THE EFFECT OF TEACHER EXPERIENCE AND TEACHER DEGREE LEVELS ON STUDENT ACHIEVEMENT IN MATHEMATICS AND COMMUNICATION ARTS

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Abstract

The purpose of this study was to examine whether years of teaching experience has an effect on overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program. In addition, this study examined whether a teacher's degree level has an effect on overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program. Using descriptive statistics and factorial ANOVA, the researcher used data from both the communication arts and mathematics sections of the Missouri Assessment Program exam from the 2005-06 and 2006-07 school years to determine whether teacher degree level or years of experience had an effect on student achievement.

Inconclusive results indicated teacher degree level alone had no effect on student achievement. The results indicated that years of experience, as well as the interaction between years of experience and degree level, had an effect on student achievement in both communication arts and mathematics. These results provide a strong foundation for further research in which this particular study could be continued using future test score data. Additionally, it could be expanded statewide, using data from districts all across the state. Finally, this study could be changed to include the addition of other factors such as years of experience teaching a tested subject or grade level as well as specific area of degree level.

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TABLE OF CONTENTS

List of Tables

List of Figures

CHAPTER ONE

INTRODUCTION

High-quality teachers are one of the key components in successful classrooms. However, there is widespread disagreement among many in the educational community about exactly what constitutes a high-quality teacher. Is it experience? Is it degree-level? Can it even be measured by a test, survey, or questionnaire?

According to author Bess Keller, there is little disagreement that high-quality teachers make a major impact on student achievement. “The world’s top-performing school systems and those coming up fast have a lesson to teach the others: Put high-quality teaching for every child at the heart of school improvement” (1). Her conclusion was based on a 2003 report sponsored by the 30-nation Organization for Economic Cooperation and Development. “School system success,” the report contends, “hinges on getting the right people to become teachers, helping them learn to teach, and crafting a system that ensures every child will get access to the teaching he needs” (Keller 1). Because high-quality teaching is so crucial to school system success, how do superintendents, boards of education, and school administrators ensure they are getting high-quality teachers in their schools?

One seemingly logical answer has dominated school system discussions: finding experienced teachers. However, according to a 2007 article by Vaishali Honawar, officials in the state of Louisiana are beginning to question that thought. “A study that scrutinizes 22 teacher-preparation programs in Louisiana says that it is possible to prepare new teachers who are as effective as, or sometimes more effective than, their

experienced colleagues" (1). This comes after researchers, led by George H. Noell, a professor of psychology at Louisiana State University, examined a variety of data including student achievement, curriculum, and teacher databases. These researchers found that teachers who had recently graduated from the LSU alternative-certification programs "performed at levels 1 and 2, meaning they did better than, or as well as, experienced teachers" (Honawar 2).

If more-experienced teachers aren't guaranteed to be better than less-experienced teachers, maybe teacher degree-level is what determines a high-quality teacher. In a 2003 article in The Gainesville Sun, author Douane D. James cited a study by Jennifer King Rice that addresses degree level as it pertains to teacher quality. According to James's article, "Advanced degrees, particularly master's degrees, have a positive effect on high school mathematics and science achievement" (2). However, the article went on to point out this holds true "only when those degrees were earned in those subjects" (James 2). Many questions are left unanswered about the effects of a teacher with an advanced degree on students in communication arts was not addressed.

While the debate continues nationwide as to what exactly constitutes a high-quality teacher, there is little debate as to the importance of high-quality teachers. This study attempted to provide definitive answers as to the relationship of teacher experience and degree-level with student performance. Simply stated, this study addressed the question, "Does teacher experience or degree level have an effect on student achievement in mathematics and communication arts?"

Background of the Study

This study was conducted in a mid-size urban school district located in northwest Missouri. The district has three high schools, four middle schools, 18 elementary schools, one vocational school, and one alternative school, for a total enrollment of 11,513 students.

Between the school years of 2000-01 and 2006-07, the composition of the teacher population was relatively stable, while the percentage of teachers earning masters' degrees or higher fluctuated (see Table 1). The average number of years of experience of teachers in the district from 2000-01 to 2003-04 was 14.5. In the 2004-05 school year, the years of experience declined by a full year and continued to decline. The percentage of teachers with a master's degree or higher fluctuated, with a jump of almost 4% from the 2002-03 school year to the 2003-04 school year, a 1% drop from the 2003-2004 school year to the 2004-05 school year, and then an increase of 3.1% between the 2004-05 school year and the 2006-07 school year.

Table 2 illustrates enrollment trends that have occurred in the school district from the school years 2000-01 to 2006-07. During this time, the district's enrollment declined by 309 students, while the diversity of the student population increased. For example, the percentage of Black and Hispanic students increased from the 2000-01 school year to the 2006-07 school year, while the percentage of white students decreased by 2%. Table 2 also shows the number of students eligible for free and reduced lunch. From 2000-01 to 2006-07, the number of students receiving free and reduced lunch has increased by 5%, with 54.0% of the students receiving free/reduced lunch during the 2005-06 school year, before declining to 53.6% in 2006-07.

Table 1

School District Faculty Information 2000-07

School Year	Average Years of Experience	Master's Degree or Higher (%)
2000-01	14.6	46.9
2001-02	14.4	47.8
2002-03	14.5	46.2
2003-04	14.4	50.4
2004-05	13.6	49.4
2005-06	13.4	51.8
2006-07	13.2	52.5

Source: "School Accountability Report Card." Missouri Department of Elementary and Secondary Education. 12 Dec. 2007. Missouri Department of Elementary and Secondary Education. 13 Dec. 2007 <http://dese.mo.gov/planning/profile/arsd[xx].html>.

Table 2

School District Demographic Information

School Year, Enrollment	Asian	Black	Hispanic	Native American	Caucasian	Free/Red. Lunch
2000-01 *N* = 11,822	0.7	6.7	2.2	0.4	90.0	47.6
2001-02 *N* = 11,726	0.8	6.8	2.5	0.4	89.5	49.2
2002-03 *N* = 11,658	0.8	7.1	2.6	1.5	89.0	50.6
2003-04 *N* = 11,559	0.8	7.2	2.9	0.5	88.6	51.4
2004-05 *N* = 11,402	0.7	7.7	2.7	0.6	88.2	52.6
2005-06 *N* = 11,363	0.9	8.7	3.1	0.5	86.8	54.0
2006-07 *N* = 11,513	1.0	8.9	5.0	0.5	84.6	53.6

Source: "School Accountability Report Card." Missouri Department of Elementary and Secondary Education. 12 Dec. 2007. Missouri Department of Elementary and Secondary Education. 13 Dec. 2007 <http://dese.mo.gov/planning/profile/arsd[xx].html>.

Every school district's policy varies regarding the maximum number of years of experience an incoming teacher can bring to a district. Some districts allow an experienced teacher to report only a limited number of years of teaching credit, while other school districts have no limitations on the number of years of experience they accept. According to the School District Employee Handbook, the school district used in this study, acceptance of previous teaching experience for placement on the salary schedule in the school district is as follows:

> Acceptance of Previous Teaching Experience - Credit shall be given for prior teaching experience outside the District, excluding substitute and apprentice teaching, to (14) years with full credit granted for the first five (5) years of experience and one-half (1/2) step/credit per year granted after five years (13).

Some would argue that in today's world of standardized testing, student achievement would benefit from more experienced teachers in the classroom. In Mark Fetler's 1999 study entitled, "High School Staff Characteristics and Mathematics Test Results," he stated, "Teacher experience, measured by the average number of years in service, is positively related to test results" (10). Such claims, however, are often countered with the argument that changing such policies would substantially increase school districts' expenses.

School districts weighing this issue must first examine how the number of years of teaching experience affects student achievement. Equally important is whether the teacher's degree level affects student achievement. Mary J. Woolridge conducted a study in 2003, examining the differences in student achievement among students taught by

teachers with a master's degree compared to students taught by a teacher with a bachelor's degree (6). The subjects in this study were third through eighth grade students in 12 schools in a Florida school district. The results of Woolridge's study showed that third and fifth-grade students of master's degree teachers achieved significantly higher results, when compared to students of bachelor's degree teachers. Additional results from the same study found achievement to be the same, regardless of the degree status of the teacher, while middle school students of master's degree teachers outperformed students of bachelor's degree teachers (91-93).

In 2005, Carrie R. Ferguson studied the relationships of teacher qualifications to middle school student achievement in mathematics (5). Results from this study "indicated that only the number of years teaching middle school mathematics had a significant relationship to student achievement, with a statistical significance of $p = 0.03$" (77). In summary, Ferguson set her critical value at 3% (as expressed in the previous equation). Because the students' scores in Ferguson's research were statistically in the upper 3% range, they are judged to be so rare that the conclusion was the obtained outcome and was not due to chance but attributed to the number of years the teacher had taught middle school math.

In 2004, Donald Rugraff studied the relationship of teacher salaries, teacher experience, and teacher education on student outcomes. In his study, Rugraff found teachers' salaries and levels of education affected student achievement, but the years of experience of teachers had little to no effect on achievement and the dropout rate (79). Both Rugraff and Ferguson's studies looked specifically at the same variables investigated in this study.

Purpose of the Study

The purpose of this study was to examine whether years of teaching experience affects overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program. In addition, this study examined whether a teacher's degree level affects overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program.

Research Questions and Hypotheses

In order to conduct the study, the essential questions that drive the research must be established. These questions not only helped focus the research but also led to a greater understanding of the importance of the research. Three research questions guided this study:

1. Does the number of years of teaching experience affect student achievement?
2. Does teacher degree level affect student achievement?
3. Are there any other factors related to years of teaching experience or teacher degree level that affect student achievement?

There were six hypotheses in this study. Two of the hypotheses examined the effect of teacher experience on student achievement in communication arts and mathematics. Two of the hypotheses examined the effect of teacher degree levels on student achievement in communication arts and mathematics. The final two hypotheses examined the interaction between teacher degree level and years of teaching experience on student achievement in both communication arts and mathematics.

HO_1: The number of years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_2: The number of years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_3: Teacher degree level has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_4: Teacher degree level has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_5: The combination of teacher degree level and years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_6: The combination of teacher degree level and years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

Significance of the Study

Most school boards adopt policies that limit the number of years of experience teachers can bring with them when they move to a new school district, while giving salary increases for the amount of graduate work they complete. Before a school district considers a policy in which it allows teachers to bring all of their years of experience with them for placement on a salary scale, it would be best to examine whether years of

teacher experience and/or teacher degree level affect student achievement. Additionally, while it is common practice for school districts in Missouri to grant increases in teaching salaries for attaining advanced degrees, it is unknown whether this translates into higher student achievement. In this study, student achievement scores from the communication arts and mathematics sections of the Missouri Assessment Program (MAP) exam were examined at grade levels 3-8, 10, and 11 to see if teacher experience and/or degree levels affect student achievement. It is important to note that in Missouri, students in grades 3-8 and 11 take the communication arts exam and students in grades 3-8 and 10 take the mathematics exam.

Overview of Methodology

In this study, principals indicated on an Excel spreadsheet the total years in the profession and highest degree earned for teachers in their buildings. The school district's Assessment Division compiled this data with archived student MAP test scale scores, as well as with the number of students scoring *advanced* and *proficient* on the exam. In the first component of this study, teachers were divided into four groups, based on the number of years of teaching experience: 1-4, 5-10, 11-19, and 20+. For each group and for each subject area (communication arts and mathematics), the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by each group to determine the percentage of students scoring *advanced* and *proficient* on the exam. In the second component of this study, teachers were divided into two groups based on their degree level: (a) bachelor's and (b) master's or higher. For each group and for each subject area, the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by each group to determine the percentage

of students scoring *advanced* and *proficient* on the exam. In the final component of this study, a factorial analysis of variance (ANOVA) was determined using student scale scores as the dependent variable and years of teaching experience and teacher degree levels as the independent variables. For those grade levels where an interaction occurred between years of teaching experience and degree level, a post hoc analysis was conducted to determine whether a significant degree of interaction occurred.

Research Variables and Instrument Used

In this study, one dependent and two independent variables were identified. The dependent variable for all research questions and hypotheses was student achievement. The independent variables were teacher experience and teacher degree level. The instrument used to conduct the statistical analysis for this study was Statistical Package for the Social Sciences (SPSS) version 16.0. All data was loaded into SPSS in order to run the factorial ANOVA, the post hoc analyses, and percentages of students scoring *advanced* and *proficient* for each of the groups.

Limitations and Delimitations

All research must conclude that an infinite number of factors are present and cannot be taken into account for various reasons; the same holds true for this study. Several of these limitations and delimitations are self-imposed, but most are due to factors outside of the researcher's control. However, these limitations and delimitations also help narrow the focus of the research to allow the significant numbers to be analyzed. There are four limitations in this study:

1. Only the variables of "number of years of teaching experience" and "degree level of the teacher" were associated with student achievement.

2. Only public schools in the mid-size urban school district are included in this study.
3. Only Missouri Assessment Program scores from 2005-06 and 2006-07 were used in this study.
4. Since the State of Missouri mandates the testing of communication arts and mathematics, these scores are the only ones used in this study.

There was one delimitation in this study:

1. The study was limited to the mid-size urban school district located in northwest Missouri.

Assumptions

The following assumptions were made in this study:

1. Graduate degrees or hours above a graduate degree were considered equal, regardless of the institution where they were earned.
2. Teaching experience at any grade level in a public or private school was congruent.
3. The Missouri Assessment Program is a reliable and valid system of assessments measuring student achievement.
4. Student pre-coded test booklets indicated the correct teacher.
5. Years of teaching experience did not take into consideration at what grade level all years were taught; rather, overall years of experience were reflected.
6. Principals submitted correct teacher information to the Assessment Division when submitting teacher information on the Excel spreadsheet.
7. All data entry into Excel was done correctly.

Definition of Terms

Instructor degree level: Refers to the degree attained by the instructor in four categories: bachelor's, master's, specialist's, and doctorate. "Graduate credit must be obtained from accredited institutions, pertain to the teaching field or to professional improvement, and must have been taken after completion of the previous degree to be accepted for salary increase purposes" (School District Employee Handbook 14).

Missouri Assessment Program (MAP): Refers to the state assessment administered to Missouri students in the spring of each year. Students in grades 3-8 and 11 are administered the MAP in communication arts. Students in grades 3-8 and 10 are administered the MAP in mathematics ("Missouri Assessment Program" 1).

Student achievement: Refers to student scale scores on the Missouri Assessment Program. Student scale scores compared to state-determined cut-scores determine whether the student is categorized as *below basic*, *basic*, *proficient*, or *advanced* ("Missouri Assessment Program" 2).

Years of teaching experience: Refers to the number of years of teaching a teacher has in the classroom setting. No less than three quarters of a school year can be counted as a full teaching year (School District Employee Handbook 14).

Organization of the Study

This clinical research study is divided into five chapters. Chapter One includes the introduction, background of the study, purpose, research questions and hypotheses, significance of the study, overview of methodology, limitations and delimitations, assumptions, and definitions of key terms. Chapter Two provides a review of the literature. Chapter Three discusses the topics of research design, population sample,

hypotheses, research variables, instrumentation, data collection procedures, and statistical analysis as related to this study. Chapter Four contains all data collected and results, based on the statistical analysis conducted in the study. Finally, Chapter Five contains the interpretation of the data, its relationship with the hypotheses, and recommendations for future study.

CHAPTER TWO

REVIEW OF LITERATURE

The purpose of this study was to examine whether a teacher's years of experience affects the overall achievement of his or her students on the communication arts and mathematics portions of the Missouri Assessment Program examination. This study also examined whether a teacher's degree level affects the overall achievement of his or her students on the communication arts and mathematics portions of the Missouri Assessment Program examination. Since numerous Missouri school districts advocate hiring educators with previous teaching experience and higher levels of education, with the idea that it will improve student performance, the findings of this study will help to determine whether these hiring practices are valid.

This study was conducted in a mid-size urban school district located in northwest Missouri. The school district has three high schools, four middle schools, 18 elementary schools, one vocational school, and one alternative school (housing six programs). The total student enrollment of the district in the 2006-07 school year was 11,513 students. Since the 2000-01 school year, the district's enrollment declined by 309 students, while the diversity of the student population increased. Over the past six years, the average years of experience among the faculty decreased by an average of 1.4, from 14.6 years of experience to 13.2. Meanwhile, the percentage of teachers with advanced degrees increased 5.6%, from 46.9% to 52.5% over the same time span.

In this chapter, research regarding four topics related to the study is examined. By exploring what previous research had determined, the idea of the direction of this study

was formulated. First, the various factors influencing student achievement are examined. Examples of these factors include teacher characteristics, teacher credentials, environmental factors such as class size, and student factors such as background, social economic status, and home life. Second, the influence of the teacher's degree level on student achievement is examined. Some studies indicated that a teacher's degree level affected student achievement only at the secondary level and only if the degree was in the subject area of mathematics (Goldhaber and Brewer "Does Teacher Certification Matter?"; Rice; Rosenthal; Woolridge; Goldhaber and Brewer "Evaluating the Effect"; Goldhaber and Anthony "Teacher Quality and").

Third, teaching experience and its influence on student achievement are examined. Research on this topic varies. On one hand, some research indicated that teaching experience positively affects student achievement until years 5-8 (Rosenthal; Kane; Rockoff; Goldhaber and Anthony "Teacher Quality"; Gorman; Walsh; and "Teacher Quality"). After this time, results showed that teacher impact on student achievement levels off and eventually decreases as the years of experience increase. Other research indicated teachers with one or two years of experience negatively affect student achievement ("Relationship Between;" Rivkin, Hanushek, and Kain; Gorman). Finally, the importance of having a quality teacher in the classroom is examined. More importantly, the impact a poor quality teacher on student achievement is investigated.

Factors Influencing Student Achievement

William Sanders, founder of the Value-Added Research and Assessment Center at the University of Tennessee-Knoxville, examined the impact of quality teachers on student achievement (qtd. in Haycock 2). Beginning in 1992, Sanders began tracking the

progress of each student in Tennessee through a large database (Hershberg, slide 17). This database included over 10 million records of test scores for all subjects at all grade levels with all teachers. The philosophy behind tracking the progress of each student lay in a term called "value added" (slide 18). Sanders believed that students had the right to progress in school at least at the same rate they had done in the past. This meant that schools added value to a student during the school year (slide 18).

In his research, Sanders found "low achieving students gain about 14 points each year on the state test when taught by the least effective teachers, but gain more than 53 points when taught by the most effective teachers" (qtd. in Haycock 2). Sanders outlined a correlation between quality teaching and student performance. Some researchers discussed the need for effective teachers because of a looming teacher shortage. In 2002, Dan Goldhaber's article, "The Mystery of Good Teaching" in the magazine, Education Next, discussed the need to examine the impact of teachers on student achievement because of a projected teacher shortage during the next decade when the baby boomer generation reaches retirement age (1). Moreover, he wrote, "Good teachers certainly make a difference, but it's unclear what makes for a good teacher" (1).

Linda Darling-Hammond et al. supported these researchers when they pointed to the importance of a quality classroom teacher to the success of students. In a paper submitted to Educational Evaluation and Policy Analysis as a response to research on teacher quality conducted by Goldhaber and Brewer, they concurred that well-prepared, quality teachers have a powerful impact on student achievement (6). A press release by Campbell from the Education Trust in February 2007, also corroborated the importance of a quality teacher on student achievement. The press release is the Education Trust's

statement on results from the 12th grade National Assessment of Educational Progress (NAEP). The NAEP scores illustrated that there is a correlation between teacher quality and student achievement—particularly for minority students (Campbell 3). The author stated, "The message is clear: having a well-qualified teacher who knows her content material is more important than the name of the course in terms of demonstrated achievement" (3).

There are also factors, both student-related and teacher-related, that can influence student achievement. Ronald F. Ferguson and Jordana Brown conducted a meta-analysis of research regarding the correlation between teacher certification test scores, teacher quality, and student achievement. They pointed out that student test score gains are "an imperfect measure of what we really want to know: the teacher's contribution to producing the gains. Because other factors such as student, home, school, and community characteristics affect achievement as well, teachers deserve neither all of the credit for success nor all of the blame for the failures" (134). Many factors affect students, yet numerous research studies point to the importance of the teacher in the classroom in relationship to student achievement gains.

A meta-analysis of current research on the impact of a quality teacher on student achievement by the Center for Public Education defined four dimensions of teacher quality: content knowledge, teaching experience, professional certification, and overall academic ability ("Teacher Quality" 2). Content knowledge is defined as having a major or minor in the field in which they teach. A minimum of five years teaching experience influences student achievement, according to the Center. On the other hand, an inexperienced teacher can hinder student achievement. Professional certification is

defined as being certified in the subject area. Academic ability is measured through ACT and/or SAT scores, grade point average, or through the selectiveness of the college or university from which the teacher graduated ("Teacher Quality" 4). According to the Center (2), the possession of these characteristics is "likely to produce effective teaching." The Center for Public Education wasn't the only organization to validate these findings. Studies from the Texas Schools Project and Tennessee's Value Added Assessment System and Student Teacher Achievement Ratio project also identified these same four qualities as major factors influencing student achievement ("Teacher Quality" 4).

Class size is another factor that various studies have related to student achievement. One of those studies is The Research Brief from the Public Policy Institute of California. It stated, "In general, class size appears to matter more in lower grades than in upper grades, whereas teacher qualifications such as experience, level of education, and subject area knowledge appear to matter more in the upper grades" (Betts, Zau, & Rice 2). Tennessee implemented a class-size reduction program called *Project STAR (Student/Teacher Achievement Ratio)*. This four-year study involved 80 schools from 42 school districts in Tennessee, and the socioeconomic status of the students varied from poor to affluent (Word et al. 2-3). Through this study, Project STAR provided ample data that reducing class size improved student achievement, especially for minority and inner city students (11).

A similar program in Wisconsin called Student Achievement Guarantee in Education (SAGE) was aimed at reducing class sizes in grades K-3 in high-poverty schools to no more than 15 students per teacher ("Student Achievement" 1). SAGE also

saw remarkable results with students in classrooms with smaller student-teacher ratios (Hruz 1); there was a larger gain for students who were African American than those who were white (1).

Although several studies examined factors impacting student achievement, many of the findings were inconclusive. Much of the time the reason stated for the inconclusiveness was differences between students. For example, using findings from a 1997 study conducted by Jaap Scheerens & Roel Bosker, Russ Whitehurst, Assistant Secretary, Educational Research and Improvement for the United States Department of Elementary and Secondary Education stated,

> Roughly 20% of the difference in student achievement is associated with the schools children attend, another 20% is associated with individual classrooms and teachers, and the remaining 60% is associated with differences among the children in each classroom, including the effects of their prior achievement and their socioeconomic background (2).

This indicated that although there is some evidence pointing to the importance of the classroom teacher in influencing student achievement, it is minimal compared to the factors of socioeconomic background and prior student achievement.

