachers rated statements of teacher knowledge and skill for their importance in certification. The study concluded that elementary teachers' perceptions of elementary

education as determined through this type of statistical analysis emphasized teacher general knowledge and skills, specific traditional elementary subject areas, educational foundations, optimizing individual achievement, and professionalism.

Bush (1989) examines teacher math anxiety in upper elementary school teachers. He writes that anxiety affects student achievement, teaching practices and teacher characteristics. The study finds a positive correlation between teacher mathematics anxiety and whole-class instruction time and a negative correlation between anxiety and students' questions.

Kelly and Tomhave (1985) write that their study of pre-service female elementary teachers indicated a high proportion of teachers who had levels of math anxiety high enough to negatively impact their students.

Stodolsky (1985) writes that math anxious elementary-level teachers do not use applied activities and experiences in their classrooms to reinforce what is learned with a real-life context. According to the study, Stodolsky found that teachers who are math anxious teach from a drill and practice perspective that gives no clue to how the information may be used in society.

McEwin (1992) states certification does have a direct effect on the establishment of middle level teacher preparation programs. "State certification agencies that fail to initiate special certification for middle level teachers are neglecting their obligation to protect the public welfare when they allow teachers who have completed no specialized preparation to teach young adolescents. A key function of certification in education is the protection of the public from incompetence. Secondary certified and prepared teachers are not allowed to teach elementary children in the vast majority of states, and

elementary prepared teachers are seldom, if ever, allowed to teach senior high students.

In the vast majority of states, however, young adolescents have been offered no assurance that the teacher who teaches them is specially prepared to do so.

According to Boydston (1995) several national organizations have updated certification or licensure criteria for middle school teachers and 22 states have licensure standards for comprehensive middle school programs.

Researchers at the Consortium for Policy Research in Education evaluated professional development through its State Systemic Initiative (SSI), ranking states on the quality of programs they found. The researchers developed a “crude” measure of quality with three criteria: level of state funding for professional development, time allocated for professional development, and incentives for teachers to enhance their knowledge and skills. Based on these criteria the researchers concluded that the weak-state support group included New Jersey. Also noted by the researchers were that many states choose to focus on professional development because of the inadequate preparation of elementary and middle school teachers in science and math. Lewis (1998) notes there are not very strong incentives for teachers to improve their subject-matter knowledge or to seek demanding professional development experiences.

CHAPTER 3

Methods of the Study

The Population and Sample

Subjects for this study were selected from the population of teachers at public schools serving sixth, seventh, eighth (or a combination of two) grade students in Camden County. These schools are classified as elementary, junior high, or middle school. The target population of middle level teachers was 500. The sample questionnaire was sent to school principals with directions for distribution to specific teachers in order to investigate their attitudes concerning middle school certification. A base will be.....

The Methods and Procedures

A fourteen item, likert-scale instrument (see Appendix A) was developed in order to obtain opinions from teachers teaching in the middle grades. In addition to providing demographic information, teachers were ask to respond to items about state certification and individual requirements for obtaining certification. Responses on the five-point scale could range from strongly agree to strongly disagree.

For purposes of data analysis and tabulation the sample population was divided into two groups, those with state certification in secondary mathematics and those without.

Forty-eight schools in Camden County were surveyed. Both groups received the same questionnaire designed to measure their attitudes toward state certification. The 1999-00 Camden County Public School Directory was used to identify the schools for the study. In January 2000, the questionnaires were mailed to these schools. Each principal was provided twelve questionnaires to distribute to teachers in grade 6, grade 7 and grade 8. Each individual questionnaire included a cover letter that briefly explained the nature and purpose of the study, provided the directions, and detailed importance of their support and cooperation in completing and returning the questionnaire as soon as possible (see Appendix A). To avoid requiring subjects to be responsible for any mailing costs, a self-addressed return envelope was included.

Research question 1

The following characteristics of New Jersey middle school mathematics teachers will be identified by calculating percentages from demographic information on the survey instrument.

- Current New Jersey certification(s)
- Years of teaching experience
- Subject(s) currently teaching
- Grade(s) currently teaching

Research question 2

The New Jersey middle school mathematics teachers' opinions on appropriate state certification for middle grades math teachers will be answered by evaluating the mean and standard deviation using a one sample T-test comparing the mean to "3" a neutral score on the survey questions "Certification" #1 to 3.