Degree Level Influence on Student Achievement

When examining the influence of teacher degree level on student achievement, many of the results are not positive. Goldhaber stated,

> The measures of teacher quality that are used by most public school systems to screen candidates and determine compensation—certification, experience, and education level—have been well researched, but there is

> little definitive empirical evidence these characteristics, defined in general terms, are associated with higher student achievement. (5)

Goldhaber clearly argued that schools do not use the correct criteria when determining what makes a quality teacher. In fact, he cited intangible characteristics, such as enthusiasm and skill in conveying knowledge (5). Figure 1 from Goldhaber's work illustrates the impact of teacher quality on student achievement. It is interesting to note that Goldhaber stated the aspects of teacher quality that can be measured account for only 3% of the student performance. The other 97% of the student performance is attributed to the immeasurable teacher qualities, such as enthusiasm and skill in the classroom (5). This figure illustrates just how little impact the measurable characteristics of teacher quality have on student achievement. Instead, Goldhaber believed the teacher's immeasurable qualities are what have the greatest impact on student achievement. Unfortunately, if these qualities are not measurable, conducting research on their impact is nearly impossible.

The traditional teacher salary schedule gives teachers pay increases based on two factors: the number of years of teaching experience and a teacher's degree level. An article in Education Next, by author Allan Odden, explained how the traditional salary schedule came into existence. "Introduced in Denver and Des Moines in 1921, the single salary schedule was meant to resolve the inequities of an era when women, minorities, and elementary school teachers were paid less than their counterparts" (1). Logic would lead one to infer if school districts put merit into the factors of teaching experience and education level, surely there must be research stating they are important factors in student achievement.

Elusive Qualities

The teacher characteristics that we can measure—experience, education level, certification status, and so on—only explain 3 percent of the differences in student achievement that are attributable to their teachers' influence.

% of Teachers' Influence Attributable to Various Characteristics

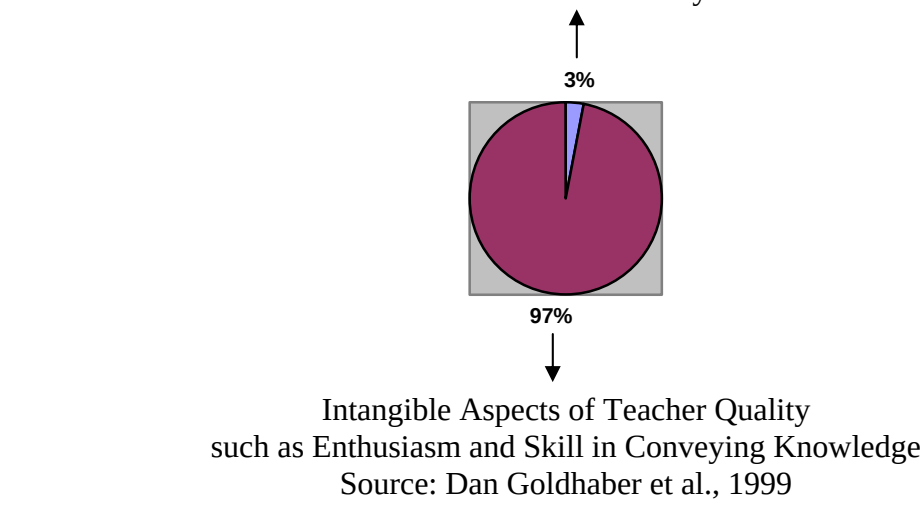

Fig. 1. Percentage of Teachers' Influence Attributable to Various Characteristics. From Goldhaber, Dan. "The Mystery of Good Teaching." Education Next 2 (2002). 13 Aug. 2007 <www.hoover.org/publications/ednext/3368021.html>.

At one time, holding a bachelor's degree was acceptable in the field of education. Today, many school districts expect that teachers possess a post-baccalaureate degree (Lewis et al. 10). In particular, secondary teachers are pressured to obtain a bachelor's degree in a subject area rather than a general education bachelor's degree, thus emphasizing the importance of subject-area knowledge rather than pedagogy (11). In 1971, 28% of public school teachers held an advanced degree. By 1991, the number rose

to 53% (Fetler 4). The National Center for Education Statistics released a report in January 1999, entitled “Teacher Quality: A Report on the Preparation and Qualifications of Public School Teachers”. This report indicated that a 1998 survey of teachers revealed that 66% of high school teachers had an undergraduate or graduate major in an academic field (Lewis et al. iv). However, only 44% of middle school teachers and 22% of elementary teachers attained an undergraduate or graduate degree in an academic field (Lewis et al. iv).

In Donald Rugraff’s research entitled, “The Relationship of Teacher Salaries, Teacher Experience, and Teacher Education on Student Outcomes,” he stated that more master’s degrees are awarded in the education field yearly than any in other area, representing one of every four degrees awarded (31). However, although the number of advanced degrees in education has risen since 1971, it has not necessarily translated into higher student achievement. Darling-Hammond believed that because master’s degrees come in such a variety of areas in education, simply having a master’s degree does not necessarily equate to student success. She stated, “Characteristics such as education level (percentage of teachers with master’s degrees) show positive but less strong relationships with education outcomes” (29).

Clotfelter, Ladd, and Vigdor studied the effects of teacher degree levels on student achievement in grades 3-5 in North Carolina between 1994 and 2003. They suggested most of the graduate degrees awarded to teachers are for the sole purpose of generating a higher salary for teachers, rather than to gain more knowledge in their content area (32). Eric Hanushek and Steven Rivkin wrote a paper in which they sought to “disentangle the impact of schools and teachers in influencing achievement” (417).

They studied student test score data in grades 3-7 for three cohorts of students in the state of Texas in the mid-1990s and looked for teacher and school impact on the student achievement. Through their research they concluded, “There is little or no evidence that a master’s degree raises the quality of teaching” (418).

In many studies, possession of a master’s degree in the content area in which a person teaches influences student achievement at the secondary level. Jennifer King Rice conducted a meta-analysis to ascertain whether teacher experience, teacher preparation programs and degrees, teacher certification, teacher coursework, and a teacher’s own test scores were indicators of teacher quality (1). In her work, she stated, “Evidence suggests that teachers who have earned advanced degrees have a positive impact on high school mathematics and science achievement when the degrees earned were in these subjects” (2).

Goldhaber and Brewer, in “Does Teacher Certification Matter?” studied the impact of teacher subject area certification on student achievement by examining data from the National Educational Longitudinal Study of 1988 (132). They shared similar findings to Rice in mathematics, but argued there is no correlation between a teacher having a subject-specific degree and achievement level of their students in science (138). Lisa Rosenthal, GreatSchools’ senior editor, stated in her April 2007 article, “Teacher Experience and Credentials: Issues to Consider,”

> Some studies have shown that a teacher having an advanced degree does not have any significant effect on student achievement gains at the elementary level, but having an advanced degree does have an effect at the

> high school level, particularly in advanced courses in math and science. (1)

Woolridge studied the impact of teacher degree levels on student achievement in mathematics by using high-stakes tests in 12 Florida schools. In a section entitled, "Recommendations for Educators," she proposed that middle school principals hire teachers with master's degrees to teach mathematics if they want to improve student achievement, but went farther to suggest that school districts should work with area universities to increase access to high-quality master's degree programs (101-102). In their work, "Evaluating the Effect of Teacher Degree Level on Educational Performance," Goldhaber and Brewer suggested the reason for increased student achievement in specific content areas was because of "subject-specific training, rather than the teacher ability that leads to these findings" (15). Robert Croninger et al. used data from the Early Childhood Longitudinal Study to examine whether a relationship exists between qualifications of elementary school teachers and first grade student achievement in reading and mathematics. They concurred with Goldhaber and Brewer's conclusion, stating, "It is consistent with our findings and those of others that subject-relevant preparation is a more important predictor of achievement than broader measures of educational attainment" (322). In other words, higher student achievement was accomplished when the teacher obtained higher levels of content-specific knowledge in areas of math or science, rather than the mere possession of a master's degree.

According to a report from the Education Trust in November 2005, having knowledge in the subject area in which one teaches can contribute to higher student achievement (Grayson 3). In this report, researchers identified what makes high

performing high schools successful. One of the major findings stated that when making decisions about which staff members teach which subjects, high performing high schools consider factors such as past student performance and the areas in which the teacher received training, rather than seniority or teacher preference (3). Croninger et al. stated, "In math and science, subject-specific degrees earned were found to have a positive impact on student test scores in those subjects" (313). Much less is known about the impact on student achievement of a teacher's knowledge level in other disciplines, such as social studies and language arts.

Goldhaber and Anthony studied the characteristics of quality teachers and their impact on student achievement through a review of research on the topic. They found that simply having an advanced degree does not impact student achievement in grades 8-10, but "having an advanced degree in math and science for math and science teachers does appear to influence students' achievement" ("Teacher Quality" 12). Little positive impact has been found, though, for teachers who have advanced degrees in subject areas different from the areas in which they teach (12).

At the elementary level, results are less indicative of the positive impact of a master's degree on student achievement. In her study of Florida elementary teachers, Mary Wooldridge stated, "Nevertheless, when comparing students of general master's degree teachers and students of bachelor's degree teachers, the mean score showed no statistical significance, though the students taught by general master's degree teachers outperformed students taught by general bachelor's degree teachers an average of ten points" (92). Although this indicated influence of a teacher's possession of a master's degree on student achievement, the results are not sufficiently significant to warrant a

conclusion. Woolridge went on to suggest to elementary principals that they should hire master's degree teachers who have obtained their degrees in "specialized mathematics teacher enhancement master's degree programs" if they want improved student achievement in mathematics (101). The results from the Clotfelter et al. study indicated that a graduate degree does not have an impact on student achievement. They concluded that teachers who either had a master's degree or obtained it within the first five years of teaching were just as effective in the classroom as colleagues without a master's degree (33).

The vast majority of research conducted indicated that a teacher with a master's degree had no additional positive impact on student achievement over a teacher with a bachelor's degree. The Institute of Education Sciences stated, "The bulk of evidence on this policy is that there are no differential gains across classes taught by teachers with a master's degree or other advanced degree in education, compared to classes taught by teachers who lack such degrees" (21). Clotfelter et al. went on to state, "Despite the fact that teachers are rewarded in the form of higher salaries for having a master's degree, the variable denoting having a graduate degree exerts no statistically significant effect on student achievement, and in some cases, the coefficient is negative" (27-28). Linda Darling-Hammond found teachers with full certification and a major in the field in which they teach had a greater impact on student achievement than teachers who possessed an advanced degree. This finding did not surprise her, however, and she stated that this is because master's degrees cover a wide range of possible subject areas (39). Some individuals obtain their master's degree in a particular content area, such as math or reading, while others choose administration or counseling (39).

Several other studies suggested that advanced degrees in the education field do not translate into better teachers. Clotfelter et al. suggested there are small or negative effects associated with a teacher having a graduate degree. They stated, “Most of these degrees are master’s degrees that generate higher salaries for teachers” (32). Their findings suggested a graduate degree does not produce higher student achievement (32). Additionally, Debra Hughes-Jones et al. reviewed a study by the Southwest Educational Development Laboratory, which examined teacher resources and their impact on student achievement in Arkansas, Louisiana, and Texas. They concluded, “Teacher education beyond the undergraduate degree had no relationship to student achievement in reading and was found to be negatively associated with math scores only in Texas” (2). Upon studying research from “The Market for Teacher Quality,” by Hanushek, Kain, O’Brien, and Rivkin, Linda Gorman stated, “Good teachers do well with students at all levels of achievement, and there is no evidence that teacher education or performance on a certification examination contributes to quality teaching” (1). Douglas Harris and Tim Sass, in their study of teacher training, teacher quality, and the impact on student achievement, concluded,

> Our results indicate that obtaining an advanced degree during one’s teaching career does not enhance productivity and may actually reduce productivity in high school math and middle school reading. This may be because the graduate degrees include a combination of pedagogy and content, and our other evidence suggests that only the latter has a positive influence on teacher productivity. (26)

A few studies suggested that student achievement is influenced because the teacher has an advanced degree. As stated earlier, studies by Goldhaber and Brewer, Rice, and Rosenthal suggested that a master's degree in a specific content area can have a positive impact on student achievement. Rugraff also stated,

> There is a significant relationship between the percentage of graduates scoring at or above the ACT national average, based upon the percentage of teachers in the school district with master's degrees or higher. This leads to the conclusion that teachers with advanced degrees can often times significantly aid students' achievement in some environments. (89)

A study by ACT and the Education Trust indicated that one of the four characteristics of high performing high schools is qualified and experienced teachers (Grayson, "Preparing All High School Students" 2). In these high performing high schools, teachers were certified in their subject area and "nearly all had a master's degree or higher, with at least one degree in their subject area" (2).

Other researchers believe it is not the possession of an advanced degree that influences student achievement; that the teacher worked to obtain the advanced degree illustrates a more committed teacher and thus, a better teacher. Allan Glatthorn cautioned researchers not to jump to the conclusion that obtaining a master's degree has anything to do with student achievement. Instead, he suggested the teacher's commitment to his/her own learning in obtaining the master's degree has more to do with the students succeeding than simply having the degree (3). Katherine Freeman took this thought farther in her study when she stated, "There was a generally positive trend in the relationship between frequency (average) of units taken by teachers and pupil scores,

leading to the conclusion that taking classes regularly may be a greater contributor to pupil achievement than years of experience or total units accumulated" (1). Good teachers are good learners. Those who continue their education by obtaining advanced degrees are those who are committed to their profession and to their students. It is no wonder that many researchers point to this immeasurable quality as a predictor of student achievement, rather than the measurable characteristics such as degree level or years of experience.

Years of Teaching Experience Influence on Student Achievement

Through examination of the research, it has been found that years of experience can be correlated to student achievement, although sometimes it is a weak correlation. Hanushek and Rivkin wrote an article on teacher quality for the Handbook of the Economics of Education in 2006. In this article, they suggested that the correlation between years of experience and student achievement is statistically weak in many instances, and therefore cannot contribute to a strong assumption of the effect (11). The Center for Public Education reported,

> Researchers agree that teaching experience is positively correlated with higher student achievement even though findings about its meaning vary. For example, some studies find that years of teaching experience are a consistent predictor of higher test scores. Others document a negative effect when a high proportion of inexperienced teachers are present in a school, in terms of higher drop-out rates and lower achievement scores ("Research Q & A" 3).

Mark Fetler investigated the relationship between teacher experience and education and student achievement in mathematics. He stated, “Teacher experience, measured by the average number of years in service, is positively related to test results” (10). Other studies support this idea. The Public Policy Institute of California stated, “The only indicator that is systematically linked to student achievement in third grade is teacher experience. Having a new teacher reduces the percentage of students who exceed national median test scores by roughly 3 percentage points in both mathematics and reading” (“Relationships Between” 2). A study conducted by Rockoff found that teaching experience of ten or more years positively influenced student achievement in reading (3). Along the same lines, Harris and Sass concluded that experienced teachers are more effective in elementary and middle school reading (29). Darling-Hammond found that teacher experience had a greater impact on student achievement than did teacher certification or teacher degree programs (38).

With all of this research supporting the impact of years of experience on student achievement, several researchers identified how many years of experience will have a positive effect on student achievement. Rosenthal stated,

> Most successful schools have a healthy combination of experienced teachers and new teachers. The experienced teachers give the schools stability and serve as mentors to the new teachers. The new teachers bring fresh ideas and enthusiasm. Experience is certainly important, but interestingly enough, some studies have shown the benefits of experience become evident after just a few years of teaching and seem to peak at four

> or five years. In other words, teachers don't necessarily become more effective the longer they remain in the classroom. (1)

Rivkin et al. wrote a paper for Econometrica in March 2005, entitled, "Teachers, Schools, and Academic Achievement." In this paper, they remarked, "Beginning teachers and to a lesser extent second and third year teachers in mathematics perform significantly worse than more experienced teachers" (447).

Multiple studies indicate teaching experience peaks at a certain point. For example, The Center for Public Education suggested, "Teaching experience, typically five years or more, produces higher student results…teachers with more than five years in the classroom seem to be the most effective" ("Teacher Quality" 4). Linda Gorman also advanced, "First-year teachers have much lower performance on average than other teachers. After that, teacher performance improves markedly, peaking in the teacher's fourth year" (1). Kane et al. studied teachers in New York City and concluded, "Teachers make long strides in their first three years, with very little experience-related improvement after that" (64). In their paper entitled, "Teacher Quality and Student Achievement", Goldhaber and Anthony wrote, "Teacher experience may predict teacher effectiveness, but there is very little evidence of this beyond the first couple of years of teaching" (4). In the Abell Foundation's meta-analysis of research regarding teacher certification, senior policy analyst Kate Walsh wrote, "Much of the research has found that teachers get better with a few years of experience, but at some point, their effectiveness drops, viewed as an inverted U-shaped pattern of effectiveness and perhaps caused by 'burnout' or the promotion of better teachers out of the classroom" (5-6). Walsh articulated,

> The effect of experience can be distorted or obscured because teachers who enter the profession at the same time tend to share certain common attributes having nothing to do with experience. However, these attributes may be mistakenly interpreted as the effect of experience rather than as a manifestation of common traits that represent a particular cohort of teachers. Therefore, before jumping to the conclusion that teaching experience has an impact on student achievement, one must first examine many other factors. (6)

Teacher tenure is one factor. Every state has different stipulations on the number of years it takes for a teacher to gain tenure status. In the state of Missouri, a teacher receives tenure after the first five successful years of teaching in a school district. If teachers move to other districts, they can bring in only one year of experience toward the five required for tenure, so a teacher who may have 15 years of experience and who accepts a job in a new district will still have to teach four years in the district before earning tenure.

Revised Missouri Statute 168.281 states:

> Teacher employment becomes permanent once they have completed five successful years of teaching in a district. The only circumstances by which they can be removed from their teaching position are immorality, felony conviction, inefficiency or incompetence in the line of duty, violation of the published regulations of the school district, violation of the laws of Missouri governing the public schools, or that his/her physical or mental

> condition refrains the employee from conducting their duties. (Missouri General Assembly 1)

Studies by Rosenthal, Kane et al., Goldhaber and Anthony, Gorman, Walsh, and "Teacher Quality" all suggest that teaching experience has an impact on student achievement until years 3-5, in which case it no longer has an effect. Other researchers suggested that if student achievement is impacted by teacher experience, it is only because the more experienced teachers teach higher-level classes with more highly achieving students (Walsh 6). This is another reason the effect of experience is so difficult to measure. Simply put, "Teachers who have seniority can choose to teach in the better schools" (Walsh 6). Gorman stated, "Previous work suggests that teachers with stronger credentials tend to end up teaching students who perform better academically" (2). Thomas Dee and Sarah Cohodes found that students who are more likely to achieve at high levels are more likely to be assigned to teachers who are "subject-qualified" (12). Goldhaber and Anthony, as well as Rugraff, also suggested that due to seniority within a school or department, teachers with the most experience will choose to teach higher-level classes with more highly achieving students. Because of these factors, it is difficult to conclude that teaching experience alone can impact student achievement.

Importance of a Quality Teacher in the Classroom

Although research is mixed as to what constitutes a quality teacher, there is no question that teacher quality influences student achievement. Goldhaber and Anthony stated, "Studies have shown that teacher quality is the most important educational input predicting student achievement" ("Teacher Quality" 1). Although it is easy to test measurable characteristics such as degree level and years of experience, quality teaching

is much more complex. Darling-Hammond suggested that teacher quality is the most influential factor in student achievement (38).

More important than the positive impacts of teacher quality on student achievement is the negative impact of a poor teacher on a student. In the Center for Public Education analysis of several studies involving teacher quality, a 1996 study by Sanders and Rivers showed how the impact of quality teachers can accumulate over time. “Fifth-grade math students who had three consecutive highly effective teachers scored between 52 and 54 percentile points ahead of students who had three consecutive teachers who were least effective, even though the math achievement of both groups of students was the same prior to entering second grade” (”Teacher Quality” 3). The progress of students assigned to the most effective and least effective teachers in grades 3-5 was also tracked. Figure 2 illustrates the impact of students having three high-performing teachers compared to those having three low-effective teachers. Students who had three low-quality teachers from grades 3-5 scored in the 29th percentile in mathematics, whereas students who had three high-quality teachers scored in the 83rd percentile (Whitehurst 3).

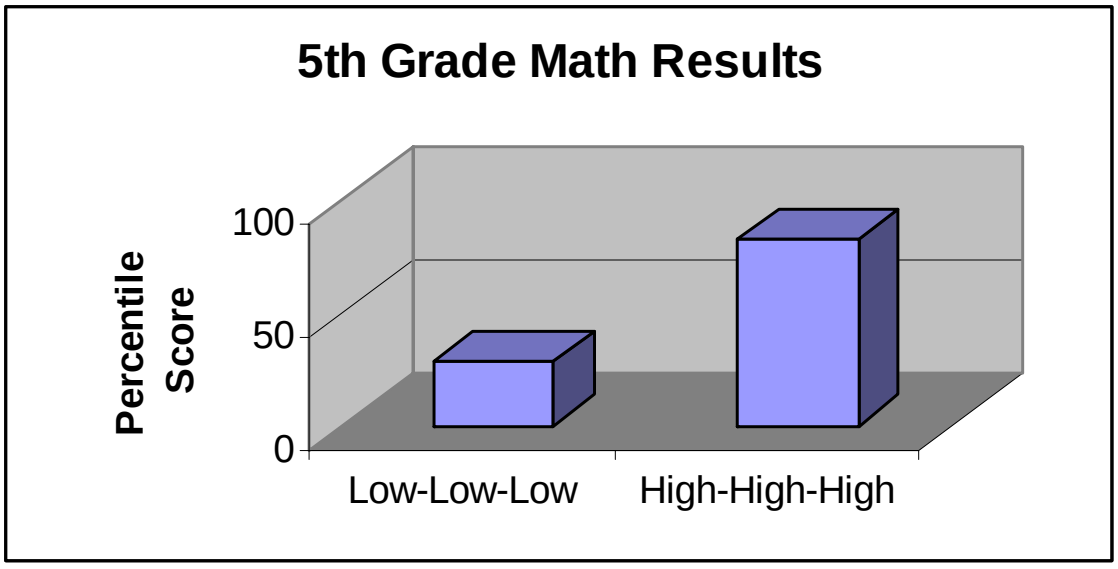

Fig. 2. Fifth Grade Math Results. From Institute of Education Sciences at <http://ies.ed.gov/director/speeches2002/03_05/2002_03_05.asp>

Jordan et al., in a 1997 study in Dallas Schools, asserted that students having three highly effective teachers in three consecutive years scored 34 percentile points higher in reading achievement and 49 percentile points higher in math achievement than did students who had three low-effect teachers in three consecutive years (qtd. in ”Research Q & A” 3). In a study conducted in Tennessee, students who failed the state’s fourth grade assessment were six times more likely to pass their graduation exit examination if they had a sequence of “highly effective teachers” than if they had a sequence of “low-effectiveness teachers” (Haycock 3). Results such as these show the positive and negative impacts of having quality teachers in every classroom. Parents do not want their children to be in a classroom with an ineffective teacher for even one year, much less three consecutive years. The impact of such an occurrence is certain to keep students from succeeding as they progress in school. Perhaps the researchers from the Dallas public

school district put it best when they stated, “A sequence of ineffective teachers with a student already low-achieving is educationally deadly” (Wilkins 5).

A trend in research illustrates the propensity for good teachers to flock to higher-paying, less diverse school districts, leaving the students in high-poverty and high-minority schools with poor-quality teachers. Russlynn Ali, director of Education Trust West, believes this is because a teacher’s status among peers does not come from how good the teacher is, but how elite the students are that he/she teaches. Teachers tend to get caught up in a form of peer pressure to teach at a well-known, respected institution. Hanley wrote, “Seniority favors teachers solely on the basis of years worked and encourages them to migrate from high-poverty and/or high-minority schools, where they are most needed, to primarily white schools” (1).

Many school administrators agree that having a high-quality teacher who chooses to stay in a high-poverty, high-minority district is a rare occurrence. In a written testimony to the Senate Committee on Health, Education, Labor, and Pensions on March 6, 2007, Amy Wilkins provided numerous statistics on this topic. “Nationally, fully 86% of math and science teachers in the nation’s highest minority schools are teaching out of field,” says Wilkins (3). This is especially crippling when one considers how often math and science are the two subject areas tested on most state assessment tests. Minority and poor students are twice as likely to receive an inexperienced teacher as those students who are white and affluent (3).

This is an alarmingly common trend in many states. For example, in Texas, students in schools with the highest poverty are twice as likely to be assigned to a new teacher as are their peers in low-poverty schools (4). Similarly, in Tennessee, a state that

has a value-added measurement of teacher effectiveness, Wilkins stated, “The ‘least-effective’ teachers in high-poverty, high-minority schools are even less effective than the ‘least effective’ teachers in low-poverty, low-minority schools” (4). Peter Hanley observed that in California, 44% of high school math classes taught to high-poverty students are taught by uncertified instructors (2).

These three states aren’t the only ones suffering from a this scenario. Juliet Williams, a correspondent for the Associated Press, reported in 2005 that schools with the highest percentage of minority students “were five times more likely to have an under-prepared teacher than those in schools with lower percentages” of minorities (1). Kevin Carey, senior policy analyst for the Education Trust, wrote a paper in 2004 entitled, “The Real Value of Teachers: Using New Information about Teacher Effectiveness to Close the Achievement Gap.” In this paper, he summed up this issue by stating, “As a society, we have to own up to a basic unethical failing. We take the most vulnerable students in public education and we persistently and pervasively assign them to our weakest teachers” (qtd. in The Education Trust 3).

Because of the inequity that exists between poor and affluent students or white and minority students, individuals such as Peter Hanley and Kevin Carey have called for changes in the educational system. For instance, Hanley suggested that tenure be repealed. He also suggested that school boards should make staffing decisions based on the needs of the students rather than on seniority. If seniority must be a factor, he asked districts to consider rotating assignments regularly to ensure that good teachers stay in schools with minority or poor students (2). Carey called for value-added teacher evaluations and other systems focusing on a teacher’s ability to help children learn (qtd.

in The Education Trust 2). In all instances, the emerging theme is to change current practice, with the overall goal to provide for students of minority or poverty at all costs.

Summary

Although the majority of the research surrounding teacher experience and degree level and their impact on student achievement is inconclusive, there are trends to be considered. Much of the research regarding teacher experience indicates that teaching experience has a positive impact on student achievement, at least until year 5, when the impact levels off. Furthermore, some research indicates teacher impact on student achievement becomes negative in the later years of teaching (Darling-Hammond 8).

Although the research regarding the impact of teacher degree level on student achievement is inconclusive, the trend thus far shows that a teacher's degree level has no significant impact on student achievement unless the graduate degree is in the teacher's content area, and then only if the content area is math or science. Because obtaining a master's degree in other education fields has become popular, user-friendly, and monetarily rewarding, teachers tend to shy away from working on a master's degree in their content area. Instead, they opt for other degree options such as administration, curriculum and instruction, technology, or counseling. These degrees prepare a teacher for a job other than teaching in the classroom, which could be why the mere possession of a master's degree does not necessarily equate to an effective teacher.

While criteria such as experience and degree level are arguable in determining what makes a quality teacher, the importance of a quality teacher in a classroom is not arguable. No parent wants to put his/her child in a classroom with an ineffective teacher

for even one year, much less multiple years, as many studies have found to be the case, especially in high-poverty and high-minority schools.

In Chapter 3, the study addresses the topics of research design, population sample, hypothesis, research variables, instrumentation, data collection procedures, and statistical analysis as related to this study.

CHAPTER THREE

METHODOLOGY

The purpose of this study was to determine whether years of teaching experience affects the overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program examination. In addition, this study examined whether teachers' degree level affects the overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program examination. The study was conducted in a mid-size urban school district in northwest Missouri.

The methodology employed to test the research hypotheses is presented in this chapter. The chapter is organized into sections: research design, population sample, hypotheses, research variables, instrumentation, data collection procedures, and statistical analysis.

Research Design

As previously mentioned, the school district used in this study has three high schools, four middle schools, eighteen elementary schools, one vocational school, and one alternative school. The 995 certificated staff members district-wide have an average of 13.2 years of experience. Certificated staff is defined as classroom teachers, counselors, and administrators, but only classroom teachers are examined in this study. In addition, 52.5% percent of the certificated staff hold an advanced degree.

In the first component of this study, teachers were divided into four groups based on the number of years of teaching experience: 1-4, 5-10, 11-19, and 20+. For each group

and for each subject area (communication arts and mathematics), the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by each group to determine the percentage of students scoring *advanced* and *proficient* on the exam. In the second component of this study, teachers were divided into two groups based on their degree level: (a) bachelor's and (b) master's or higher. For each group and for each subject area, the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by each group to determine the percentage of students scoring *advanced* and *proficient* on the exam. In the final component of this study, a factorial analysis of variance (ANOVA) was determined using student scale scores as the dependent variable and years of teaching experience and teacher degree levels as the independent variables.

Hypotheses

This study has six hypotheses. Two of the hypotheses examine the effect of teacher experience on student achievement in communication arts and mathematics. Two of the hypotheses examine the effect of teacher degree levels on student achievement in communication arts and mathematics. The final two hypotheses examine the interaction between teacher degree level and years of teaching experience on student achievement in both communication arts and mathematics.

HO_1: The number of years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_2: The number of years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_3: Teacher degree level has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_4: Teacher degree level has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_5: The combination of teacher degree level and years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_6: The combination of teacher degree level and years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

Data Collection Procedures

In this study, principals indicated on an Excel spreadsheet the total years in the profession and highest degree earned for teachers in their buildings. This spreadsheet was sent to the school district's assessment division to establish a baseline of data. Although teacher names were identified on the spreadsheet with all student data, the researcher in this study did not have access to this information. All teacher and student names were removed for purposes of this study.

All of the 27 schools in the district participated in the study, with the exception of the area vocational and technical school. Students in this educational setting take the

MAP test in their sending schools, so their data is included at their home high schools. Student scores on the MAP test were collected and input by teacher into the Excel file.

Statistical Analysis

In the first component of this study, teachers were divided into four groups based on the number of years of teaching experience: 1-4, 5-10, 11-19, and 20+. For each group and subject area, the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by each group to determine the percentage of students scoring *advanced* and *proficient* on the exam. Both the student scale scores and teacher information were input into the SPSS version 16.0 computer program.

In the second component of this study, teachers were divided into two groups based on their degree level: (a) bachelor's and (b) master's or higher. For each group the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by each group to determine the percentage of students scoring *advanced* and *proficient* on the exam.

In the final component of this study, a factorial analysis of variance (ANOVA) was determined, using student scale scores as the dependent variable and years of teaching experience and teacher degree levels as the independent variables. According to author Neil Salkind, a factorial ANOVA allows the researcher to study the "main effect" for each independent variable separately, as well as the interaction between the independent variables, which is called the "interaction effect" (213, 218). In this study, the factorial ANOVA was used to determine three outcomes: the main effect of years of teaching experience on student achievement in communication arts and mathematics, the main effect of teacher degree level on student achievement in communication arts and

mathematics, and the interaction effect of teacher degree level and years of teaching experience, using student scores in communication arts and mathematics.

The statistical test used for the ANOVA is the *F*-test (194). The *F* test is a ratio of the variability between groups to the amount of variability within groups (Salkind 198). The higher the *F*-value, the more likely variability exists due to the factors being studied (198). For example, in this study a higher *F*-value would cause the researcher to believe the distribution of student test scores was due to the teacher factor of the number of years of teaching experience rather than chance.

Validity and Reliability

In 2007, the Missouri Department of Elementary and Secondary Education (DESE), in accordance with CTB/McGraw-Hill, published a technical report providing evidence of the validity and reliability of MAP test scores. The reliability of scores on the MAP test was evaluated using Cronbach's alpha ("Missouri Assessment Program" 65). According to DESE, "the reliability coefficient is a ratio of the variance of true test scores to those of observed scores, with the values ranging from 0 to 1" (65). When using reliability coefficients, the closer the coefficient is to 1, the more consistent the scores. In this report, DESE reported reliability coefficients above 0.90 for all tests at all grade levels in communication arts and mathematics. In terms of validity, DESE asserted, "Validity is the overarching component of the MAP testing program" and "the MAP tests measure what they are intended to measure" ("Missouri Assessment Program" 4). Above all, both reliability and validity are difficult to establish. According to Salkind, "The process of establishing the reliability and validity of any instrument can take years of intensive work" (293).

Summary

This chapter described the research methodology and procedures used in this research study. Statistical analysis using one-way analysis of variance and *t* test for independent means were used to determine the effect of years of teaching experience and teacher degree levels on student tests scores on the Missouri Assessment Program. In Chapter Four, the results of this study are presented.

CHAPTER FOUR:

RESULTS

The purpose of this study was to examine whether years of teaching experience and teacher degree level have an effect on overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program (MAP). The previous three chapters contained the background, literature review, research questions and hypotheses, and methodology associated with this research study. The purpose of chapter 4 is to present the results of the study. This chapter reports the results from the quantitative analysis used to address each of the research hypotheses. These findings are organized and presented in three sections. The first section presents the percentage of students scoring *advanced* and *proficient* on the MAP. The second section presents the results from the factorial ANOVAs and post hoc analysis conducted to determine whether teacher degree level and years of teaching experience have an effect on student achievement on the communication arts section of the MAP. The third section reports the results from the factorial ANOVAs and post hoc analysis conducted to determine whether years of teacher degree level and years of teaching experience have an effect on student achievement on the mathematics section of the MAP.

Summary of Methodology

For the purposes of this study, teachers were divided into four groups based on the number of years of teaching experience: 1-4, 5-10, 11-19, and 20+. For each group and for each subject area (communication arts and mathematics), the number of students scoring *advanced* and *proficient* was divided by the total number of students tested by

each group to determine the percentage of students scoring *advanced* and *proficient* on the exam. Additionally, teachers were divided into two groups based on their degree level: those with a bachelor's degree and those with a master's degree or higher (i.e., Specialist, Ph. D., Ed.D., etc.). For each group and for each subject area, the number of students scoring *advanced* and *proficient* was divided by the total number of students tested to determine the percentage of students scoring *advanced* and *proficient* on the exam. In the final component of this study, a factorial analysis of variance (ANOVA) was determined, using student scale scores as the dependent variable and years of teaching experience and teacher degree levels as the independent variables.

Descriptive Statistics

The MAP scores for the years 2005-06 and 2006-07 in the areas of communication arts and mathematics were utilized to study the achievement of students disaggregated by teacher experience and degree level. Student achievement in this study refers to student scale scores on the Missouri Assessment Program. Student scale scores compared to state-determined cut-scores determine whether a student is categorized as *below basic, basic, proficient,* or *advanced*. The researcher is interested in the students categorized as *proficient* and *advanced* in order to determine whether teacher experience or degree level effects student achievement.

For the 2005-06 and 2006-07 school years, students were grouped by school level (elementary or secondary), and by teacher's degree level. The percentage of students scoring *advanced* and *proficient* on each MAP test (communication arts and mathematics) were calculated and presented in Tables 3-6. For the same two school years, students were then grouped by school level (elementary or secondary), and by

teacher's experience level. The percentage of students scoring *advanced* and *proficient* on each MAP test (communication arts and mathematics) were calculated and presented in Tables 7-10.

The information in Table 3 details the percentage of students scoring *advanced* and *proficient* as reported by elementary teacher degree level for the years 2005-06 and 2006-07 on the communication arts section of the MAP. These results show elementary teachers with master's degrees or higher had 9.2% more students score in *advanced* and *proficient* on the communication arts section of the MAP than did teachers who had bachelor's degrees.

Table 3

2005-06 and 2006-07 Elementary Communication Arts

Degree	Number of Students Tested	Students Scoring *Advanced* and *Proficient*	
		N	*%*
Bachelor's	2824	1132	40.1
Master's +	3870	1906	49.3

Table 4 presents the percentage of students scoring *advanced* and *proficient* as reported by secondary teacher degree level for the years 2005-06 and 2006-07 on the communication arts section of the MAP. These results show secondary communication arts teachers with master's degrees or higher had 2.6% more students scored in *advanced* and *proficient* than did communication arts teachers with bachelor's degrees.

Table 4

2005-06 and 2006-07 Secondary Communication Arts

Degree	Number of Students Tested	Students Scoring *Advanced* and *Proficient*	
		N	*%*
Bachelor's	1975	770	39.0
Master's +	3089	1285	41.6

The results in Table 5 illustrate the percentage of students scoring *advanced* and *proficient* as reported by elementary teacher degree level for the years 2005-06 and 2006-07 on the mathematics section of the MAP. These results show elementary teachers with master's degrees or higher had 9.1% more students score in *advanced* and *proficient* on the mathematics section of the MAP than did teachers who had bachelor's degrees.

Table 5

2005-06 and 2006-07 Elementary Mathematics

Degree	Number of Students Tested	Students Scoring *Advanced* and *Proficient*	
		N	*%*
Bachelor's	2754	1399	50.8
Master's +	3880	2324	59.9

The percentage of students scoring *advanced* and *proficient* as reported by secondary teacher degree level for the years 2005-06 and 2006-07 on the mathematics section of the MAP is presented in Table 6. These results show mathematics teachers

with master's degrees or higher had 9.9% more students score *advanced* and *proficient* on the MAP than did mathematics teachers having bachelor's degrees.

Table 6

2005-06 and 2006-07 Secondary Mathematics

Degree	Number of Students Tested	Students Scoring *Advanced* and *Proficient*	
		N	*%*
Bachelor's	1548	521	33.7
Master's +	3691	1611	43.6

Table 7 depicts the percentage of students scoring *advanced* and *proficient* on the communication arts section of the MAP as reported by elementary teacher years of experience during the 2005-06 and 2006-07 school years. These results show a steady increase in the percentage of students scoring *advanced* and *proficient* on the MAP as the years of teaching experience increase. Teachers with 5-10 years of experience had 7.2% more students scoring *advanced* and *proficient* on the communication arts section of the MAP than did teachers with 0-4 years of experience. Likewise, teachers with 11-19 years of experience had 1.7% more students scoring *advanced* and *proficient* than did teachers with 5-10 years of experience. Finally, teachers with 20 or more years of experience had 5.7% more students scoring *advanced* and *proficient* on the communication arts section of the MAP than did teachers with 11-19 years of experience. Overall, the total difference in percentage of students scoring *advanced* and *proficient* on the communication arts

section of the MAP was 14.6% between teachers with 0-4 years of experience and teachers with 20 or more years of experience.

Table 7

2005-06 and 2006-07 Elementary Communication Arts

Years of Experience	Students Tested by Group	Students Scoring *Advanced* and *Proficient*	
		N	*%*
0-4 years	2153	825	38.3
5-10 years	1269	578	45.5
11-19 years	1739	821	47.2
20 + years	1535	812	52.9

The results in Table 8 delineate the percentage of students scoring *advanced* and *proficient* on the communication arts section of the MAP as reported by secondary teacher years of experience during the 2005-06 and 2006-07 school years. These results show an increase in the percentage of students scoring *advanced* and *proficient* as the years of teaching experience increase until 11-19 years of experience, and then a decline in the percentage of students scoring *advanced* and *proficient* with secondary communication arts teachers with 20 or more years of experience. In fact, secondary communication arts teachers with 20 or more years of experience had 3% fewer students scoring *advanced* and *proficient* than did teachers with 5-10 years of experience.

Table 8

2005-06 and 2006-07 Secondary Communication Arts

Years of Experience	Students Tested by Group	Students Scoring *Advanced* and *Proficient*	
		N	*%*
0-4 years	203	42	20.7
5-10 years	1334	577	43.3
11-19 years	1566	906	57.9
20 + years	1458	588	40.3

In Table 9, the percentage of students scoring *advanced* and *proficient* on the mathematics section of the MAP is reported by elementary teacher years of experience during the 2005-06 and 2006-07 school years. These results show a steady increase in the percentage of students scoring *advanced* and *proficient* on the mathematics section of the MAP as the years of teaching experience increases. Overall, teachers with 20 or more years of teaching experience had 17.3% more students scoring *advanced* and *proficient* than did teachers with 0-4 years of experience.

Table 9

2005-06 and 2006-07 Elementary Mathematics

Years of Experience	Students Tested by Group	Students Scoring *Advanced* and *Proficient*	
		N	%
0-4 years	2179	1034	47.5
5-10 years	1299	699	53.8
11-19 years	1721	1003	58.3
20 + years	1523	987	64.8

The percentage of students scoring *advanced* and *proficient* on the mathematics section of the MAP as reported by secondary teacher years of experience during the 2005-06 and 2006-07 school years is presented in Table 10. These results show an increase in the percentage of students scoring *advanced* and *proficient* as the years of teaching experience increase up until 11-19 years of experience, and then a decline in the percentage of students scoring *advanced* and *proficient* who had secondary mathematics teachers with 20 or more years of experience. Secondary mathematics teachers with 20 or more years of experience had 11.7% fewer students scoring *advanced* and *proficient* than did teachers with 11-19 years of experience.

Table 10

2005-06 and 2006-07 Secondary Mathematics

Years of Experience	Students Tested by Group	Students Scoring *Advanced* and *Proficient*	
		N	*%*
0-4 years	903	291	32.2
5-10 years	1651	629	38.1
11-19 years	1137	590	51.9
20 + years	1549	623	40.2

Communication Arts Results

For the 2005-06 and 2006-07 school years, the dependent variable of student scale scores on the communication arts section of the MAP were grouped according to grade level (3-8 and 11), and by the independent variables of teacher's degree level (bachelor's and master's or higher) and years of teaching experience (1-4, 5-10, 11-19, and 20+ years). A factorial ANOVA was conducted using this data in order to determine whether a significant difference occurred in the means of the MAP scores, based on years of experience and degree level. The results of the ANOVAs on the 2005-06 communication arts MAP scores are presented by each grade level in Table 11. In third grade, there was a significant difference in mean scores based on degree level of the teacher. In fourth grade, there was a significant difference in mean scores based on experience of the teacher. In grades 6, 7, 8, and 11 there was a significant difference in mean scores based

on the interaction of years of experience and teacher degree level. Areas highlighted in gray indicate significance.

Table 11

2005-06 Communication Arts ANOVA Results

Grade	Source	*F*-value	*df*	Significance
3	Experience	1.46765	3	0.2219751
	Degree Level	7.58463	1	0.0060199
	Exper. * Degree Level	1.49713	1	0.2214721
4	Experience	3.32458	3	0.0192909
	Degree Level	2.66509	1	0.1029793
	Exper. * Degree Level	0.08839	3	0.9664155
5	Experience	0.86464	3	0.4589925
	Degree Level	0.16371	1	0.6858686
	Exper. * Degree Level	0.3884	3	0.7613875
6	Experience	5.62658	3	0.000806
	Degree Level	0.00459	1	0.946012
	Exper. * Degree Level	7.46374	3	6.184E-05
7	Experience	49.2484	3	2.072E-29
	Degree Level	1.57163	1	0.2103064
	Exper. * Degree Level	9.78411	3	2.366E-06
8	Experience	44.1626	3	1.566E-26
	Degree Level	4.61556	1	0.0319645
	Exper. * Degree Level	28.7271	3	1.064E-17
11	Experience	71.9383	3	3.713E-41
	Degree Level	14.7528	1	0.0001323
	Exper. * Degree Level	10.5414	1	0.0012164

In fourth grade, there was a significant difference in mean scores based on experience of the teacher. Using Tukey's post hoc analysis (see Appendix B), teachers with 20 or more years of experience had students with significantly higher mean scores than did teachers in the other three groups (1-4, 5-10, and 11-19 years of experience). This occurrence is illustrated in Figure 3.

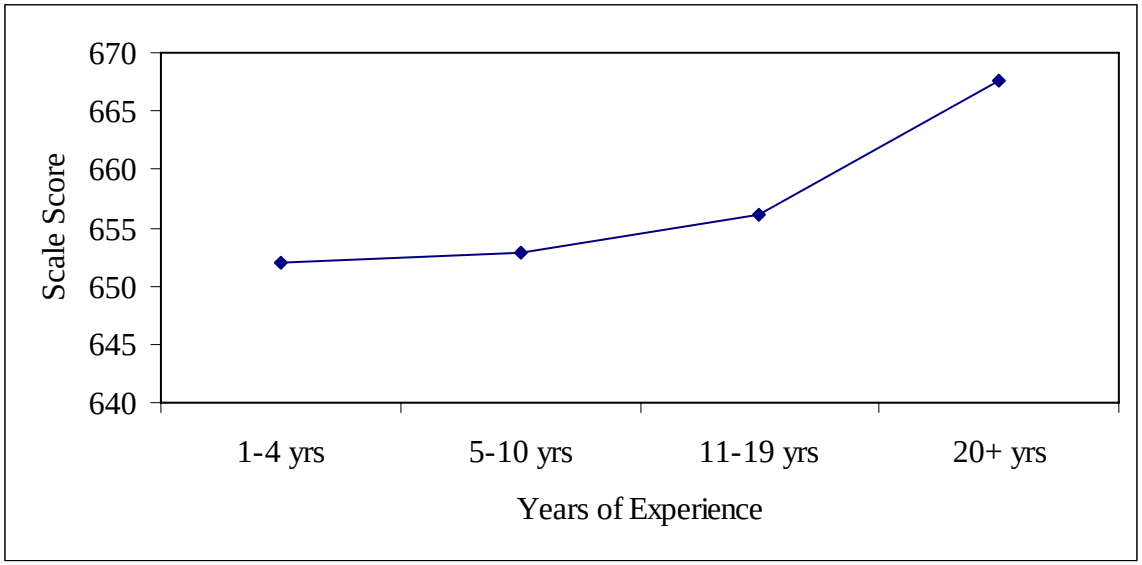

Fig. 3. 2006 Communication Arts Fourth Grade

In grades 6 and 7, there was a significant difference in mean scores based on the interaction of years of experience and teacher degree level. The post hoc calculation (see Appendix B) for the interaction between years of experience and degree level reveals sixth grade teachers with bachelor's degrees and 20 or more years of experience had students who posted mean scores significantly higher than had teachers with bachelor's degrees and 1-10 years of experience, as well as teachers with master's degrees or higher and 5-19 years of experience. Figure 4 depicts the interaction between years of experience and degree level for sixth grade communication arts in 2006. The x-axis on

the graph represents the four groupings of teachers based on years of experience, where 1 represents teachers with 1-4 years of experience, 2 represents teachers with 5-10 years of experience, 3 represents teachers with 11-19 years of experience, and 4 represents teachers with 20+ years of experience. The gray line in the graph represents mean scale scores for teachers with bachelor's degrees in each of the four groupings. The dark line in the graph represents mean scale scores for teachers with masters degrees or higher. The degree to which the two lines are not parallel is an indication of the interaction between years of experience and degree level. This graph illustrates that the highest scores for sixth grade communication arts in 2006 are observed in the group with bachelor's degrees and 20+ years of experience.