Research question 3

The New Jersey middle school mathematics teachers' opinions on required course work for the pre-service middle grades math teacher will be identified by evaluating the mean and standard deviation using a one sample T-test comparing the mean to "3" a neutral score on the survey's "Certification" questions #4 and 5 and "Certification Requirements" questions #1-9.

Research question 4

A difference in opinion between middle grades math teachers that are certified in secondary mathematics and those holding other state certification(s) will be identified by using a 2 sample T-test on the survey's "Certification" questions #1-3 and "Certification Requirements" questions #4 and 7.

CHAPTER 4

Analysis of the Data

The results of the study will be separated into four parts by the researcher. Part I will identify the general characteristics of the teachers responding to the survey.

Table 1

Summary of Results of part I
Characteristics of Surveyed New Jersey middle grades mathematics teachers

Gender	
Female	60.0 %
Male	36.5 %
Omitted	3.5 %

NJ Teaching Certification	
Elementary/other	61.9 %
Secondary	38.1 %
Omitted	1.2 %

Year(s) of Teaching Experience	
0-5 yrs	24.7 %
6-10yrs	18.8 %
11-15yrs	10.6 %
16-20yrs	7.1 %
20+yrs	38.8 %

Course(s) currently teaching	
Math only	72.9 %
Math and other	27.1 %

Grade(s) currently teaching	
6 th	24.7 %
6 th , 7 th	2.4 %
6 th , 7 th , 8 th	5.9 %
6 th , 8 th	4.7 %
7 th	20.0 %
7 th , 8 th	16.5 %
8 th	25.9 %

Survey responses indicated diversity with respect to years of teaching experience and middle grade(s) currently teaching. Majorities were identified in the following characteristics. 52 teachers have elementary or non-secondary math certification, while 32 teachers have secondary math certification. One survey had no certification response. 62 teachers teach math exclusively, while 23 teachers teach math and some other subject(s) daily. Responses to the survey also indicated that 51 teachers were female and 31 were male. Three surveys had no gender response.

Part II of the results will focus on teacher response to certification for teaching mathematics in the middle grades. Data presented in Table 2 summarizes responses to the statements on the need for a middle grades certification and the adequacy of elementary and secondary certification programs.

Table 2

Summary of Results of part II
 Certification programs for teaching middle grades mathematics

Item	1 Strongly Agree	2	3	4	5 Strongly Disagree	mean	Standard Deviation	t-value	
C1	21 (24.7%)	27 (31.8%)	25 (29.4%)	9 (10.6%)	3 (3.5%)	2.36	1.08	-5.43	*
C2	6 (7.1%)	14 (16.5%)	9 (10.6%)	36 (42.4%)	18 (21.2%)	3.55	1.21	4.17	*
C3	13 (15.3%)	39 (45.9%)	19 (22.4%)	10 (11.8%)	2 (2.4%)	2.39	.97	-5.75	*

* p < 0.001

A response mean score of 2.36 ($p < 0.001$) indicated teachers supported the statement that a need exists for a middle grades certification program in the state of New Jersey (item C1). Approximately 56% of the teachers agreed or strongly agreed on the need for a middle grades certification program, while 14% disagreed or strongly disagreed.

A response mean score of 2.39 ($p < 0.001$) indicated teachers disagreed with the statement that elementary certification programs adequately prepare individuals to teach mathematics in the middle grades (item C2). Approximately 64% of the teachers disagreed or strongly disagreed that teachers with elementary certification were adequately prepared to teach mathematics in the middle grades, while 22% agreed or strongly agreed.

A response mean score of 3.55 ($p < 0.001$) indicated teachers supported the statement that secondary certification programs adequately prepare individuals to teach mathematics in the middle grades (item C3). Approximately 61% of the teachers agreed or strongly agreed that teachers with secondary certification were adequately prepared to teach mathematics in the middle grades, while 14% disagreed or strongly disagreed.

Part III of the results will focus on teacher response to how middle grade certification is accomplished and certification requirements for teachers certified to teach middle grades mathematics. Data presented in Table 3 summarizes responses to questions on how middle grades certification is accomplished.