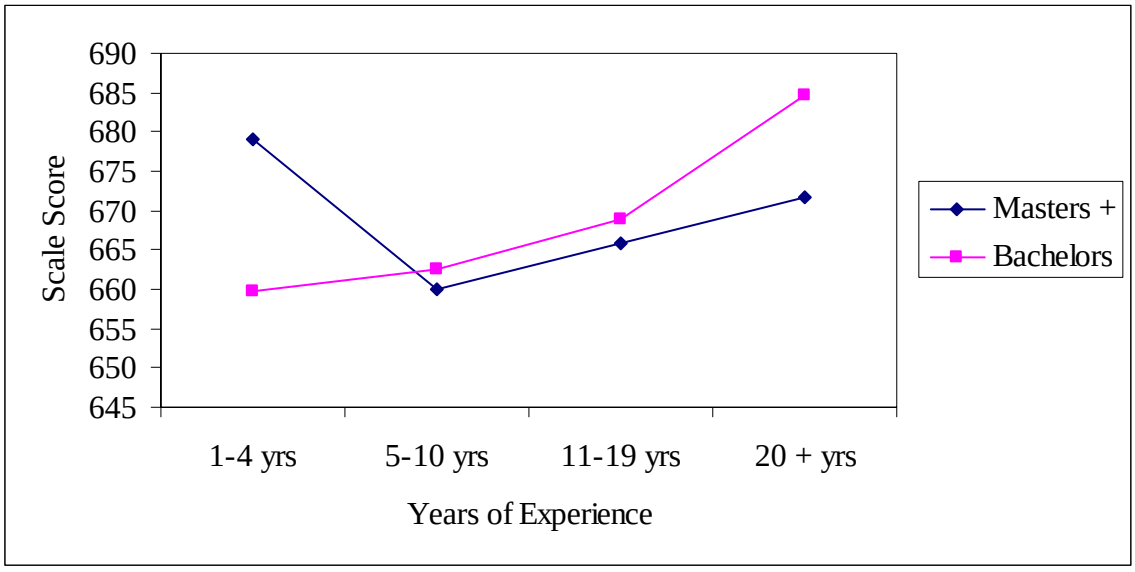

Fig. 4. Interaction between Sixth Grade Teacher Years of Experience and Degree Level in 2006

At the seventh grade level, the post hoc analysis (see Appendix B) for the interaction between years of experience and degree level, teachers with bachelor's degrees and 5-10 years of experience had students with higher mean MAP scores than did teachers with graduate degrees and 1-4 years of experience. Teachers with master's degrees or higher who had taught for 5-20+ years had students with significantly higher mean scores than did teachers with bachelor's degrees who had taught 1-10 years, as well as teachers with master's or higher degrees who had taught for 1-4 years. Additionally, teachers with bachelor's degrees who have taught for 11-20+ years had students with significantly higher mean scores than did teachers with bachelor's degrees who had taught for 1-10 years, along with teachers with master's degrees or higher who had taught 1-4 years. Figure 5 illustrates the interaction between years of experience and degree level for seventh grade communication arts scores in 2006. In this graph, the greatest difference in mean scores for 2006 seventh grade communication arts occurred with teachers who had 5-10 years of experience. Teachers with 5-10 years of experience and a master's degree or higher had students with a higher mean score than did those with the same years of experience and a bachelor's degree.

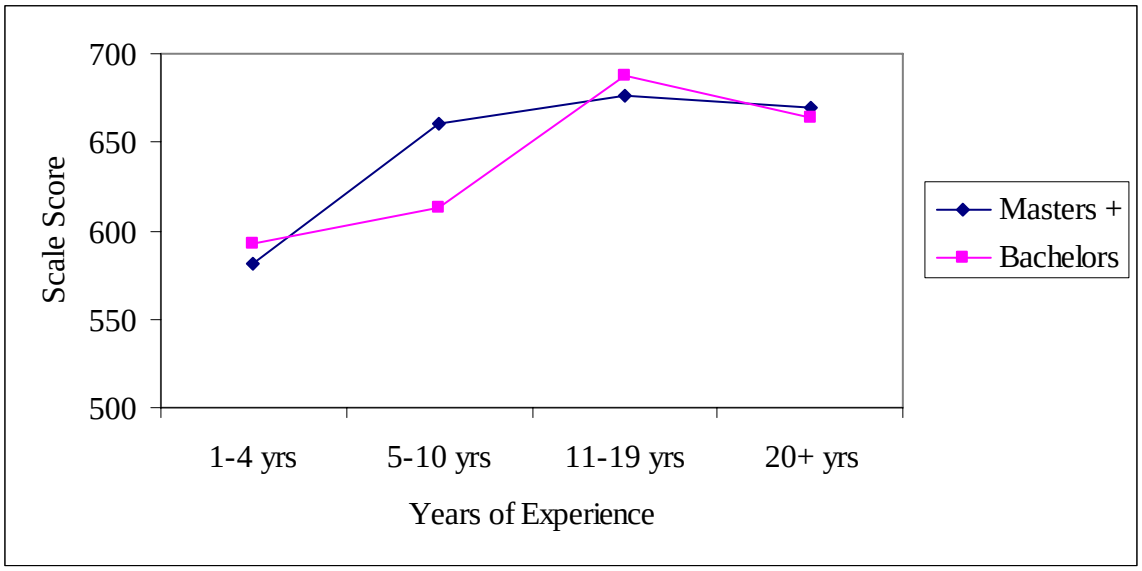

Fig. 5. Interaction between Seventh Grade Teacher Years of Experience and Degree Level in 2006

Finally, in grades 8 and 11, there was a significant difference in mean scores based on the interaction between years of experience and teacher degree level. A post hoc analysis for the interaction between years of experience and teacher degree level identified several points of significance. Eighth grade teachers with bachelor's degrees and 5-10 years of experience had students with significantly higher mean scores than did teachers with 1-4 years of experience who had either a bachelor's or master's degree. Teachers with bachelor's degrees and 11-19 years of experience had students with significantly higher mean scores than did teachers with master's degrees or higher and 1-4 years of experience, as well as teachers with bachelor's degrees and 1-10 years of experience. Teachers with master's degrees or higher and 11-20 or more years of experience had significantly higher student mean MAP scores than did teachers with master's degrees or higher and 1-4 years of experience, as well as teachers with

bachelor's degrees and 1-10 years of experience. Finally, teachers with bachelor's degrees and 20 or more years of experience, as well as teachers with master's degrees and 5-10 years of experience had students with significantly higher mean MAP scores than did teachers with bachelor's degrees and 1-19 years of experience, as well as teachers with master's degrees and 1-4 years of experience. Figure 6 depicts the interaction between years of experience and degree level for eighth grade communication arts scores in 2006. As in other instances, the degree to which the two lines are not parallel is an indication of the interaction between years of experience and degree level.

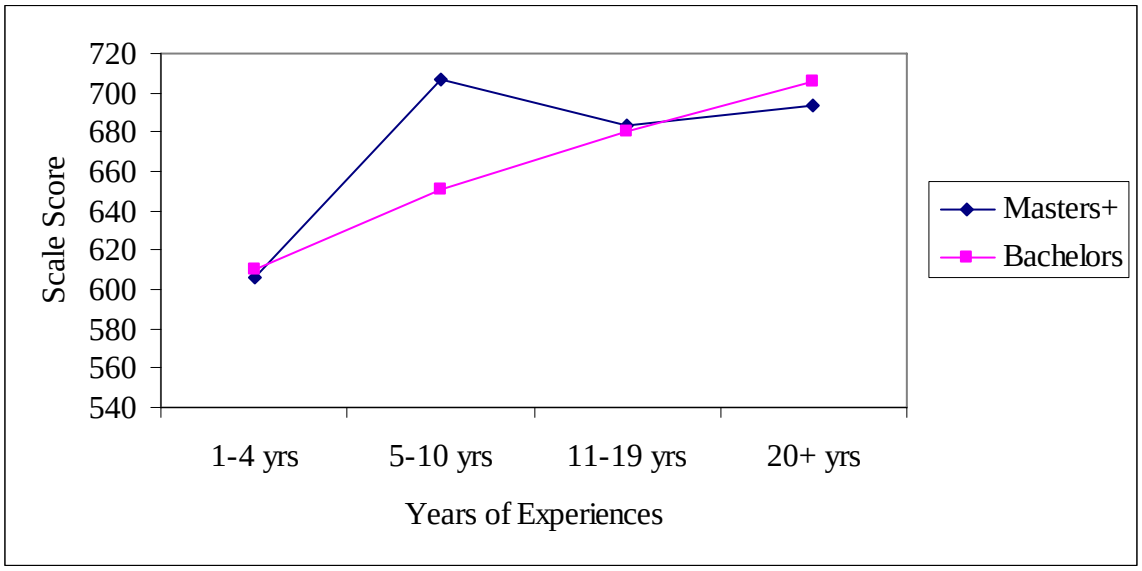

Fig. 6. Interaction between Eighth Grade Teacher Years of Experience and Degree Level in 2006

For grade 11, a comparison of the interaction between years of experience and degree level depicts that teachers with master's degrees or higher and 20+ years of experience had students with significantly lower scores than did all other groups: teachers with bachelor's degrees and 1-19 years of experience and teachers with master's degrees

or higher and 5-19 years of experience (see Appendix B). For this grade level, there were no teachers with a master's degree and 1-4 years experience or teachers with a bachelor's degree and 20+ years of experience. Figure 7 delineates the interaction between teacher degree level and years of experience for 2006 eleventh grade communication arts.

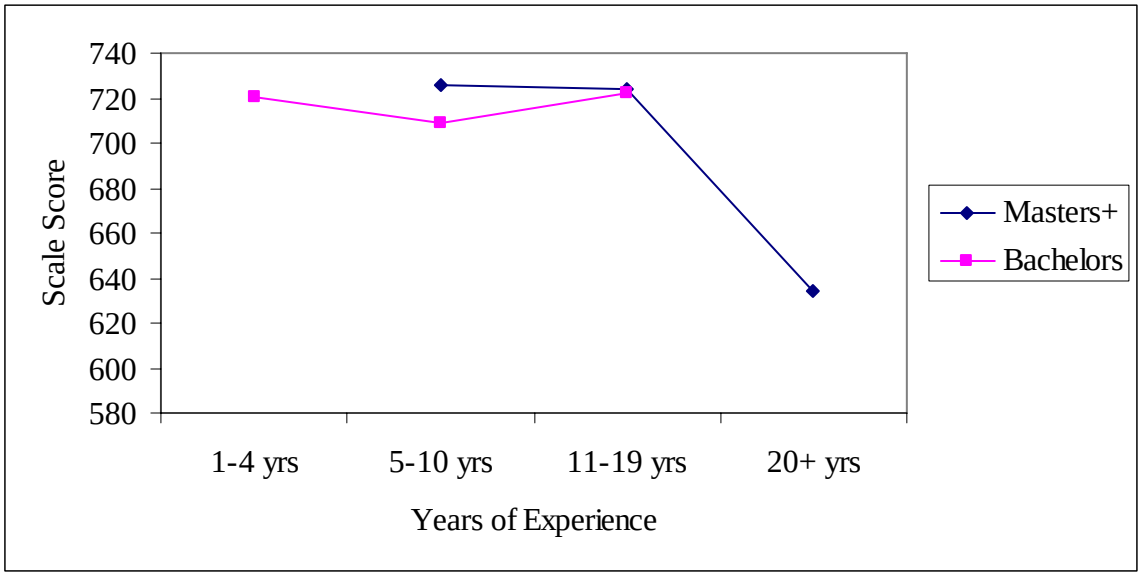

Fig. 7. Interaction between Eleventh Grade Teacher Years of Experience and Degree Level in 2006

The results of the ANOVAs on the 2006-07 communication arts MAP scores are presented by each grade level in Table 12. In grades 3, 4, 5, 6, 7, and 8, there was a significant difference in mean scores based on the interaction between years of experience and teacher degree level. In grade 11, there was a significant difference in mean scores based on years of experience and teacher degree level. Areas shaded in gray indicate significance.

Table 12

2006-07 Communication Arts ANOVA Results

Grade	Source	*F*-value	*df*	Significance
3	Experience	13.4633	3	1.362E-08
	Degree Level	7.43826	1	0.0065146
	Exper. * Degree Level	4.08848	2	0.0170901
4	Experience	4.21342	3	0.005712
	Degree Level	0.58002	1	0.4465205
	Exper. * Degree Level	9.79359	2	6.255E-05
5	Experience	7.33621	3	7.453E-05
	Degree Level	4.39823	1	0.0362932
	Exper. * Degree Level	13.4062	2	1.88E-06
6	Experience	5.5567	3	0.0008881
	Degree Level	0.60941	1	0.435231
	Exper. * Degree Level	15.1945	3	1.229E-09
7	Experience	9.34641	3	4.39E-06
	Degree Level	16.0771	1	6.61E-05
	Exper. * Degree Level	12.559	3	4.84E-08
8	Experience	17.4003	3	5.602E-11
	Degree Level	8.12774	1	0.0044624
	Exper. * Degree Level	2.7453	3	0.042019
11	Experience	13.9324	3	7.614E-09
	Degree Level	8.26181	1	0.0041647
	Exper. * Degree Level	N/A		N/A

As stated earlier, 2007 scores in grades 3, 4, 5, 6, 7, and 8 revealed a significant difference in mean scores based on the interaction between years of experience and teacher degree level. A post hoc analysis (see Appendix C) of the interaction between years of experience and degree level indicates that third grade teachers with bachelor's

degrees and between 11-19 years of experience had students with a significantly lower mean score than did teachers with bachelor's degrees and 1-10 years of experience, as well as teachers with master's degrees or higher with all years of experience. For this grade level, there were no teachers with a bachelor's degree and 20+ years of experience. Figure 8 illustrates the interaction between years of experience and degree level for third grade communication arts scores in 2007.

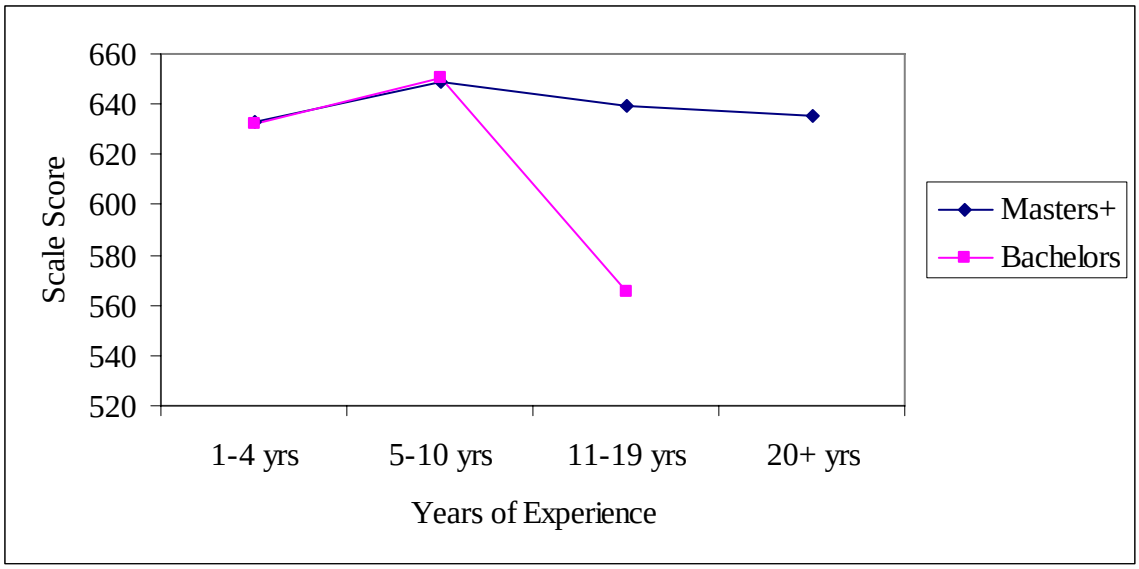

Fig. 8. Interaction between Third Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix C) of the interaction between years of experience and teacher degree level indicates that fourth grade teachers with master's degrees or higher and 11-20+ years of experience had students with a significantly higher mean score than did teachers with master's degrees or higher and 1-4 years of experience, as well as teachers with bachelor's degrees and 5-10 years of experience. In addition,

teachers with bachelor's degrees and 1-4 years of experience had students with a higher mean score than did teachers with master's degrees or higher and 1-4 years of experience. For this grade level, there were no teachers with a bachelor's degree and 20+ years of experience. Figure 9 shows the interaction between years of experience and degree level for fourth grade teachers in 2007.

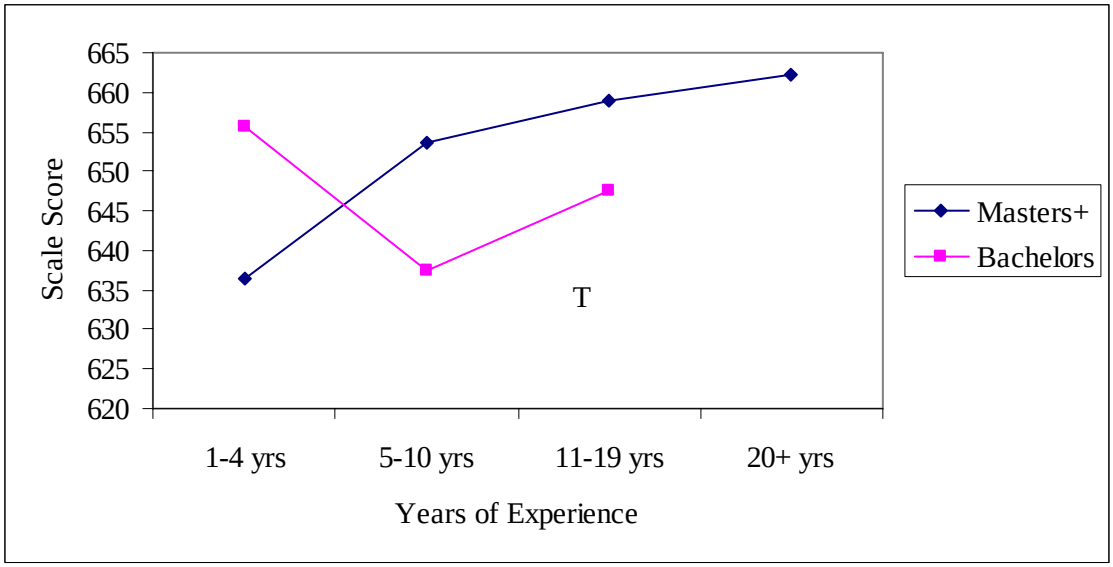

Fig. 9. Interaction between Fourth Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix C) of the interaction between years of experience and teacher degree level delineates fifth grade teachers with bachelor's degrees and 11-19 years of experience had students with significantly lower mean scores than did fifth grade teachers with bachelor's degrees and 1-10 years of experience, those with bachelor's degrees and 20 or more years of experience, and those with master's degrees and 11-20 + years of experience. In addition, fifth grade teachers with master's degrees and 5-10 years of experience had students with significantly lower mean scores

than did teachers with bachelor's degrees and 1-10 years of experience and teachers with master's degrees and 11-20 + years of experience. For this grade level, there were no teachers with a master's degree or higher and 1-4 years of experience. Figure 10 depicts the interaction between years of experience and degree levels for fifth grade teachers in 2007.

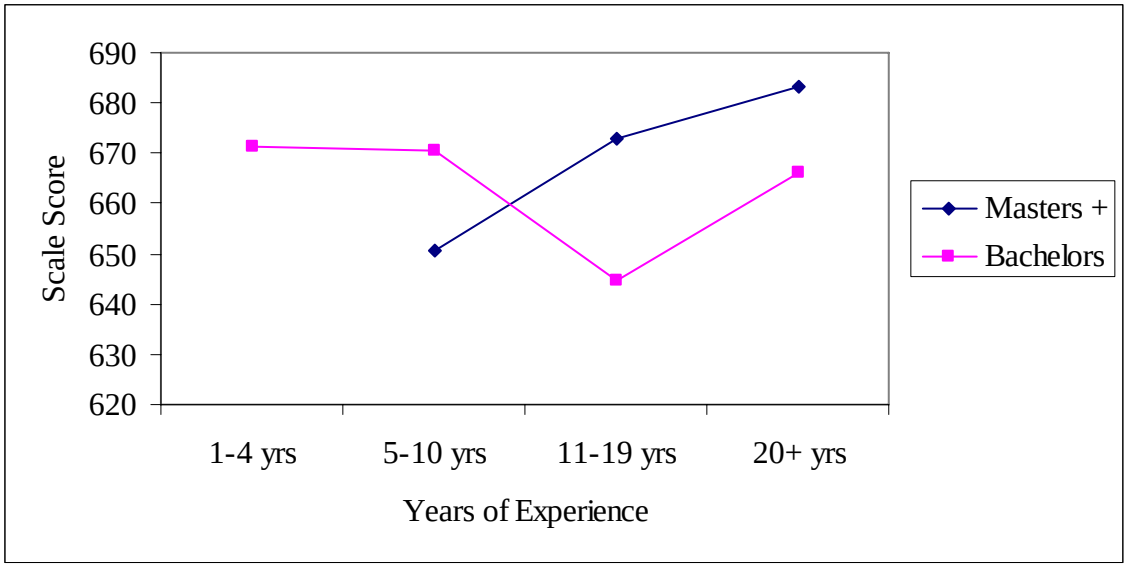

Fig. 10. Interaction between Fifth Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix C) of the interaction between years of experience and degree level for sixth grade teachers in 2007 reveals that teachers with bachelor's degrees and 20+ years of experience had students with a significantly higher mean score than did teachers with bachelor's degrees and between 1 and 19 years of experience, along with teachers with master's degrees or higher and between 5 and 20+ years of experience. In addition, teachers with master's degrees and 1-4 years of experience had students with a significantly higher mean score than did teachers with

bachelor's degrees and 1-4 years of experience and 11-19 years of experience. Finally, teachers with master's degrees and 11-19 years of experience had students with a significantly higher mean score than did teachers with the same number amount of experience, but who had bachelor's degrees. Figure 11 depicts the interaction between years of experience and degree level for sixth grade communication arts teachers in 2007.

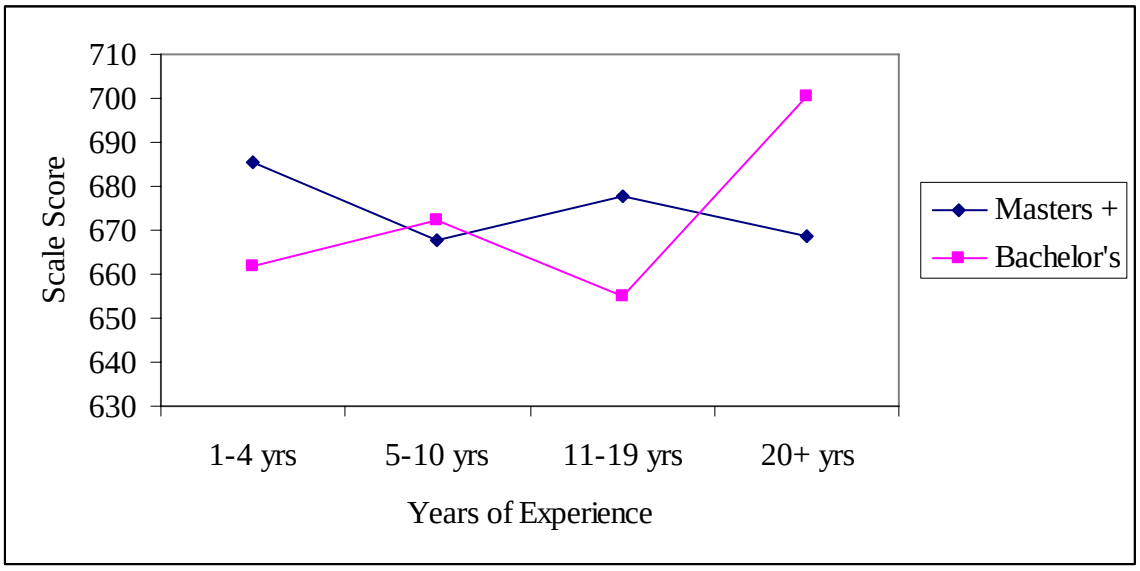

Fig. 11. Interaction between Sixth Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix C) indicates seventh grade teachers with 1-4 years of experience who have master's degrees had students with a significantly lower mean score than every other group tested. Additionally, teachers with 5-10 years of experience who have bachelor's degrees had students with significantly higher mean scores than did teachers with 1-4 years of experience who have a bachelor's degree, as well as teachers with master's degrees or higher who have 1-10 years of experience.

Figure 12 depicts the interaction between seventh grade teacher years of experience and degree levels.

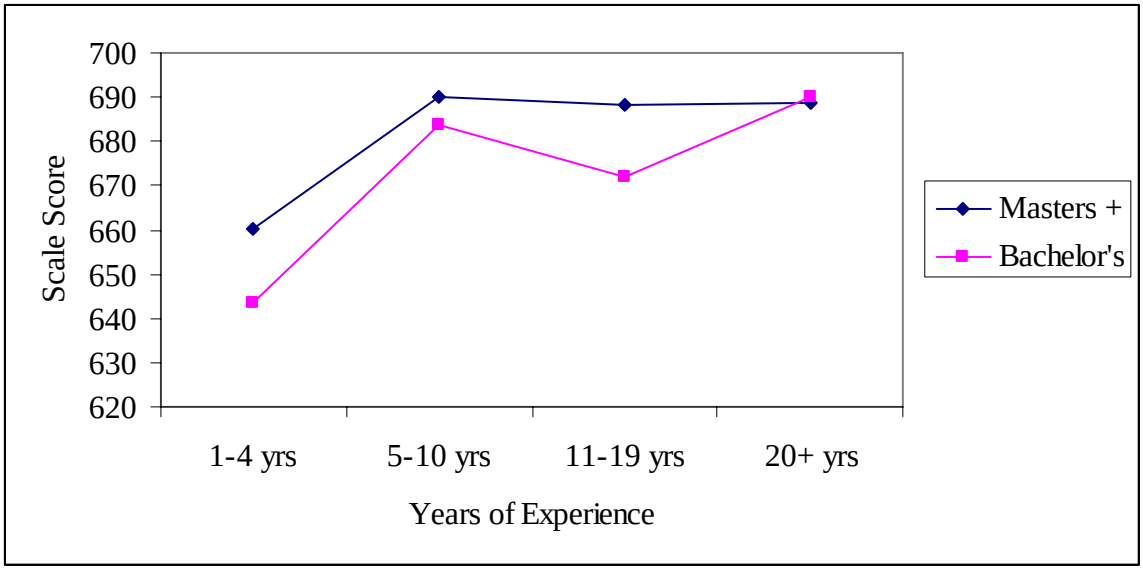

Fig. 12. Interaction between Seventh Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix C) for the interaction between years of experience and degree level depicts eighth grade teachers with bachelor's degrees and 1-4 years of experience had students with significantly lower mean scores than did teachers with bachelor's degrees and 5-20 + years of experience, as well as teachers with master's degrees or higher who have between 5 and 20 + years of experience. Additionally, teachers with master's degrees or higher who have 1-4 years of experience had students with significantly lower mean scores than did teachers with bachelor's degrees and 5-10 and 20 + years of experience, as well as teachers with master's degrees or higher and 5-20 + years of experience. Figure 13 illustrates the interaction between years of experience and degree level for eighth grade communication arts teachers in 2007.

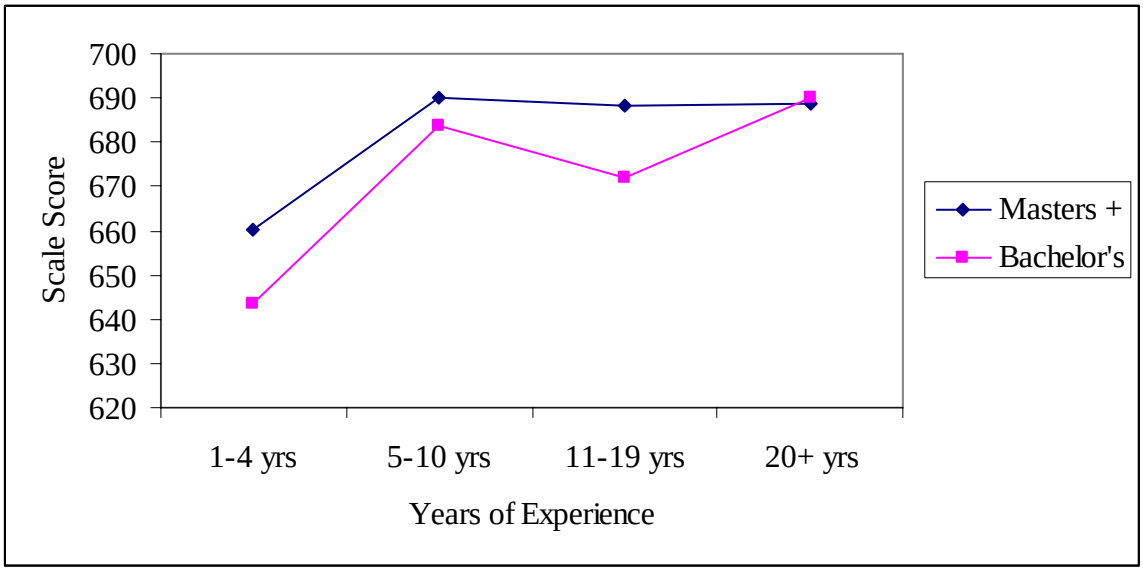

Fig. 13. Interaction between Eighth Grade Teacher Years of Experience and Degree Level in 2007

In grade 11, there was a significant difference in mean scores based on teacher years of experience. A post hoc analysis (see Appendix C) of the interaction between the different groups based on years of experience reveals significant differences among every group (based on years of experience) when compared to all other groups. This relationship is illustrated in Figure 14.

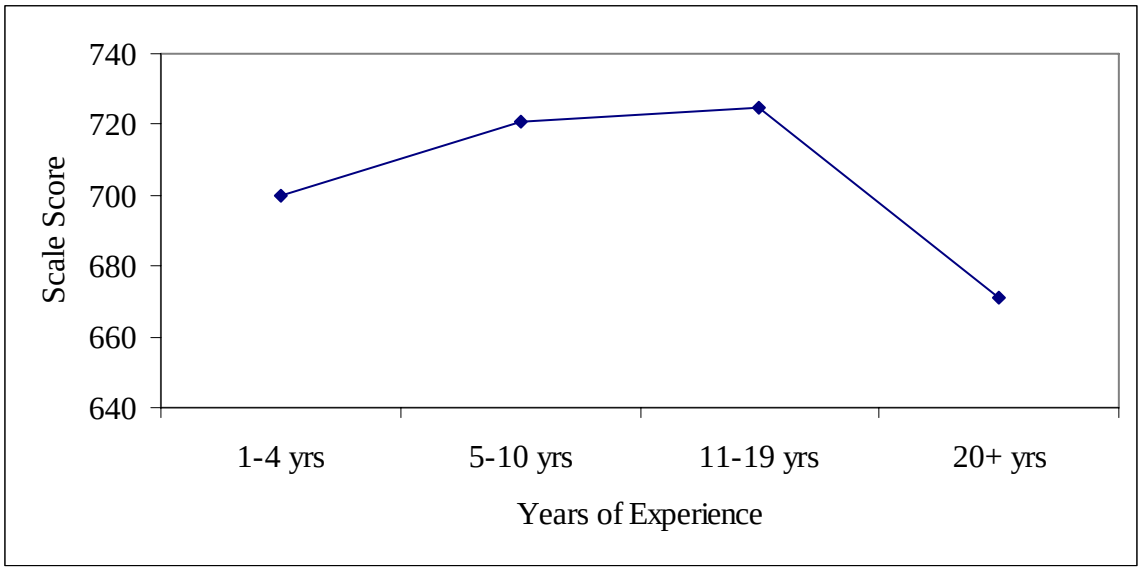

Fig. 14. Eleventh Grade Communication Arts Scores 2007

Section 3: Mathematics

For the 2005-06 and 2006-07 school years, the dependent variables of student scale scores on the mathematics section of the MAP were grouped according to grade level (3-8 and 11), and by the independent variables of teacher's degree level (bachelor's and master's or higher) and years of teaching experience (1-4, 5-10, 11-19, and 20+ years). A factorial ANOVA was conducted using this data in order to determine whether a significant difference occurred in the means of the MAP scores based on years of experience and degree level. The results of the ANOVAs on the 2005-06 mathematics MAP scores are presented by each grade level in Table 11. In grades 4, 5, and 6, there was a significant difference in mean scores based on teacher experience and degree level. In grades 3, 7, 8, and 10 there was a significant difference in mean scores based on the interaction between years of teaching experience and degree level.

Table 13

2005-06 Mathematics ANOVA Results

Grade	Source	*F*-value	*df*	Significance
3	Experience	1.76288	3	0.15275363
	Degree Level	6.84627	1	0.009048378
	Exper. * Degree Level	5.978	1	0.01469771
4	Experience	4.2615	3	0.005360498
	Degree Level	11.1424	1	0.000883872
	Exper. * Degree Level	0.31556	2	0.72947456
5	Experience	2.80134	3	0.039005288
	Degree Level	4.18662	1	0.041057112
	Exper. * Degree Level	1.27021	3	0.283394146
6	Experience	15.0159	3	1.57419E-09
	Degree Level	14.1854	1	0.000177132
	Exper. * Degree Level	1.7004	2	0.183234544
7	Experience	22.7063	3	3.6794E-14
	Degree Level	0.77468	1	0.379013999
	Exper. * Degree Level	60.4954	1	2.07662E-14
8	Experience	15.7418	3	5.68452E-10
	Degree Level	27.2734	1	2.21903E-07
	Exper. * Degree Level	45.9775	2	1.08054E-19
10	Experience	34.6975	3	3.56678E-21
	Degree Level	77.0245	1	8.95968E-18
	Exper. * Degree Level	28.4478	2	1.08732E-12

As stated previously, 2006 mathematics MAP scores in grades 4, 5, and 6 showed a significant difference in mean scores based on teacher experience and degree level. A post hoc analysis (see Appendix D) of the interaction between years of experience for fourth grade mathematics teachers highlights significant differences in means in several

instances. Teachers with 1-4 years of experience had students with a significantly lower mean score than teachers with 11-19 and 20 + years of experience. Moreover, teachers with 20 + years of experience had students with a significantly higher mean score than the other three groups of teachers. These occurrences are illustrated in Figure 15.

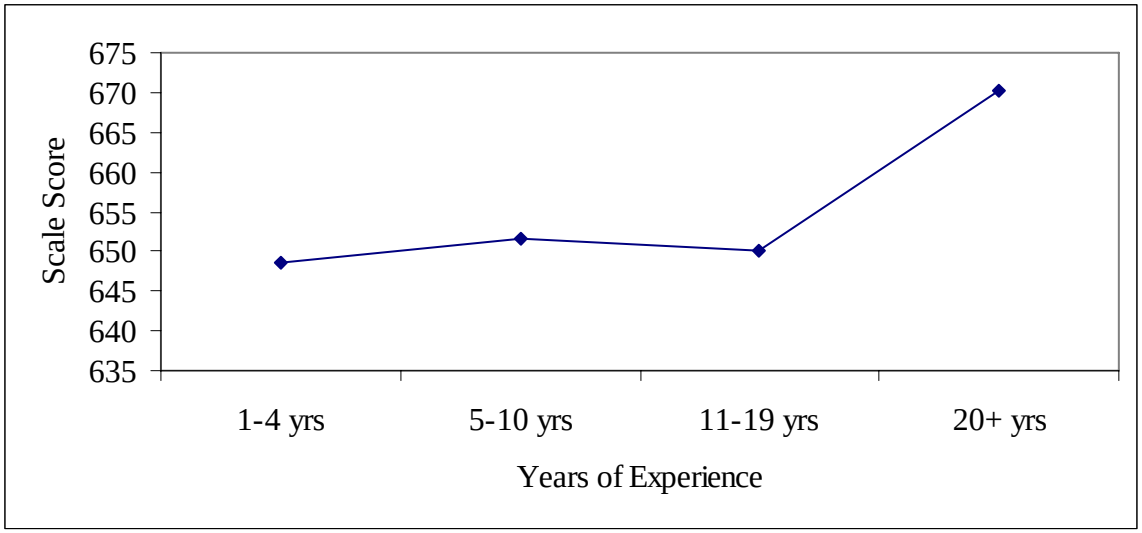

Fig. 15. Fourth Grade Mathematics Scores 2006

A post hoc analysis (see Appendix D) of the interaction between the four groups based on years of experience for fifth grade teachers revealed significant differences between means of two groups. Teachers with 11-19 years of experience, as well as teachers with 20 or more years of experience, had students with significantly higher mean scores than did teachers with 5-10 years of experience. This interaction is illustrated in Figure 16.

Fig. 16. Fifth Grade Mathematics Scores 2006

A post hoc analysis (see Appendix D) of the interaction between the four groups based on years of experience for sixth grade teachers in 2006 revealed that teachers with 20+ years of experience had students with a significantly higher mean score than did teachers with 1-4 years of experience, those with 5-10 years of experience, and those with 11-19 years of experience. These relationships are depicted in Figure 17.

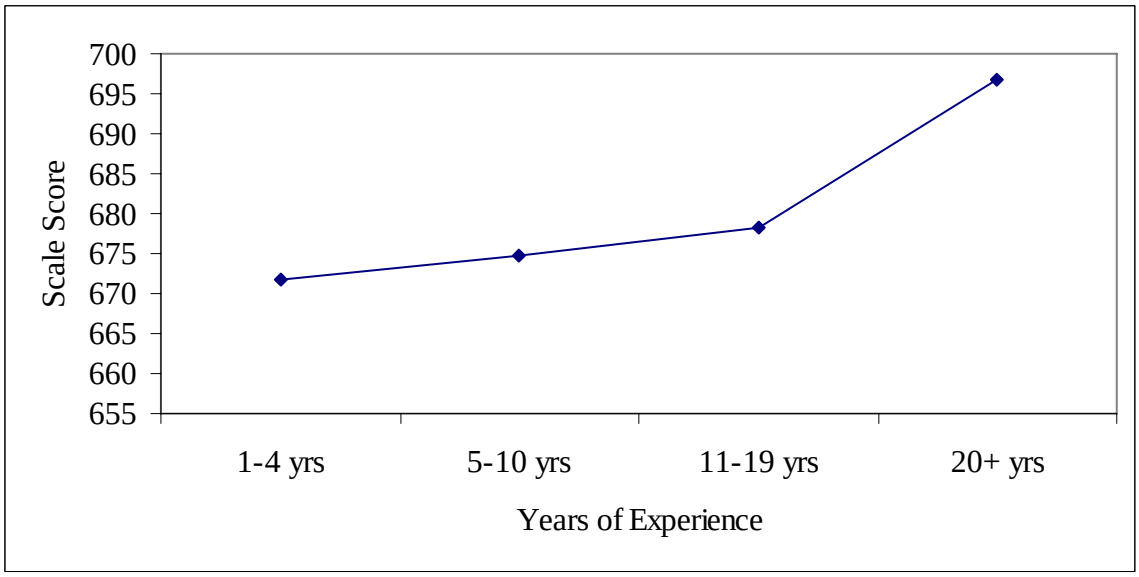

Fig. 17. Sixth Grade Mathematics Scores 2006

In grade 3 in 2006, there was a significant difference in mean mathematics scores based on the interaction between years of teaching experience and degree level. A post hoc analysis (see Appendix D) for the interaction between years of experience and degree level indicated that third grade teachers with 1-4 years of experience and a bachelor's degree had students with a significantly lower mean score than did third grade mathematics teachers with master's degrees and 1-4 years of experience, 11-19 years of experience, and 20 + years of experience. For this grade level, there were no teachers with a bachelor's degree and 11-19 or 20+ years of experience. Figure 18 delineates the interaction between years of experience and degree level for third grade mathematics teachers in 2006.

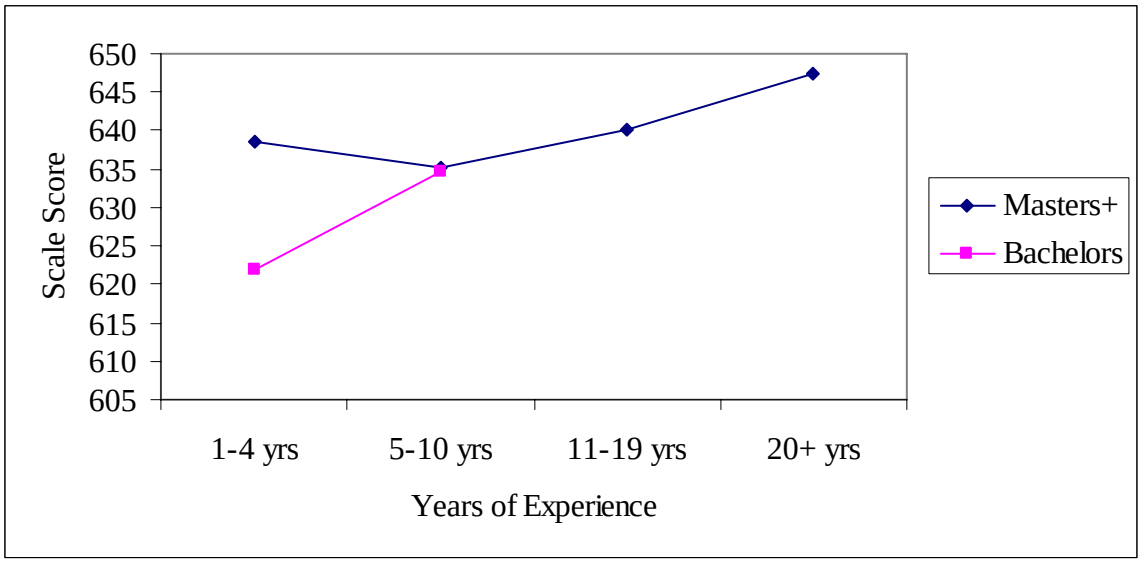

Fig. 18. Interaction between Third Grade Teacher Years of Experience and Degree Level in 2006

In grade 7, there was a significant difference in mean scores based on the interaction between years of teaching experience and degree level. A post hoc analysis (see Appendix D) for the interaction between years of experience and degree level suggests that teachers with bachelor's degrees and 1-4 years of experience had students with a significantly higher mean score than did teachers with 1-4 years of experience and a master's degree or higher, as well as teachers with 11-19 years of experience and a bachelor's degree. Moreover, teachers with master's degrees or higher and 5-10, 11-19, and 20 + years of experience had students with significantly higher mean scores than teachers with 1-4 years of experience, regardless of degree status, in addition to teachers with bachelor's degrees and 11-19 years of experience. For this grade level, there were no teachers with a bachelor's degree and 5-10 years of experience, and no teachers with a bachelor's degree and 20+ years of experience. Figure 19 illustrates the interaction

between years of experience and degree level for seventh grade mathematics teachers in 2006. Because there are only two groups of teachers with bachelor's degrees, these are represented by two points, not a line on the graph.

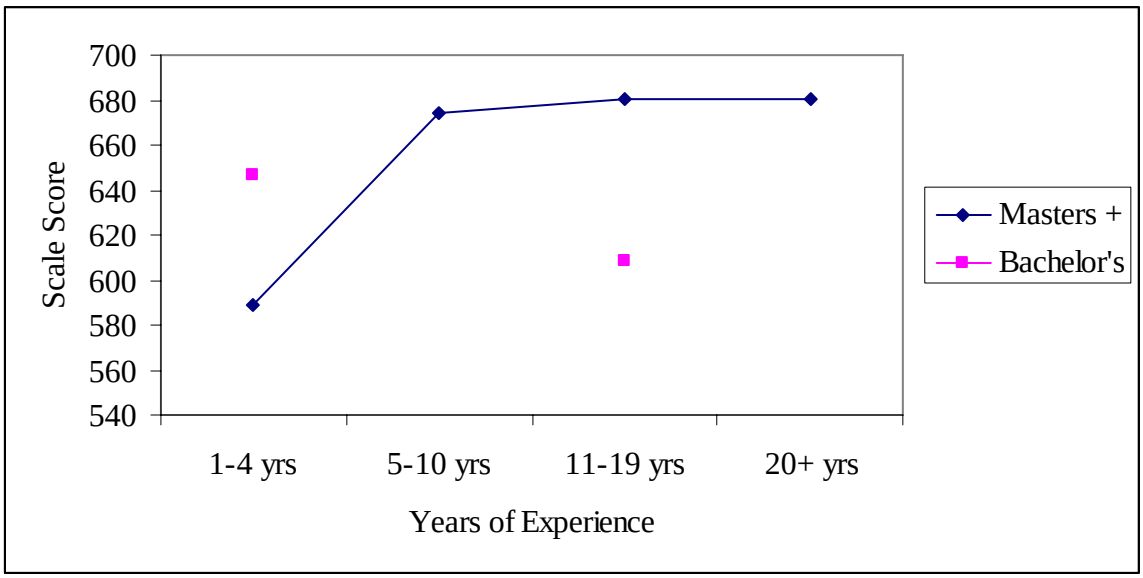

Fig. 19. Interaction between Seventh Grade Teacher Years of Experience and Degree Level in 2006

Finally, in grades 8 and 10 there was a significant difference in mean scores based on the interaction between years of experience and degree level. A post hoc analysis (see Appendix D) for the interaction between years of experience and degree level for eighth grade mathematics teachers revealed several significant differences between means of groups. Teachers with bachelor's degrees and 11-19 years of experience had students with a significantly higher mean score than every other group tested. Teachers with 1-4 years of experience and either a bachelor's degree or a master's or higher, along with teachers with master's degrees or higher who had 1-4, 5-10, and 20 or more years of

experience, had students with significantly higher mean scores than did teachers with 5-10 years of experience and a bachelor's degree as well as teachers with 11-19 years of experience and a master's degree or higher. For this grade level, there were no teachers with a bachelor's degree and 20+ years of experience. Figure 20 shows the interaction between years of experience and degree level for eighth grade mathematics teachers in 2006.