Table 3

Summary of Results of part III
Attaining middle grades teaching certification

Item	1 Strongly Agree	2	3	4	5 Strongly Disagree	Mean	Standard Deviation	t-value
C4	8 (9.4%)	38 (42.4%)	21 (24.7%)	13 (15.3%)	5 (5.9%)	2.64	1.05	-3.22
C5	8 (9.4%)	36 (42.4%)	25 (29.4%)	13 (15.3%)	3 (3.5%)	2.61	0.98	-3.66 *

* p < 0.001

A response mean score of 2.61 ($p < 0.001$) indicated teachers supported the statement that certification should be accomplished through a program of additional course offerings leading to a middle grades validation sticker being added to the elementary or secondary certificate (item C5). Approximately 50% agreed or strongly agreed on a program of additional course work for middle grades certification, while 19% disagreed or strongly disagreed.

Teacher responses to the statement that certification should be accomplished through a program of academic course offerings leading to a degree in middle grades education (item C4) were not statistically significant.

Data presented in Table 4 summarizes responses to the statements on requirements for certification to teach middle grades mathematics.

Table 4

Summary of Results of part III
Requirements for middle grades mathematics teaching certification

Item	1 Strongly Agree	2	3	4	5 Strongly Disagree	mean	Standard Deviation	t-value	
CR1	26 (30.6%)	44 (51.8%)	8 (9.4%)	5 (5.9%)	2 (2.4%)	1.98	0.93	-10.20	*
CR2	27 (31.8%)	48 (56.5%)	7 (8.2%)	2 (2.4%)	1 (1.2%)	1.85	0.76	-13.92	*
CR3	25 (29.4%)	47 (55.3%)	9 (10.6%)	4 (4.7%)	0	1.90	0.77	-13.17	*
CR4	12 (14.1%)	36 (42.4%)	14 (16.5%)	16 (18.8%)	6 (7.1%)	2.62	1.16	-3.01	
CR5	18 (21.2%)	50 (58.8%)	14 (16.5%)	2 (2.4%)	1 (1.2%)	2.03	.76	-11.66	*
CR6	13 (15.3%)	46 (54.1%)	18 (21.2%)	8 (9.4%)		2.25	.83	-8.37	*
CR7	5 (5.9%)	17 (20.0%)	27 (31.8%)	21 (24.7%)	15 (17.6%)	3.28	1.15	2.26	
CR8	10 (11.8%)	48 (56.5%)	24 (28.2%)	3 (3.5%)		2.24	.70	-10.06	*
CR9	6 (7.1%)	19 (22.4%)	28 (32.9%)	23 (27.1%)	9 (10.6%)	3.12	1.10	.99	

* p < 0.001

A response mean score of 1.98 ($p < 0.001$) indicated teachers supported the statement that certified middle grades mathematics teachers should have had field experience in middle grades during student teaching (item CR1). Approximately 82% agreed or strongly agreed to this idea, while 8% disagreed or strongly disagreed.

A response mean score of 1.85 ($p < 0.001$) indicated teachers supported the statement that certified middle grades mathematics teachers should have had course offerings in special methods of teaching math in middle grades (item CR2). Approximately 88% agreed or strongly agreed to this idea, while 4% disagreed or strongly disagreed.

A response mean score of 1.90 ($p < 0.001$) indicated teachers supported the statement that certified middle grades mathematics teachers should have had course offerings dealing with the psychology of learning and behavior as it applies to the middle grades child (item CR3). Approximately 85% agreed or strongly agreed to this idea, while 5% disagreed and no one strongly disagreed.

A response mean score of 2.03 ($p < 0.001$) indicated teachers supported the statement that certified middle grades mathematics teachers should have had course offerings that studied the New Jersey Mathematics' Standards (item CR5). Approximately 80% agreed or strongly agreed to this idea, while 4% disagreed or strongly disagreed.

A response mean score of 2.25 ($p < 0.001$) indicated teachers supported the statement that certified middle grades mathematics teachers should have had course offerings dealing with the philosophy, and purpose of middle grades math education

(item CR6). Approximately 69% agreed or strongly agreed to this idea, while 9% disagreed and no one strongly disagreed.

A response mean score of 2.24 ($p < 0.001$) indicated teachers supported the statement that certified middle grades mathematics teachers should have had course offerings dealing with methods of individual instruction (item CR8). Approximately 68% agreed or strongly agreed to this idea, while 4% disagreed and no one strongly disagreed.

Teacher responses to a requirement of academic minor in mathematics (item CR4), certification to teach an additional middle school subject (item CR7) and majoring in mathematics with an additional field of academic minor (item CR9) were not statistically significant.

Part IV of the results will compare the opinions of teachers with elementary or non-secondary math certification to that of teachers with secondary mathematics certification. Data presented in Table 5 summarizes responses from both groups on the need for a middle grades certification program and the adequacy of elementary and secondary certification programs.

Table 5

Summary of Results of part IV
Certification programs for teaching middle grades mathematics

Item	1 Strongly Agree	2	3	4	5 Strongly Disagree	Mean	Standard Deviation	t-value
C1								
Elementary/ Other	14 27%	15 29%	15 29%	7 13%	1 2%	2.35	1.08	-0.25
Secondary	7 22%	11 34%	10 31%	2 6%	2 6%	2.41	1.10	-0.24
C2								
Elementary/ Other	6 12%	13 26%	6 12%	21 42%	4 8%	3.08	1.23	-5.36 *
Secondary	0 0%	0 0%	3 9%	15 47%	14 44%	4.34	0.65	-6.07 *
C3								
Elementary/ other	4 8%	20 40%	18 36%	8 16%	0 0%	2.60	0.86	2.51
Secondary	9 28%	18 56%	1 3%	2 6%	2 6%	2.06	1.08	2.38
* p < .001								

Diverse responses and a response mean score of 3.08 ($p < 0.001$) indicated teachers with elementary or non-secondary certification had varied opinions on the statement that elementary certification programs adequately prepare individuals to teach mathematics in the middle grades (item C2), approximately 38% agreed or strongly agreed to this idea, while 50% disagreed or strongly disagreed.

However, with a response mean score of 4.34 ($p < 0.001$) teachers with secondary certification disagreed with the statement that elementary certification programs adequately prepare individuals to teach mathematics in the middle grades (item C2), no one agreed or strongly agreed with this statement, while 91% disagreed or strongly disagreed.

To the statement that a need exists for a middle grades certification program in New Jersey (item C1), elementary or non-secondary certified teacher had a response mean score of 2.35 and teachers with secondary certification had a response mean score of 2.41, however neither was statistically significant.

To the statement that secondary certification programs adequately prepare individuals to teach mathematics in the middle grades (item C3), elementary or non-secondary certified teacher had a response mean score of 2.60 and teachers with secondary certification had a response mean score of 2.06, however again neither was statistically significant.

Data presented in Table 6 summarizes responses from teachers with elementary or non-secondary certification and teachers with secondary mathematics certification to questions on requirements for certification to teach middle grades mathematics.

Table 6

Summary of Results of part IV
Requirements for middle grades mathematics teaching certification

Item	1 Strongly Agree	2	3	4	5 Strongly Disagree	Mean	Standard Deviation	t-value
CR4								
Elementary/ other	5 10%	18 35%	12 23%	13 25%	4 8%	2.87	1.14	2.49
Secondary	7 23%	17 55%	2 6%	3 10%	2 6%	2.23	1.12	2.51
CR7								
Elementary/ other	5 10%	15 29%	14 27%	13 25%	5 10%	2.96	1.15	-3.49 *
Secondary	0 0%	2 6%	12 38%	8 25%	10 31%	3.81	0.97	-3.64 *

* p < .001

Diverse responses and a response mean score of 3.08 ($p < 0.001$) indicated teachers with elementary or non-secondary certification had varied opinions on the statement that teachers certified to teach middle grades math should be certified to teach an additional middle school subject (item CR7), approximately 39% agreed or strongly agreed to this idea, while 35% disagreed or strongly disagreed.

However, teachers with secondary certification disagreed with the statement that teachers certified to teach middle grades math should be certified to teach an additional middle school subject (item CR7), 6% agreed and no one strongly agreed to this idea, while 56% disagreed or strongly disagreed.

To the statement that teachers certified to teach middle grades math should have an academic minor in mathematics (item CR4) teachers with elementary or non-secondary certification had a response mean score of 2.87 and teachers with secondary certification had a response mean score of 2.23, however neither is statistically significant.

CHAPTER 5

Summary, Conclusions and Recommendations

Summary

The nature of teacher preparation programs is driven by state licensure requirements. Despite the steady but slow growth rate, many states do not require teachers to hold middle level licensure to teach in the middle grades. Overlapping licensure regulations enable teachers trained at elementary or secondary level to teach middle grades.