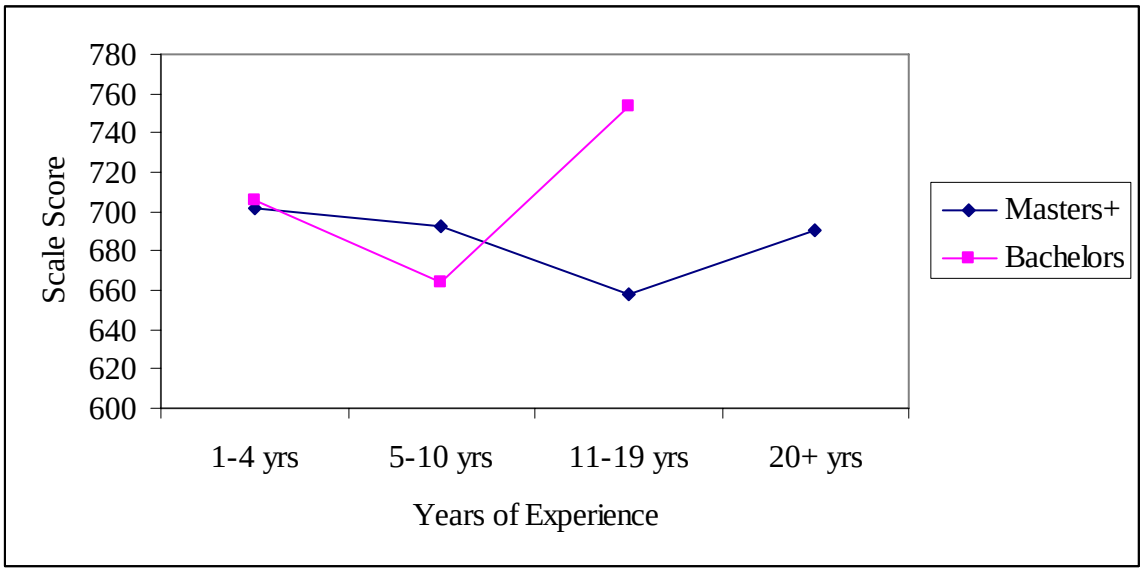

Fig. 20. Interaction between Eighth Grade Teacher Years of Experience and Degree Level in 2006

A post hoc analysis (see Appendix D) for the interaction between years of experience and degree level for tenth grade mathematics teachers revealed significant interactions between several groups. Tenth grade mathematics teachers with 11-19 years of experience and a master's degree or higher had students with a significantly higher mean score than did all other groups tested. Furthermore, teachers with bachelor's degrees and 20 or more years of experience had students with a significantly lower mean

score than did all other groups. For this grade level, there were no teachers with a master's degree and 1-4 years of experience. Figure 21 reveals the interaction between years of experience and degree level for 10th grade mathematics teachers in 2006.

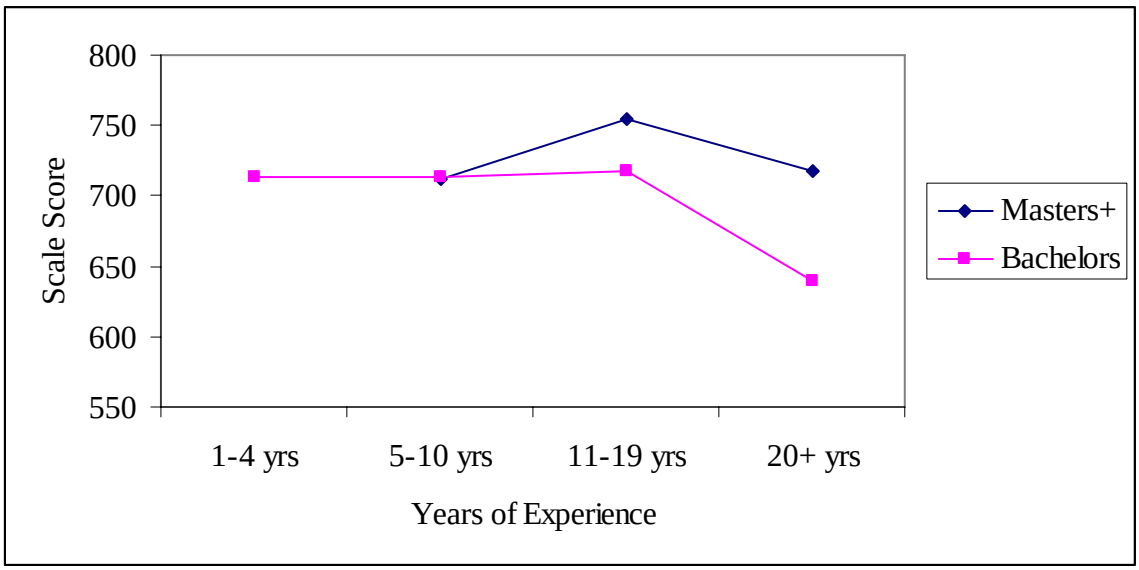

Fig. 21. Interaction between Tenth Grade Teacher Years of Experience and Degree Level in 2006

The results of the ANOVAs on the 2006-07 mathematics MAP scores are presented by each grade level in Table 14. In grades 3, 4, 5, 6, and 10 there was a significant difference in the means of the scores based on the interaction between years of experience and teacher degree level. In grade 7, there was a significant difference in the means of the scores based on years of experience. In grade 8, there was a significant difference based on years of experience and teacher degree level.

Table 14

2006-07 Mathematics ANOVA Results

Grade	Source	F-value	df	Significance
3	Experience	15.1655	3	1.261E-09
	Degree Level	8.05508	1	0.0046437
	Exper. * Degree Level	7.25642	2	0.0007494
4	Experience	3.58698	3	0.0134744
	Degree Level	0.09051	1	0.7636048
	Exper. * Degree Level	10.9932	2	1.94E-05
5	Experience	12.3835	3	6.37E-08
	Degree Level	3.83964	1	0.050403
	Exper. * Degree Level	11.2011	2	1.594E-05
6	Experience	5.23795	3	0.0013834
	Degree Level	0.51677	1	0.4724224
	Exper. * Degree Level	14.7867	3	2.168E-09
7	Experience	10.2998	3	1.148E-06
	Degree Level	1.82176	1	0.1774554
	Exper. * Degree Level	3.69892	1	0.0547737
8	Experience	19.0491	3	5.707E-12
	Degree Level	5.73951	1	0.0167983
	Exper. * Degree Level	0.55153	1	0.4578933
10	Experience	15.1063	3	1.397E-09
	Degree Level	137.152	1	1.942E-29
	Exper. * Degree Level	76.0038	2	4.735E-31

As mentioned earlier, for mathematics MAP scores in 2007 for grades 3, 4, 5, 6, and 10, there was a significant difference in the means of the scores based on the interaction between years of experience and teacher degree level. A post hoc analysis of the interaction between teacher degree level and years of experience shows that third

grade teachers with 11-19 years of experience and a bachelor's degree had students with a significantly lower mean score than all other groups tested. For this grade level, there were no teachers with a bachelor's degree and 20+ years of experience. Figure 22 shows the interaction between years of experience and degree level for 3rd grade mathematics teachers in 2007.

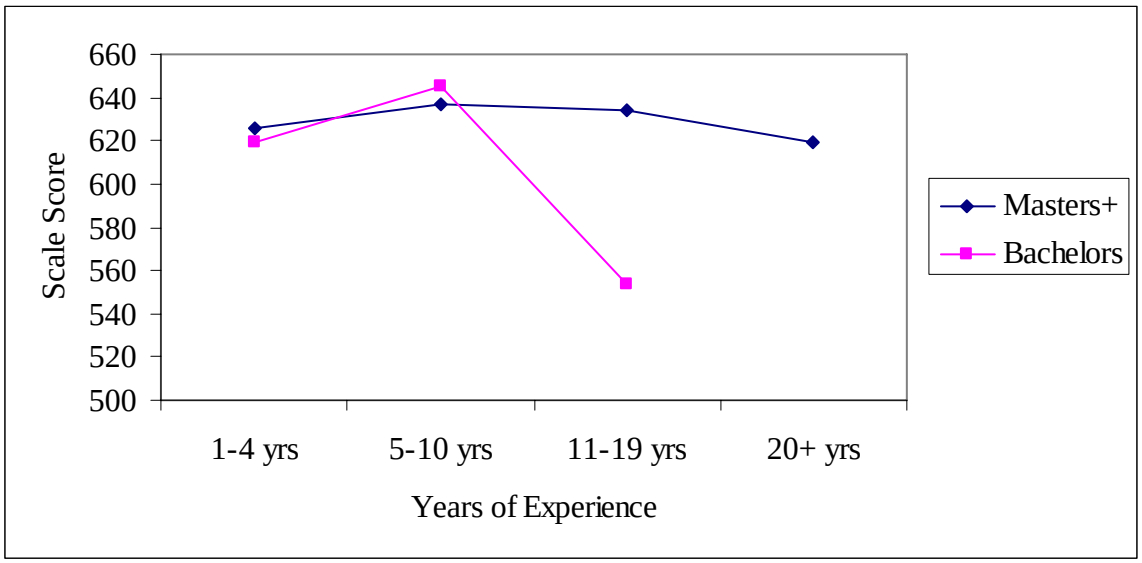

Fig. 22. Interaction between Third Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix E) for interaction between years of experience and teacher degree level indicates that fourth grade mathematics teachers with 1-4 years of experience and a bachelor's degree, those with 11-19 years of experience and a master's degree or higher, and those with 20 or more years of experience and a master's degree or higher had students with significantly higher mean scores than did teachers with 1-4 years of experience and a master's degree or higher and teachers with 5-10 years

of experience and a bachelor's degree. For this grade level, there were no teachers with a bachelor's degree and 20+ years of experience. Figure 23 depicts the interaction between years of experience and degree level for fourth grade mathematics teachers in 2007.

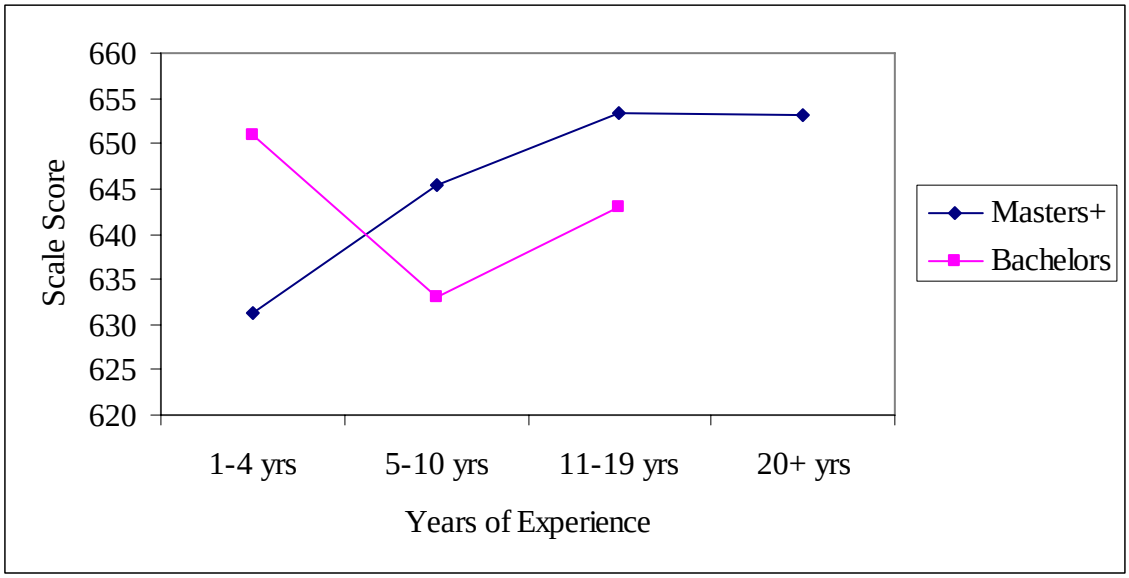

Fig. 23. Interaction between Fourth Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix E) of the interaction between years of experience and degree level reveals that fifth grade teachers with 11-19 years of experience and a bachelor's degree had students with a significantly lower mean score than did teachers with bachelor's degrees and 1-4, 5-10, and 20+ years of experience, as well as teachers with master's degrees with 11-19 and 20+ years of experience. Furthermore, teachers with master's degrees and 5-10 years of experience had students with a significantly lower mean score than did teachers with a bachelor's degree and 1-4 years of experience and 20+ years of experience, as well as teachers with master's

degrees or higher and 11-19 and 20+ years of experience. Overall, teachers with 20 + years of experience and a master's degree or higher had students with a significantly higher mean score than did teachers with a bachelor's degree and 11-19 years of experience, as well as teachers with 5-10 years of experience, regardless of their degree level. For this grade level, there were no teachers with a master's degree and 1-4 years of experience. Figure 24 illustrates the interaction between years of experience and degree level for fifth grade mathematics teachers in 2007.

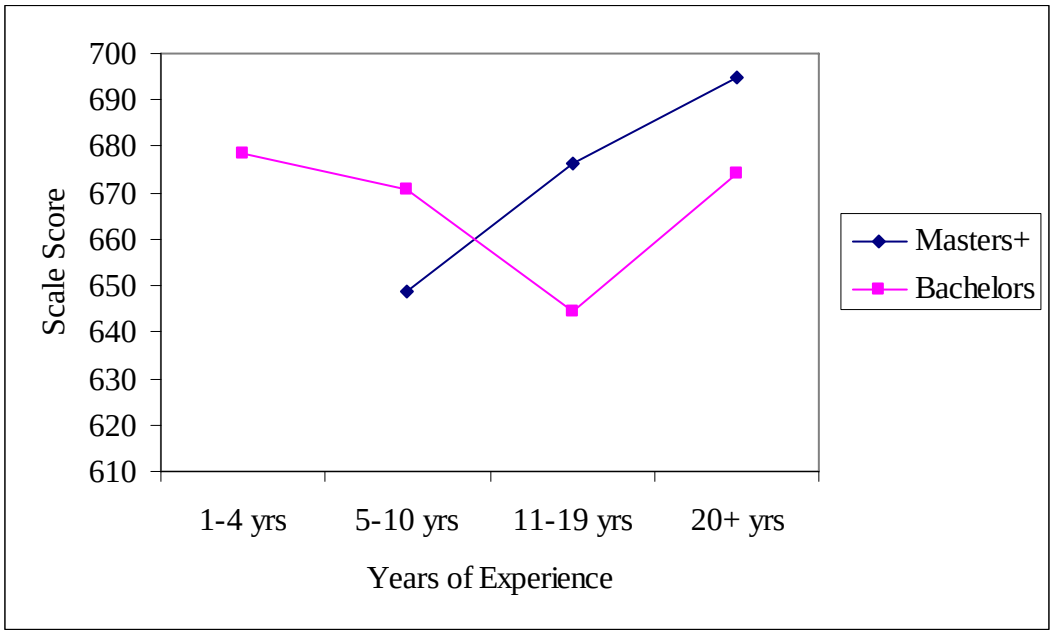

Fig. 24. Interaction between Fifth Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix E) of the interaction between years of experience and degree level reveals that sixth grade teachers with bachelor's degrees and 20 or more years of experience had students with a significantly higher mean score than

did teachers with bachelor's degrees and 1-4, 5-10, and 11-19 years of experience, as well as teachers with master's degrees or higher with 5-10 and 20 or more years of experience. Additionally, sixth grade teachers with master's degrees or higher with 1-4 years of experience had students with a significantly higher mean score than did teachers with bachelor's degrees and 1-4 and 11-19 years of experience, as well as teachers with master's degrees or higher who had 5-10 years of experience. Finally, teachers with master's degrees or higher and 11-19 years of experience had students with a significantly higher mean score than did teachers with a bachelor's degree and 1-4 years of experience, along with teachers with a master's degree or higher and 5-10 years of experience. Figure 25 shows the interaction between years of experience and degree level for 6th grade mathematics teachers in 2007.

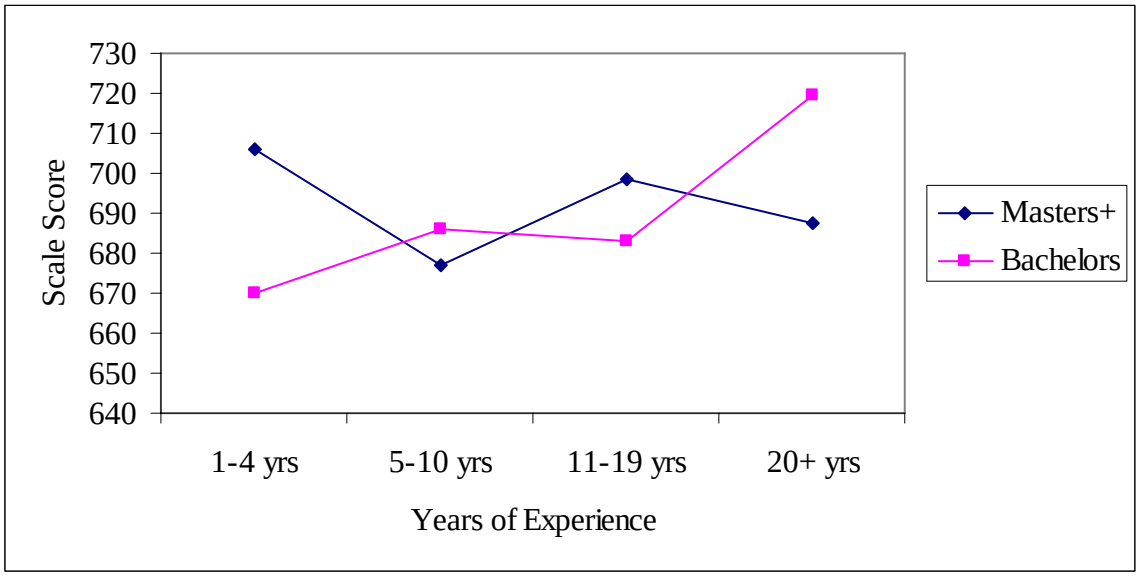

Fig. 25. Interaction between Sixth Grade Teacher Years of Experience and Degree Level in 2007

A post hoc analysis (see Appendix E) of the interaction between degree level and years of experience reveals 10th grade teachers with 20 or more years of experience and a master's degree had students with a significantly higher mean score when compared to all other groups tested, except for teachers with master's degrees and 1-4 years of experience. Tenth grade mathematics teachers with a master's degree or higher and 11-19 years of experience had students with a significantly higher mean than did all teachers with bachelor's degrees, as well as teachers with master's degrees with 5-10 years of experience. Overall, teachers with bachelor's degrees and 20+ years of experience had students with a significantly lower mean than all other groups tested. For this grade level, there were no teachers with a master's degree and 1-4 years of experience. Figure 26 delineates the interaction between years of experience and degree level for tenth grade mathematics teachers in 2007.

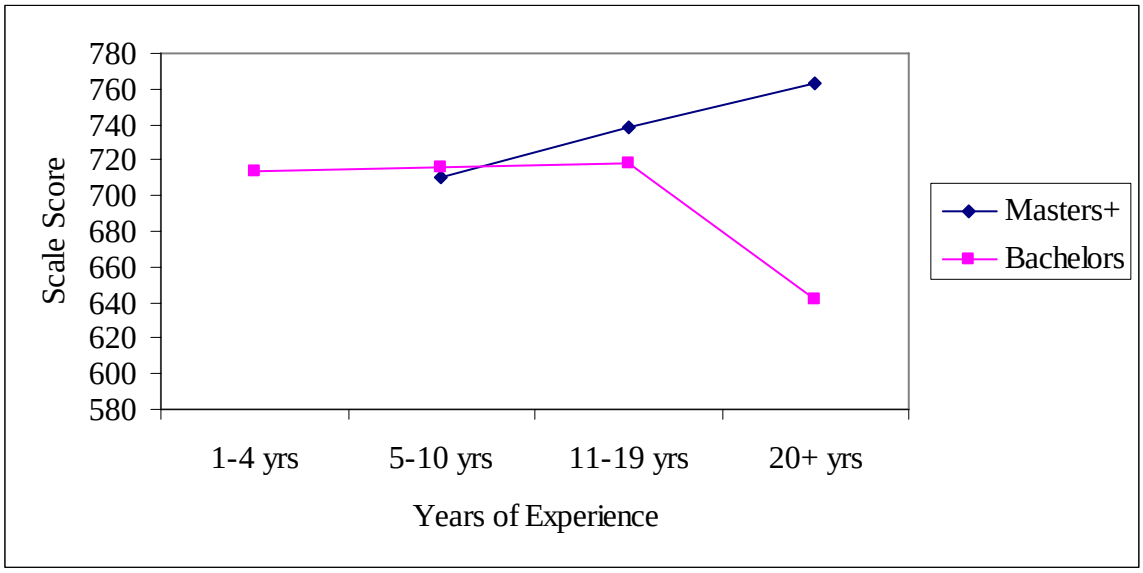

Fig. 26. Interaction between 10th Grade Teacher Years of Experience and Degree Level in 2007

In grade 7, there was a significant difference in the means of the scores based on years of experience (see Appendix E). Seventh grade teachers with 1-4 years of experience had significantly lower mean scores than did teachers with 5-20+ years of experience. Figure 27 illustrates this relationship.

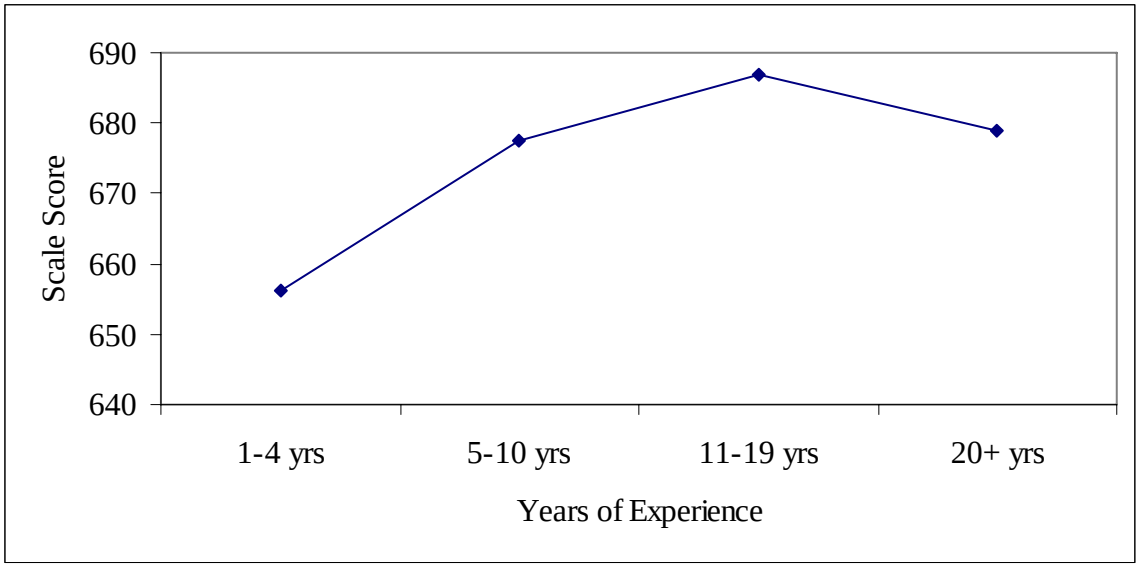

Fig. 27. Seventh Grade Mathematics Scores 2007

In grade 8, there was a significant difference in mean scores based on years of experience. A post hoc analysis (see Appendix E) for the interaction between years of experience reveals that teachers with 11-19 years of experience had significantly higher scores than did teachers with 1-4, 5-10 and 20+ years of experience. In addition, teachers with 1-4 years of experience had a significantly lower mean score than did teachers with 5-10, 11-19, and 20+ years of experience. Furthermore, examining mean scores based on teacher degree level indicated that teachers with master's degrees or higher had higher

mean scores than did their colleagues with bachelor's degrees. These relationships are depicted in Figure 28.