New Jersey's current certification system gives local school boards no clear guidelines on qualifications for a middle grades mathematics teacher. The board has the option of appointing an elementary certified candidate who may not have received adequate concentrations in mathematics or a secondary certified candidate who may be lacking insight into the pedagogies of the middle grades student. The ambiguity of this system perpetuates placement of unprepared middle school mathematics teachers.

Researchers generally agree that middle school preparation is a prerequisite for quality teacher education and that it should be different from elementary and secondary school preparation. Studies found that math anxious elementary-level teachers do not use applied activities and experiences in their classrooms to reinforce what is learned with a real-life context. Instead, they teach from a drill and practice perspective that gives no clue to how the information may be used in society.

Many middle school mathematics teachers feel growing discomfort with the mathematics they are being asked to teach. At the time when students' begin to think abstractly, young adolescents expect their teachers to be knowledgeable about their subjects.

Teaching mathematics in ways that guide students through understanding and then expansion of a math concept requires deep, flexible knowledge on the part of the teacher. Many middle grade teachers have had limited experience teaching more ambitious curricula, helping students deal with complex mathematical tasks, or learning complex mathematics themselves.

Conclusions and Recommendations

The current New Jersey certification system permits teachers with one of a variety of certifications to teach middle grades mathematics. From the data collected in this study it is clear that New Jersey middle grades mathematics teachers do not support that system for identifying an adequately prepared middle grades mathematics teachers.

The study revealed that teachers did not believe that elementary certification programs adequately prepared individuals to teach middle grades mathematics. Not one secondary math certified teacher believed that an elementary certification program was adequate preparation for an individual teaching middle grades math courses. However, most alarming was the fact that fifty percent of the teachers currently holding elementary or non-secondary certifications reported that the elementary certification program is not an adequate preparation.

This finding, although not surprising since math is not a primary focus for the elementary certification program, is significant as it may be one of the major reasons why change in current certification requirements should be investigated. Perhaps if those working in middle level schools were to develop a better understanding of the purposes and curriculum of middle grades mathematics' programs, they would see a greater need for reform in certification for teaching middle grades mathematics. I would think that a lack of confidence in your preparatory program must affect your ability to instruct affectively.

One bright spot was that a majority of the teachers surveyed seemed to perceive secondary mathematics certification an adequate preparation for teaching middle grades math. Though a little less than fifty percent of the elementary or non-secondary certified teachers surveyed agreed with the secondary preparation statement, eighty-four percent of the teachers with secondary math certification felt they were adequately prepared to teach the courses they were assigned. However, it should be noted that secondary certification programs lack some of the required coursework supported by the teachers surveyed.

The underlying perception is that neither of the current certification programs addresses the distinction of the middle grades students learning as separate from elementary or secondary learning.

Results specifically revealed the teachers felt a need for the inclusion of three required course offerings for middle grades math certification. First, certification programs must have course offerings in special methods of teaching middle grades mathematics. Second, these programs must require coursework dealing with the

psychology of learning and behavior of the middle grades child. Finally, the New Jersey Mathematics' Standards must be studied prior to certification.

In addition to this coursework, teachers overwhelmingly agreed that certified middle grades math teachers must have field experience in middle grades during student teaching. This new coursework seem appropriate but almost certainly difficult to necessitate without change to the current certification programs. That is either changing the each program by adding a middle grades focus that is currently lacking or by the designing of a new certification program specifically for the middle grades.

In terms of a special type of certification, the study revealed two findings. First, there is support by all teachers for a middle grades certification program. Second, their support was for certification by additional coursework. The coursework would add a validation sticker to the elementary or secondary certification. This finding seems surprising since additional coursework would require additional time and cost for the individual interested in teaching middle grades mathematics.

Results of the study clearly point out whether or not one favors the need to be certified in an additional middle school subject appears to be directly related to the certification of the individual. That is, teachers with secondary math certification appear less to see a need for an additional subject certification for themselves. On the other hand, a greater percentage of elementary or non-secondary certified teachers see a need for middle grades teachers to have an additional subject certification.

This disparity may be attributed to varying perceptions on the role of a middle grades teacher. Is the middle grades teacher a specialist? As reported in the characteristics of the teachers surveyed most teachers teach math exclusively but one out

of four middle grades math teachers reported teaching an additional subject. To address this issue, future studies should explore the possibility of state continuity for math teachers' roles in the middle grades.