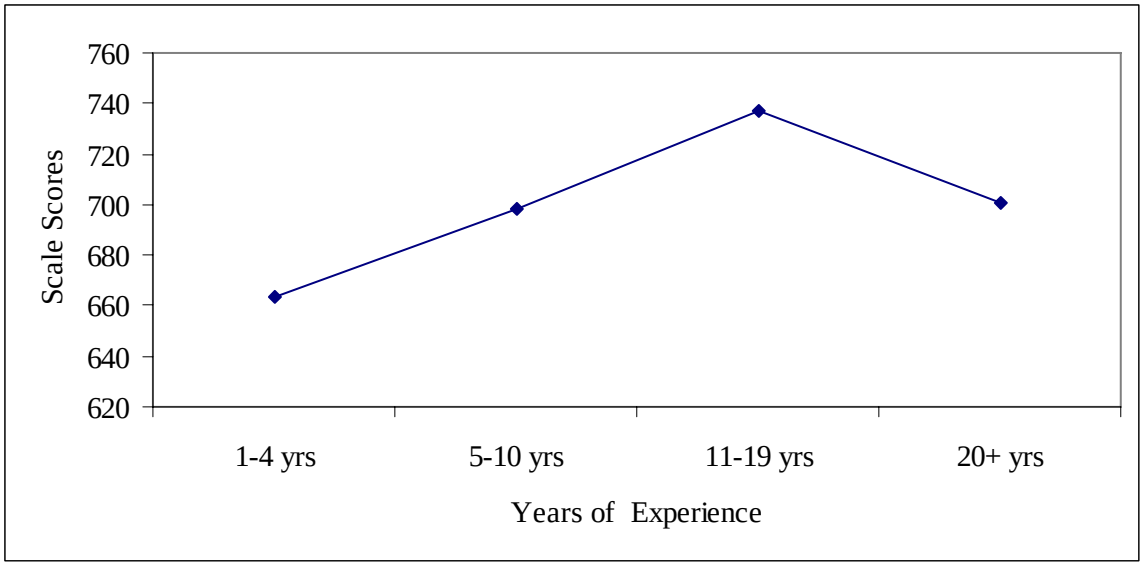

Fig. 28. Eighth Grade Mathematics Scores 2007

Summary of Chapter Four

Examining teacher degree level revealed that elementary teachers with master's degrees and above had a larger percentage of students score *advanced* and *proficient* on both the communication arts and mathematics sections of the MAP than did the elementary teachers with bachelor's degrees. In addition, the percentage of students scoring *advanced* and *proficient* on the communication arts and mathematics sections of the MAP increased as the number of years of teaching experience increased for elementary teachers.

A deeper look into secondary teacher degree level indicated that secondary teachers with master's degrees and above also had a larger percentage of students score *advanced* and *proficient* on both the communication arts and mathematics sections of the

MAP than did secondary teachers with bachelor's degrees. The percentage of students scoring *advanced* and *proficient* on the communication arts and mathematics sections of the MAP increased as the number of years of teaching experience increased, with the 11-19 years of experience group producing the highest percentage of students, before decreasing with the 20+ years of experience teachers. Additionally, secondary communication arts teachers with 20 or more years of teaching experience had a lower percentage of students scoring *advanced* and *proficient* than did secondary communication arts teachers with 5-10 years of experience.

In the area of communication arts, 2006-07 had larger incidents of significance when compared to 2005-06. In the 2005-06 school year, the interaction between years of experience and degree level was prevalent among all grade levels tested but three: third, fourth, and fifth. In grade 3, the difference in mean scores based on degree level was significant. In grade 4, teachers with 20+ years of experience had significantly higher communication arts MAP test scores than did all other years of experience. Grade 5 showed no occurrences of a significant difference in mean test scores. Sixth grade teachers with a bachelor's degree and 20+ years of experience had significantly higher mean scores than did their grade level colleagues with bachelor's degrees and 1-10 years of experience, as well as those with a master's degree and 5-19 years of experience. Seventh grade teachers with master's degrees and 5-20+ years of experience had higher mean scores than did those with bachelor's degrees and 1-10 years of experience, as well as those with master's degrees and 1-4 years of experience. Eighth grade communication arts teachers with master's degrees and 5-10 years of experience had the highest mean score of all groups. Finally, eleventh grade communication arts teachers in 2006 with

master's degrees and 20+ years of experience had significantly lower scores than all other groups.

The 2006-07 school year contained numerous occurrences of significance in mean test scores on the communication arts section of the MAP. In grade 3, teachers with a bachelor's degree and 11-19 years had higher mean scores than did all other grade level colleagues. Fourth grade teachers with a master's degree and 11-20+ years of experience had significantly higher mean scores than teachers with a master's degree and 1-4 years of experience, as well as those with a bachelor's degree and 5-10 years of experience. Fifth grade teachers with a bachelor's degree and 11-19 years of experience had significantly lower mean scores than all other grade level colleagues with a bachelor's degree, as well as those with a master's degree and 11-20+ years of experience. Moreover, fifth grade teachers with a master's degree and 5-10 years of experience had significantly higher mean scores than did grade level colleagues with a bachelor's degree and 1-10 years of experience, as well as those with a master's degree and 11-20+ years of experience.

During the 2006-07 school year, sixth grade teachers with a bachelor's degree and 20+ years of experience had a significantly higher mean score than did those with bachelor's degrees and 1-19 years of experience. Also, sixth grade teachers with a master's degree and 1-4 years of experience had a significantly higher mean score than did teachers with a bachelor's degree and 1-4 and 11-19 years of experience. Seventh grade teachers with a master's degree and 1-4 years of experience had a significantly lower mean score than did all other grade level colleagues. In addition, seventh grade communication arts teachers with a bachelor's degree and 5-10 years of experience had a

significantly higher mean score than did those with a bachelor's degree and 1-4 years of experience, as well as those with a master's degree and 1-10 years of experience. Eighth grade teachers with a bachelor's degree and 1-4 years of experience (regardless of degree level) had significantly lower mean scores than did most other colleagues. Finally, each mean eleventh grade communication arts score was significantly different from each other group based on years of experience.

Mathematics scores in 2005-06 showed several areas of significant differences. Third grade teaches with a bachelor's degree and 1-4 years of experience had significantly lower mean scores than did colleagues with master's degrees and 1-4, 11-19 and 20+ years of experience. In grade 4, teachers with 1-4 years of experience had significantly lower mean scores than did teachers with 11-20+ years of experience. In addition, fourth grade teachers with 20+ years of experience had significantly higher mean scores than did all other grade level colleagues. Fifth grade teachers with 11-19 and 20+ years of experience had significantly higher mean scores than did those with 5-10 years of experience. Sixth grade teachers with 20+ years of experience had significantly higher mean scores than did all other grade level colleagues.

Seventh grade teachers with a bachelor's degree and 1-4 years of experience had significantly higher mean scores than did those with a master's degree and 1-4 years of experience, as well as those with a bachelor's degree and 11-19 years of experience. Additionally, seventh grade mathematics teachers with a master's degree and 5-20+ years of experience had significantly higher mean scores than did those with 1-4 years of experience (regardless of degree level) and those with a bachelor's degree and 11-19 years of experience. Eighth grade teachers with a bachelor's degree and 11-19 years of

experience had a significantly higher mean score than did all other grade level teachers. Finally, tenth grade teaches with a master's degree and 11-19 years of experience had a significantly higher mean score than did all other grade level colleagues. Moreover, tenth grade mathematics teachers with a bachelor's degree and 20+ years of experience had a significantly lower mean score than did all other grade level mathematics teachers.

As in communication arts, 2006-07 contained more occurrences of significance in mathematics scores than 2005-06. Third grade teachers with a bachelor's degree and 11-19 years of experience had significantly higher mean scores than did all other grade level teachers. Fourth grade teachers with a master's degree or higher and 1-4 years of experience, as well as those with a bachelor's degree and 5-10 years of experience, had significantly higher mean scores than did all other teachers with a master's degree, along with those with a bachelor's degree and 1-4 years of experience. Fifth grade teachers with a bachelor's degree and 11-19 years of experience had a significantly lower mean score than did all other grade level colleagues with a bachelor's degree, as well as those with a master's degree and 11-20+ years of experience. Moreover, fifth grade teachers with a master's degree and 20+ years of experience had a significantly higher mean score than did those with a bachelor's degree and 5-19 years of experience, along with colleagues with a master's degree and 5-10 years of experience.

Sixth grade mathematics teachers with a bachelor's degree and 20+ years of experience had a significantly higher mean score than did all other grade level teachers with a bachelor's degree, as well as those with a master's or higher and 5-10 and 20+ years of experience. Seventh and eighth grade mathematics teachers with 11-19 years of experience had a significantly higher mean score, compared to all other years of

experience in their respective grade levels. In addition, eighth grade teachers with 1-4 years of experience had a significantly lower mean score than did teachers with all other years of experience. Finally, tenth grade teachers with a master's degree and 20+ years of experience had a higher mean score than did all other colleagues, with the exception of colleagues with master's degrees and 1-4 years of experience. Furthermore, tenth grade mathematics teachers with 20+ years of experience and a bachelor's degree had a significantly lower mean score than did all other grade level colleagues.

This chapter included the results from the statistical analysis conducted in the study. Chapter 5 contains the discussion and interpretation of the results, implications for further research, and implications for practice and recommendations.

CHAPTER FIVE

INTERPRETATIONS AND RECOMMENDATIONS

Restatement of the Purpose

The purpose of this study was to examine whether years of teaching experience has an effect on overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program. In addition, this study examined whether a teacher's degree level has an effect on overall achievement of students on the communication arts and mathematics sections of the Missouri Assessment Program. There were six hypotheses in this study:

HO_1: The number of years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_2: The number of years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_3: Teacher degree level has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_4: Teacher degree level has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_5: The combination of teacher degree level and years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

HO_6: The combination of teacher degree level and years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

The first four chapters contained the background, literature review, research questions and hypotheses, methodology, and results associated with this research study. The purpose of Chapter Five is to present the interpretation of the results and recommendations for future study. Chapter Five is organized in the following sections: a summary of the results, discussion of the results, implications for further research, and implications for practice and recommendations.

Summary of Results

Examining teacher degree level revealed that elementary teachers with master's degrees and above had a larger percentage of students score *advanced* and *proficient* on both the communication arts and mathematics sections of the MAP than did the elementary teachers with bachelor's degrees. In addition, the percentage of students scoring *advanced* and *proficient* on the communication arts and mathematics sections of the MAP increased as the number of years of teaching experience increased for elementary teachers.

A deeper look into secondary teacher degree level indicated that secondary teachers with master's degrees and above also had a larger percentage of students score *advanced* and *proficient* on both the communication arts and mathematics sections of the

MAP than did secondary teachers with bachelor's degrees. The percentage of students scoring *advanced* and *proficient* on the communication arts and mathematics sections of the MAP increased as the number of years of teaching experience increased, with the 11-19 years of experience group producing the highest percentage of *advanced* and *proficient* scores, before decreasing with the 20+ years of experience teachers. Additionally, secondary communication arts teachers with 20 or more years of teaching experience had a lower percentage of students scoring *advanced* and *proficient* than did secondary communication arts teachers with 5-10 years of experience.

After conducting a factorial ANOVA for scores in 2005-06 and 2006-07 in both communication arts and mathematics, 2006-07 contained larger incidents of significance in communication arts when compared to 2005-06. In the 2005-06 school year, the interaction between years of experience and degree level was prevalent among all grade levels tested but three: third, fourth, and fifth. In grade 3, the difference in mean scores based on degree level was significant. In grade 4, teachers with 20+ years of experience had significantly higher communication arts MAP test scores than did all other years of experience. Grade 5 showed no occurrences of a significant difference in mean test scores. Sixth grade teachers with a bachelor's degree and 20+ years of experience had significantly higher mean scores than did their grade level colleagues with bachelor's degrees and 1-10 years of experience, as well as those with a master's degree and 5-19 years of experience. Seventh grade teachers with master's degrees and 5-20+ years of experience had higher mean scores than those with bachelor's degrees and 1-10 years of experience, as well as those with master's degrees and 1-4 years of experience. Eighth grade communication arts teachers with master's degrees and 5-10 years of experience

had the highest mean score of all other groups. Finally, eleventh grade communication arts teachers in 2006 with master's degrees and 20+ years of experience had significantly lower scores than did all other groups.

The 2006-07 school year contained numerous occurrences of significance in mean test scores on the communication arts section of the MAP. In grade 3, teachers with a bachelor's degree and 11-19 years had higher mean scores than did all other grade level colleagues. Fourth grade teachers with a master's degree and 11-20+ years of experience had significantly higher mean scores than did teachers with a master's degree and 1-4 years of experience, as well as those with a bachelor's degree and 5-10 years of experience. Fifth grade teachers with a bachelor's degree and 11-19 years of experience had significantly lower mean scores than did all other grade level colleagues with a bachelor's degree, as well as those with a master's degree and 11-20+ years of experience. Moreover, fifth grade teachers with a master's degree and 5-10 years of experience had significantly higher mean scores than did grade level colleagues with a bachelor's degree and 1-10 years of experience, as well as those with a master's degree and 11-20+ years of experience.

During the 2006-07 school year, sixth grade teachers with a bachelor's degree and 20+ years of experience had a significantly higher mean score than did those with bachelor's degrees and 1-19 years of experience. Also, sixth grade teachers with a master's degree and 1-4 years of experience had a significantly higher mean score than did teachers with a bachelor's degree and 1-4 and 11-19 years of experience. Seventh grade teachers with a master's degree and 1-4 years of experience had a significantly lower mean score than did all other grade level colleagues. In addition, seventh grade

communication arts teachers with a bachelor's degree and 5-10 years of experience had a significantly higher mean score than did those with a bachelor's degree and 1-4 years of experience, as well as those with a master's degree and 1-10 years of experience. Eighth grade teachers with a bachelor's degree and 1-4 years of experience (regardless of degree level) had significantly lower mean scores than did most other colleagues. Finally, each mean eleventh grade communication arts score was significantly different from each other group, based on years of experience.

Mathematics scores in 2005-06 showed several areas of significant differences. Third grade teachers with a bachelor's degree and 1-4 years of experience had significantly lower mean scores than did colleagues with master's degrees and 1-4, 11-19 and 20+ years of experience. In grade 4, teachers with 1-4 years of experience had significantly lower mean scores than did teachers with 11-20+ years of experience. In addition, fourth grade teachers with 20+ years of experience had significantly higher mean scores than did all other grade level colleagues. Fifth grade teachers with 11-19 and 20+ years of experience had significantly higher mean scores than did those with 5-10 years of experience. Sixth grade teachers with 20+ years of experience had significantly higher mean scores than did all other grade level colleagues. Seventh grade teachers with a bachelor's degree and 1-4 years of experience had significantly higher mean scores than did those with a master's degree and 1-4 years of experience, as well as those with a bachelor's degree and 11-19 years of experience. Additionally, seventh grade mathematics teachers with a master's degree and 5-20+ years of experience had significantly higher mean scores than did those with 1-4 years of experience (regardless of degree level) and those with a bachelor's degree and 11-19 years of experience. Eighth

grade teachers with a bachelor's degree and 11-19 years of experience had a significantly higher mean score than did all other grade level teachers. Finally, tenth grade teaches with a master's degree and 11-19 years of experience had a significantly higher mean score than did all other grade level colleagues. Moreover, tenth grade mathematics teachers with a bachelor's degree and 20+ years of experience had a significantly lower mean score than did all other grade level mathematics teachers.

As in communication arts, 2006-07 contained more occurrences of significance in mathematics scores than 2005-06. Third grade teachers with a bachelor's degree and 11-19 years of experience had significantly higher mean scores than did all other grade level teachers. Fourth grade teachers with a master's degree or higher and 1-4 years of experience, as well as those with a bachelor's degree and 5-10 years of experience, had significantly higher mean scores than did all other teachers with a master's degree, along with those with a bachelor's degree and 1-4 years of experience. Fifth grade teachers with a bachelor's degree and 11-19 years of experience had a significantly lower mean score than did all other grade level colleagues with a bachelor's degree, as well as those with a master's degree and 11-20+ years of experience. Moreover, fifth grade teachers with a master's degree and 20+ years of experience had a significantly higher mean score than did those with a bachelor's degree and 5-19 years of experience, along with colleagues with a master's degree and 5-10 years of experience.

Sixth grade mathematics teachers with a bachelor's degree and 20+ years of experience had a significantly higher mean score than did all other grade level teachers with a bachelor's degree, as well as those with a master's degree or higher and 5-10 and 20+ years of experience. Seventh and eighth grade mathematics teachers with 11-19

years of experience had a significantly higher mean score compared to all other years of experience in their respective grade levels. In addition, eighth grade teachers with 1-4 years of experience had a significantly lower mean score than did teachers with all other years of experience. Finally, tenth grade teachers with a master's degree and 20+ years of experience had a higher mean score than did all other colleagues, with the exception of colleagues with master's degrees and 1-4 years of experience. Furthermore, tenth grade mathematics teachers with 20+ years of experience and a bachelor's degree had a significantly lower mean score than did all other grade level colleagues.

Discussion of Results

Because it encompassed two years of data in communication arts and mathematics over seven grade levels, this study contained a large number of data sets. The descriptive statistics were a preview into what was seen through the factorial ANOVA. When examining teacher degree levels at both the elementary and secondary levels, teachers with master's degrees or higher had a higher percentage of students scoring *advanced* and *proficient* on the communication arts and mathematics MAP exam than did teachers with bachelor's degrees. This might indicate that teacher degree level influences student achievement. However, further analysis using the factorial ANOVA revealed inconclusive results.

Teacher degree level had an effect on student achievement in communication arts in grades 3, 8, and 11 for both the 2005-06 and 2006-07 school years. The other grade levels studied had inconclusive results. In mathematics, teacher degree level had an effect on student achievement in grades 3, 5, 8, and 10 in both 2005-06 and 2006-07. The other grade levels showed inconclusive results. These mixed results were similar to the

discussion in Chapter 2 with regard to the effect of teacher degree level on student achievement. Rugraff's research revealed there were more master's degrees awarded in the education field yearly than in any other area, representing one in every four degrees awarded (31). However, some would argue although the number of advanced degrees in education has increased, this has not necessarily translated into higher student achievement. Darling-Hammond believed that because master's degrees come in such a variety of areas in education, simply having a master's degree does not necessarily equate to student success. She stated, "Characteristics such as education level (percentage of teachers with master's degrees) show positive but less strong relationships with education outcomes" (29). Through their research, Hanushek et al. concluded, "There is little or no evidence that a master's degree raises the quality of teaching" (418). On the other side, studies by Goldhaber and Brewer, Rice, and Rosenthal suggested that a master's degree in a specific content area can have a positive impact on student achievement. Rugraff stated,

> There is a significant relationship between the percentage of graduates scoring at or above the ACT national average, based upon the percentage of teachers in the school district with master's degrees or higher. This leads to the conclusion that teachers with advanced degrees can often times significantly aid students' achievement in some environments. (89)

Just as the literature had mixed reviews on the impact of teacher degree level on student achievement, so did the results of this study. Because this study did not collect the specific content area of the advanced degree, it is unknown whether it was the reason

for the effect on student achievement in grades 3, 8 and 11 in communication arts and 3, 5, 8, and 10 in mathematics.

An examination of years of experience revealed a slight difference between elementary and secondary teachers when looking at the descriptive statistics. At the elementary level, teachers with more years of experience had more students scoring *advanced* and *proficient* on the MAP in both communication arts and mathematics. At the secondary level, years of experience had a positive impact on student achievement at the secondary level until around year 20, when it then had a negative impact.

The results of this study support much of what was discussed in the review of literature. Fetler stated, “Teacher experience, measured by the average number of years in service, is positively related to test results” (10). In regards to the effect of teacher experience at specific grade levels, three studies discussed in Chapter Two support findings in this study. The Public Policy Institute of California stated, “The only indicator that is systematically linked to student achievement in third grade is teacher experience. Having a new teacher reduces the percentage of students who exceed national median test scores by roughly 3 percentage points in both mathematics and reading” (“Relationships Between” 2). Harris and Sass concluded that experienced teachers are more effective in teaching elementary and middle school reading (29). Darling-Hammond found teacher experience had a greater impact on student achievement than did teacher certification or teacher degree programs (38). All three of these studies support this study’s results that years of teaching experience have an effect on student achievement.

There was also an indication that the specific number of years of teaching experience had an impact on student achievement in this study. Several studies discussed

in Chapter Two also supported these findings. Rosenthal stated, “Teachers don’t necessarily become more effective the longer they remain in the classroom” (1). In addition, Hanushek et al. concluded, “Beginning teachers, and to a lesser extent, second and third year teachers in mathematics perform significantly worse than more experienced teachers” (447). The Center for Public Education suggested, “Teaching experience, typically five years or more, produces higher student results…teachers with more than five years in the classroom seem to be the most effective” (“Teacher Quality” 4). Linda Gorman reported, “First-year teachers have much lower performance on average than other teachers. After that, teacher performance improves markedly, peaking in the teacher’s fourth year” (1).

Kane et al. concluded, “Teachers make long strides in their first three years, with very little experience-related improvement after that” (64). Goldhaber and Anthony wrote, “Teacher experience may predict teacher effectiveness, but there is very little evidence of this beyond the first couple of years of teaching” (4). Finally, Walsh stated, “Much of the research has found that teachers get better with a few years of experience, but at some point their effectiveness drops, viewed as an inverted U-shaped pattern of effectiveness and perhaps caused by ‘burnout’ or by the promotion of better teachers out of the classroom” (5-6). The results from the descriptive statistics and factorial ANOVA support this research. There was evidence that years of teaching experience had an effect on student achievement, and there was also evidence showing that years of teaching experience had either a positive and negative effect, depending on the number of years of experience.

Summary of Discussion

There were six hypotheses in this study. Two of the hypotheses examined the effect of teacher experience on student achievement in communication arts and mathematics. Two of the hypotheses examined the effect of teacher degree levels on student achievement in communication arts and mathematics. The final two hypotheses examined the interaction between teacher degree level and years of teaching experience on student achievement in both communication arts and mathematics. The results of this study were used to determine whether to accept or reject the hypotheses as they were presented.

Hypothesis 1: The number of years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

Based on the results from the factorial ANOVA for data in both the 2005-06 and 2006-07 school years, there were significant differences in mean scores for years of experience in grades 4, 6, 7, 8, and 11. There were no significant differences in mean scores in grades 3 and 5 for both years, although there were significant differences in 2006-07. Therefore, this hypothesis is rejected, as years of teaching experience has a significant effect on student achievement on the communication arts section of the MAP.