No agreement could be made about an academic program leading to a degree in middle grades education. This could be attributed to an uncertainty in an unproven program and the employment limitations that program might impose. Future studies should attempt to create a model for a middle grades certification program.

Also, attempts should be made to include opinion from administrators on this subject. Future studies should also investigate the certification programs middle grades administrators believe best prepare individuals for teaching middle grades math. Since, these are the individuals hiring the teachers that teach our middle grades math students.

The data reported here suggests that change is needed to insure that mathematics is taught in the middle grades by qualified confident teachers. However, before any change occurs additional questions will need to be answered. Will this specialized certification ultimately improve student achievement or simply deplete the number of qualified applicants for middle grades math positions?

As we strive for excellence in math education we will see certification play an important role. First and foremost will be its responsibility to identify exactly which teachers are qualified to teach mathematics in the middle grades. Ultimately this identification will assist in improving the quality of math education in the middle grades.

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APPENDIX A

1534 N. Bowling Green Drive
Cherry Hill, NJ 08003
February 11, 2000

Dear School Principal and/or Math Supervisor:

I am a graduate student at Rowan University and a math teacher of ten years. I previously taught 7th grade math in Pennsauken and currently teach 6th and 7th grade math at Rosa International in Cherry Hill. I have always been intrigued by the varying views of colleagues with regards to state certification for middle grades math teachers. Enclosed please find twelve copies of a short survey to examine teachers' opinions on this issue. I will use the results of this survey in my thesis.

Please distribute these to any teachers who teach mathematics in grade 6, grade 7 or grade 8. Please return the completed surveys within one week of your receipt of them in the enclosed, self-addressed, stamped envelope. Be assured that confidentiality will be maintained.

There is great concern in the entire country about the low mathematics scores of our students. One recent topic of importance is the need to have qualified teachers teaching mathematics in the middle grades. The importance of the responses of your teachers goes beyond importance to me as an individual researcher.

Your cooperation will be very much appreciated. Since I will have no way of knowing which specific schools reply, this is my only opportunity to express that appreciation.

Thank you!

Sincerely,

Jim Thompson
Mathematics Teacher
Rosa Intrn'tl Middle School

1534 N. Bowling Green Drive
Cherry Hill NJ 08003
February 4, 2000

Dear Fellow Teacher:

Thank you very much for taking the time to complete the attached survey. I am a graduate student at Rowan University and a math teacher of ten years. I previously taught 7th grade math in Pennsauken and currently teach 6th and 7th grade math in Cherry Hill. I will be using the results of this survey in my thesis.

We are all aware of the national concern about the low mathematics scores of our students. One recent topic of importance is the need to have qualified teachers teaching mathematics in the middle grades. The importance of your cooperation and honesty goes beyond importance to me as an individual researcher. Be assured that confidentiality will be maintained.

Since I will have no way of knowing which specific schools reply, this is my only opportunity to express that appreciation.

Thank you very much!

Sincerely,

Jim Thompson

II. Certification Requirements

- | | | | | | |
|---|-----------|----------|----------|----------|-----------|
| 1. Teachers certified to teach middle grades math should have had field experience in middle grades during student teaching. | SA | A | N | D | SD |
| 2. Teachers certified to teach middle grades math should have had course offerings in special methods of teaching math in middle grades. | SA | A | N | D | SD |
| 3. Teachers certified to teach middle grades math should have had course offerings dealing with the psychology of learning and behavior as it applies to the middle grades child. | SA | A | N | D | SD |
| 4. Teachers certified to teach middle grades math should be required to have an academic minor in mathematics. | SA | A | N | D | SD |
| 5. Teachers certified to teach middle grades math should have had course offerings that studied the New Jersey Mathematics' Standards. | SA | A | N | D | SD |
| 6. Teachers certified to teach middle grades math should have had course offerings dealing with the philosophy, and purpose of middle grade math education. | SA | A | N | D | SD |
| 7. Teachers certified to teach middle grades math should be certified to teach an additional middle school subject. | SA | A | N | D | SD |
| 8. Teachers certified to teach middle grades math should have had course offerings in methods of individualized instruction. | SA | A | N | D | SD |
| 9. Teachers certified to teach middle grades math should have a major in mathematics with an additional field of academic minor. | SA | A | N | D | SD |