Hypothesis 2: The number of years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

The results from the factorial ANOVA indicated that years of experience showed significant differences in mean scores for grades 4, 5, 6, 7, 8, and 10 in both the 2005-06

and 2006-07 school years. Third grade was the only grade level in which there was not a significant difference in mean scores for both years, although there was a significant difference in 2006-07. Therefore, this hypothesis is rejected, as years of teaching experience has a significant effect on student achievement in mathematics on the MAP.

Hypothesis 3: Teacher degree level has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

The results of this study delineated that there were significant differences in mean communication arts scores for teacher degree level in grades 3, 8, and 11 in both the 2005-06 and 2006-07 school years. There were significant differences in mean communication arts scores for grades 5 and 7 in 2006-07. There were no significant differences in mean communication arts scores for grades 4 and 6 in either year. Therefore, because the data is inconclusive, this hypothesis cannot be rejected.

Hypothesis 4: Teacher degree level has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

The outcome of the factorial ANOVA depicted significant differences in mean mathematics scores for teacher degree level in grades 3, 5, 8, and 10 in both the 2005-06 and 2006-07 school years. There were significant differences in mean mathematics scores in grades 4 and 6 in 2005-06, while grade 7 showed no significant differences in either school year. Therefore, because the data is inconclusive, this hypothesis cannot be rejected.

Hypothesis 5: The combination of teacher degree level and years of teaching experience has no effect on student achievement in communication arts on the Missouri Assessment Program exam at the 0.05 level of significance.

The interaction between years of experience and degree level showed significant differences in mean communication arts scores for grades 6, 7, and 8 in both 2005-06 and 2006-07. Moreover, the interaction between years of experience and degree level showed significant differences in mean communication arts scores for grades 3, 4, and 5 in 2006-07 and in grade 11 in 2005-06. Because all grade levels showed significant differences in mean scores on the communication arts MAP in either year, this hypothesis is rejected. The interaction between years of experience and degree level has an effect on student achievement in communication arts on the MAP exam.

Hypothesis 6: The combination of teacher degree level and years of teaching experience has no effect on student achievement in mathematics on the Missouri Assessment Program exam at the 0.05 level of significance.

The interaction between years of experience and degree level showed significant differences at grades 3, 8, and 10 on the mathematics section of the MAP in 2005-06 and 2006-07. Furthermore, the interaction between years of experience and degree level showed significant differences in mean mathematics scores in grades 4, 5, and 6 in 2006-07 and in grade 7 in 2005-06. Because all grade levels showed significant differences in mean mathematics scores in either or both school years, this hypothesis is rejected. The combination of teacher degree level and years of teaching experience has an effect on student achievement on the mathematics section of the MAP exam.

Implications for Further Research

This study can be the basis for further research opportunities. This particular study could be expanded to include additional school districts of similar size to this district or it could be expanded to the state level. The expansion could occur by specific grade level or by multiple grade levels. This study could also be continued to include future years of MAP data in this district. In addition, the literature names several other factors that could have an impact on student achievement and that could be studied, including class size, years of experience teaching the tested content, years of experience teaching a tested grade level, and specific subject area of the undergraduate and graduate degree.

Implications for Practice and Recommendations

As discussed in Chapter One, most school boards adopt policies limiting the number of years of experience teachers can bring with them when they move to a new school district, while providing salary increases for graduate work they complete. This is intended to both limit personnel costs for hiring incoming teachers and entice current employees to stay in the district. Teachers know that if they leave, they will not be given credit by their new employer for the years of teaching experience they have.

While it is common practice for school districts in Missouri to give increases in teaching salaries for attaining advanced degrees as well as for longevity in the district, does this translate into higher student achievement? The results of this study indicated that years of experience, as well as the combination of years of experience and degree level, have an effect on student achievement. School districts should be careful about implementing policies that limit the number of years of experience for which a district

will give credit, especially at the elementary level. This study showed that elementary teachers with 20 or more years of experience produced the highest number of students scoring *advanced* and *proficient* on the MAP in both communication arts and mathematics. Years of experience also had an effect on student achievement at the secondary level, although it was a negative effect. In several instances, teachers with 5-19 years of experience had students achieve at higher levels than did those teachers with 1-4 or 20+ years of experience. The reasons for the difference between the impact of years of experience at the elementary and at the secondary level are unknown. However, it warrants a closer look by those who develop policies at the district level.

Limitations

All research must conclude there are an infinite number of factors that cannot be taken into account for various reasons. The same holds true for this study. Several of these limitations in this study were self-imposed, but most are due to factors outside of the researcher's control. There were four limitations in this study. First, only the variables of "number of years of teaching experience" and "degree level of the teacher" were associated with student achievement. Although there are more factors than these two that can have an impact on student achievement, this study examined only these two. Second, only public schools in one mid-size urban school district in northwest Missouri are included in this study. As stated in the recommendations for further research, this study could be expanded to include other districts of similar size to the school district studied or to the state level in order to enlarge the pool of data. Third, only Missouri Assessment Program scores from 2005-06 and 2006- 07 were used in this study. The school year of 2005-06 was the first year the state of Missouri expanded its testing to grade level exams

instead of grade-span exams. The State of Missouri also reduced its scoring from five levels to four levels. Because of this, test scores prior to 2005-06 were not of similar composition to the test scores used in this study, and therefore, were not used. Finally, since the State of Missouri mandates the testing of communication arts and mathematics, these scores are the only ones used in this study. Missouri has offered districts the option of taking a science and social studies exam at the expense of the district, but this school district has not elected to do so for several years.

Conclusion

The title of this study is, "The Effect of Teacher Experience and Degree Level on Student Achievement in Communication Arts and Mathematics". More specifically, this study examined whether teacher experience and/or degree level had an effect on student achievement in communication arts and mathematics on the Missouri Assessment Program exam, using data from the 2005-06 and 2006-07 school years. The results from descriptive statistics depict that teachers with advanced degrees had a higher percentage of students scoring *advanced* and *proficient* on both the communication arts and mathematics sections of the MAP at both the elementary and secondary levels. At the elementary level, the percentage of students scoring *advanced* and *proficient* increased as the number of years of teaching experience increased. At the secondary level, the percentage of student scoring *advanced* and *proficient* increased as the number of years of teaching experience increased, peaking at years 11-19 and then decreasing for teachers with 20 or more years of experience. The results of a factorial ANOVA indicated significant differences in mean scale scores in both communication arts and mathematics over the course of both years, thus indicating for this study that teacher degree level and

years of experience have an effect on student achievement. The findings of this study supported and broadened a knowledge base already brimming with studies on this topic. While years of teaching experience had an effect on student achievement in both communication arts and mathematics at all grade levels, the results were inconclusive for teacher degree level. These results provide a strong foundation for further research in which this particular study could be continued using future test score data. It could be expanded statewide, using data from districts all across the state, or this study could be enlarged to include other factors such as years of experience teaching a tested subject or grade level, as well as specific area of degree level. The results of this study highlight the importance of teacher degree level and years of experience to student achievement at any grade level. School districts can and should collect this data to use for their own decision-making regarding hiring and staffing decisions. Using this information would represent data-driven decision-making.

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APPENDIX A: PERMISSION LETTER FROM SCHOOL DISTRICT

March 4, 2008

To: Dissertation Advisory Committee – School of Education, Baker University

Re: Jaime C. Dial

Permission is granted for Jaime Dial to access the District's archived data from the assessment and human resources departments for her dissertation entitled *The Effect of Teacher Experience and Teacher Degree Levels on Student Achievement in Mathematics and Communication Arts*.

The following are conditions for the study to be conducted in this school district: Data must be archival data and all student, teacher, and school identifiers must remain confidential. Upon completion of the dissertation defense, findings and conclusions of the study will be reported in an executive summary to the District's Institutional Review Board.

Feel free to contact me if I may assist you further.

Sincerely,

Melody A. Smith, Ed.D.
Superintendent of Schools

Cc: Mrs. Cheri Patterson, Associate Superintendent

APPENDIX B: RESULTS FROM FACTORIAL ANOVA

2005-06 COMMUNICATION ARTS

2005-06 Communication Arts 3rd Grade Analysis for Degree Level

Degree	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	648.205	1.916	644.444	651.966
Bachelors	637.334(a)	2.041	633.328	641.340

a Based on modified population marginal mean.

2005-06 Communication Arts 4th Grade Post Hoc for Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	Lower Bound
1-4	5-10	-.3991	5.14921	1.000	-13.6564	12.8582
	11-19	-7.7030	3.14237	.069	-15.7934	.3875
	20+	-20.2197(*)	3.46664	.000	-29.1450	-11.2944
5-10	1-4	.3991	5.14921	1.000	-12.8582	13.6564
	11-19	-7.3039	4.96904	.456	-20.0973	5.4895
	20+	-19.8206(*)	5.18020	.001	-33.1577	-6.4836
11-19	1-4	7.7030	3.14237	.069	-.3875	15.7934
	5-10	7.3039	4.96904	.456	-5.4895	20.0973
	11-19	-12.5168(*)	3.19290	.001	-20.7373	-4.2962
20+	1-4	20.2197(*)	3.46664	.000	11.2944	29.1450
	5-10	19.8206(*)	5.18020	.001	6.4836	33.1577
	11-19	12.5168(*)	3.19290	.001	4.2962	20.7373

Based on observed means.

* The mean difference is significant at the .05 level.

2005-06 Communication Arts 6th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	669.491	2.480	664.623	674.359
5-10	661.341	3.851	653.782	668.900
11-19	667.368	2.169	663.110	671.626
20+	678.128	2.531	673.160	683.096

2005-06 Communication Arts 6th Grade Comparison of Means for Years of Experience and Degree Level

Yrs Exp	Degree Level	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1-4	Masters +	679.149	4.415	670.484	687.814
	Bachelors	659.832	2.262	655.392	664.272
5-10	Masters +	660.077	5.935	648.427	671.727
	Bachelors	662.605	4.910	652.969	672.242
11-19	Masters +	665.912	2.314	661.370	670.455
	Bachelors	668.824	3.670	661.620	676.027
20+	Masters +	671.573	1.812	668.017	675.130
	Bachelors	684.683	4.726	675.406	693.960

2005-06 Communication Arts 6th Grade Post Hoc Analysis for Interaction of Years of Experience and Teacher Degree Level

			1-4	5-10	5-10	11-19	11-19	20+	1-4	20+
			Ba	Ma	Ba	Ma	Ba	Ma	Ma	Ba
			659.8	660.1	662.6	665.9	668.8	671.6	679.1	684.7
1	Ba	659.8								
2	Ma	660.1	0.24							
2	Ba	662.6	2.77	2.53						
3	Ma	665.9	6.08	5.84	3.31					
3	Ba	668.8	8.99	8.75	6.22	2.91				
4	Ma	671.6	11.74	11.50	8.97	5.66	2.75			
1	Ma	679.1	19.32	19.07	16.54	13.24	10.33	7.58		
4	Ba	684.7	24.85	24.61	22.08	18.77	15.86	13.11	5.53	

Tukey's HSD = 16.97068

2005-06 Communication Arts 7th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	586.667	9.935	567.168	606.165
5-10	636.899	5.678	625.754	648.043
11-19	681.723	1.852	678.089	685.357
20+	666.457	1.838	662.850	670.064

2005-06 Communication Arts 7th Grade Post Hoc Analysis of Years of Experience and Teacher Degree Level

			1-4 Ma	1-4 Ba	5-10 Ba	5-10 Ma	20+ Ba	20+ Ma	11-19 Ma	11-19 Ba
			581	592.3	613.4	660.4	663.8	669.1	675.9	687.5
1-4	Ma	581								
1-4	Ba	592.33	11.33							
5-10	Ba	613.38	32.38	21.04						
5-10	Ma	660.42	79.42	68.09	47.05					
20+	Ba	663.79	82.79	71.46	50.42	3.37				
20+	Ma	669.12	88.12	76.79	55.75	8.70	5.33			
11-19	Ma	675.91	94.91	83.58	62.54	15.49	12.12	6.79		
11-19	Ba	687.53	106.53	95.20	74.16	27.11	23.74	18.41	11.62	

Tukey's HSD = 32.54875

2005-06 Communication Arts 8th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	608.042	8.762	590.845	625.239
5-10	679.096	3.153	672.907	685.286
11-19	682.039	2.234	677.653	686.425
20+	699.773	2.013	695.823	703.724

2005-06 Communication Arts 8th Grade Comparison of Means for Teacher Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	672.494	2.299	667.981	677.006
Bachelors	661.982	4.319	653.505	670.459

2005-06 Communication Arts 8th Grade Post Hoc Analysis of Years of Experience and Teacher Degree Level

			1-4 Ma	1-4 Ba	5-10 Ba	11-19 Ba	11-19 Ma	20+ Ma	20+ Ba	5-10 Ma
			605.7	610.4	651.0	680.4	683.7	693.4	706.2	707.2
1-4	Ma	605.7								
1-4	Ba	610.4	4.72							
5-10	Ba	651.0	45.27	40.55						
11-19	Ba	680.4	74.70	69.98	29.43					
11-19	Ma	683.7	78.01	73.29	32.74	3.31				
20+	Ma	693.4	87.67	82.96	42.40	12.97	9.66			
20+	Ba	706.2	100.51	95.79	55.24	25.81	22.5	12.84		
5-10	Ma	707.2	101.56	96.84	56.29	26.86	23.55	13.89	1.05	

Tukey's HSD = 24.76004

2005-06 Communication Arts 11th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	720.700(a)	6.910	707.135	734.265
5-10	717.178	1.870	713.507	720.850
11-19	723.081	1.411	720.311	725.851
20 +	634.615(a)	6.061	622.718	646.512

a Based on modified population marginal mean.

2005-06 Communication Arts 11th Grade Comparison of Means for Degree Level

Degree level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	694.625(a)	2.305	690.101	699.149
Bachelor	717.320(a)	2.553	712.309	722.331

a Based on modified population marginal mean.

2005-06 Communication Arts 11th Grade Post Hoc Analysis for Years of Experience and Degree Level

			1-4 G	20+ G	5-10 UG	1-4 UG	11-19 UG	11-19 G	5-10 G	20+ UG
			.(a)	634.6	708.9	720.7	722.4	723.8	725.5	.(a)
1-4	G	.(a)								
20+	G	634.6								
5-10	UG	708.9		74.26						
1-4	UG	720.7		86.08	11.83					
11-19	UG	722.4		87.77	13.51	1.68				
11-19	G	723.8		89.16	14.90	3.08	1.39			
5-10	G	725.5		90.87	16.61	4.78	3.10	1.70		

Tukey's HSD = 16.8225

APPENDIX C: Results from Factorial ANOVA

2006-07 Communication Arts

2006-07 Communication Arts 3rd Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	632.392	2.134	628.204	636.581
5-10	649.856	2.326	645.292	654.421
11-19	602.495	13.004	576.971	628.019
20+	634.951(a)	5.683	623.797	646.105

a Based on modified population marginal mean.

2006-07 Communication Arts 3rd grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	639.048	2.104	634.918	643.177
Bachelors	616.082(a)	8.678	599.050	633.115

a Based on modified population marginal mean.

2006-07 Communication Arts 3rd Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			11-19 Ba	1-4 Ba	1-4 Ma	20+ Ma	11-19 Ma	5-10 Ma	5-10 Ba	20+ Ba
			565.5	632.1	632.7	635.0	639.5	649.1	650.6	.(a)
11-19	Ba	565.5								
1-4	Ba	632.1	66.61							
1-4	Ma	632.7	67.17	0.56						
20+	Ma	635.0	69.45	2.84	2.28					
11-19	Ma	639.5	73.99	7.38	6.81	4.54				
5-10	Ma	649.1	83.58	16.97	16.30	14.13	9.59			
5-10	Ba	650.6	85.14	18.53	17.96	15.68	11.15	1.56		

Tukey's HSD = 18.30168506

2006-07 Communication Arts 4th grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	646.094	2.782	640.633	651.555
5-10	645.571	3.793	638.126	653.016
11-19	653.231	3.183	646.984	659.478
20+	662.343(a)	2.730	656.985	667.702

a Based on modified population marginal mean.

2006-07 Communication Arts 4th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4	5-10	11-19	5-10	1-4	11-19	20+	20+
			Ma	Ba	Ba	Ma	Ba	Ma	Ma	Ba
			636.5	637.5	647.5	653.7	655.6	659.0	662.3	.(a)
1-4	Ma	636.5								
5-10	Ba	637.5	0.91							
11-19	Ba	647.5	10.9	10.02						
5-10	Ma	653.7	17.1	16.24	6.21					
1-4	Ba	655.6	19.1	18.19	8.16	1.95				
11-19	Ma	659.0	22.4	21.53	11.51	5.30	3.34			
20+	Ma	662.3	25.8	24.89	14.87	8.65	6.70	3.36		
20+	Ba	.(a)								

Tukey's HSD = 18

2006-07 Communication Arts 5th grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	671.212(a)	2.308	666.683	675.742
5-10	660.595	3.187	654.340	666.850
11-19	658.881	4.305	650.430	667.332
20+	674.685	2.956	668.882	680.488

a Based on modified population marginal mean.

2006-07 Communication Arts 5th grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	668.997(a)	2.242	664.596	673.398
Bachelors	663.136	2.620	657.994	668.278

a Based on modified population marginal mean.

2006-07 Communication Arts 5th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

		1-4	11-19	5-10	20+	5-10	1-4	11-19	20+
		Ma	Ba	Ma	Ba	Ba	Ba	Ma	Ma
		.(a)	644.8	650.7	666.0	670.5	671.2	672.9	683.4
1-4	Ma	.(a)							
11-19	Ba	644.8							
5-10	Ma	650.7	5.83						
20+	Ba	666.0	21.15	15.32					
5-10	Ba	670.5	25.71	19.88	4.56				
1-4	Ba	671.2	26.39	20.56	5.24	0.68			
11-19	Ma	672.9	28.11	22.28	6.96	2.41	1.73		
20+	Ma	683.4	38.57	32.74	17.42	12.86	12.18	10.46	

Tukey's HSD = 19.62451

2006-07 Communication Arts 6th grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	673.777	3.142	667.610	679.944
5-10	670.081	3.173	663.853	676.309
11-19	666.439	2.236	662.051	670.828
20+	684.579	3.972	676.782	692.375

2006-07 Communication Arts 6th grade Interaction Between Years of Experience and Degree Level

			11-19	1-4	5-10	20+	5-10	11-19	1-4	20+
			Ba	Ba	Ma	Ma	Ba	Ma	Ma	Ba
			655.1	661.9	667.8	668.7	672.4	677.8	685.6	700.4
11-19	Ba	655.1								
1-4	Ba	661.9	6.82							
5-10	Ma	667.8	12.65	5.82						
20+	Ma	668.7	13.60	6.78	0.96					
5-10	Ba	672.4	17.28	10.45	4.63	3.67				
11-19	Ma	677.8	22.64	15.82	9.99	9.04	5.36			
1-4	Ma	685.6	30.49	23.67	17.84	16.89	13.21	7.85		
20+	Ba	700.4	45.32	38.49	32.67	31.71	28.04	22.68	14.83	

2006-07 Communication Arts 7th grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	606.333	13.113	580.597	632.070
5-10	661.189	2.322	656.631	665.747
11-19	668.848	1.923	665.074	672.622
20+	668.085	2.257	663.655	672.515

2006-07 Communication Arts 7th grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	637.438	5.835	625.986	648.891
Bachelors	664.790	3.533	657.855	671.724

2006-07 Communication Arts 7th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4	1-4	5-10	11-19	20+	20+	11-19	5-10
			Ma	Ba	Ma	Ma	Ma	Ba	Ba	Ba
			572.5	640.2	643.6	666.1	667.5	668.7	671.6	678.7
1-4	Ma	572.5								
1-4	Ba	640.2	67.67							
5-10	Ma	643.6	71.14	3.48						
11-19	Ma	666.1	93.59	25.93	22.45					
20+	Ma	667.5	95.02	27.35	23.88	1.43				
20+	Ba	668.7	96.15	28.48	25.01	2.56	1.13			
11-19	Ba	671.6	99.10	31.44	27.96	5.51	4.08	2.95		
5-10	Ba	678.7	106.24	38.57	35.09	12.64	11.22	10.09	7.13	

Tukey's HSD = 33.99386

2006-07 Communication Arts 8th grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	651.868	4.885	642.281	661.455
5-10	686.895	3.174	680.666	693.124
11-19	680.068	2.583	674.999	685.138
20+	689.327	2.134	685.138	693.516

2006-07 Communication Arts 8th grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	681.829	1.670	678.552	685.106
Bachelors	672.250	2.916	666.527	677.973

2006-07 Communication Arts 8th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4 Ba	1-4 Ma	11-19 Ba	5-10 Ba	11-19 Ma	20+ Ma	20+ Ba	5-10 Ma
			643.4	660.3	671.8	683.8	688.3	688.7	690.0	690
1-4	Ba	643.4								
1-4	Ma	660.4	16.96							
11-19	Ba	671.8	28.44	11.48						
5-10	Ba	683.8	40.40	23.44	11.96					
11-19	Ma	688.3	44.92	27.96	16.48	4.52				
20+	Ma	688.7	45.27	28.31	16.83	4.87	0.35			
20+	Ba	690.0	46.61	29.65	18.17	6.20	1.68	1.34		
5-10	Ma	690	46.61	29.65	18.17	6.21	1.69	1.34	0.01	

Tukey's HSD = 19.7156

2006-07 Communication Arts 11th grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	699.676(a)	5.074	689.715	709.637
5-10	720.769	2.864	715.147	726.391
11-19	724.584(a)	1.647	721.350	727.818
20+	671.083(a)	8.909	653.593	688.574

a Based on modified population marginal mean.

2006-07 Communication Arts 11th Grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	708.222(a)	3.525	701.301	715.144
Bachelors	706.107(a)	2.682	700.841	711.373

a Based on modified population marginal mean.

2007 Communication Arts 11th Grade Post Hoc Analysis of Interaction Between Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Upper Bound	Lower Bound
1-4	5-10	-14.3850(*)	5.33828	.036	-28.1304	-.6396
	11-19	-24.9084(*)	5.33461	.000	-38.6443	-11.1724
	20+	28.5923(*)	10.25292	.028	2.1924	54.9923
5-10	1-4	14.3850(*)	5.33828	.036	.6396	28.1304
	11-19	-10.5234(*)	2.33811	.000	-16.5437	-4.5030
	20+	42.9774(*)	9.06262	.000	19.6423	66.3124
11-19	1-4	24.9084(*)	5.33461	.000	11.1724	38.6443
	5-10	10.5234(*)	2.33811	.000	4.5030	16.5437
	20+	53.5007(*)	9.06046	.000	30.1712	76.8302
20+	1-4	-28.5923(*)	10.25292	.028	-54.9923	-2.1924
	5-10	-42.9774(*)	9.06262	.000	-66.3124	-19.6423
	11-19	-53.5007(*)	9.06046	.000	-76.8302	-30.1712

Based on observed means.

* The mean difference is significant at the .05 level.

APPENDIX D: Results from Factorial ANOVA 2005-06 Mathematics

2005-06 Mathematics 3rd Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4	5-10	5-10	1-4	11-19	20+	11-19	20+
			Ba	Ba	Ma	Ma	Ma	Ma	Ba	Ba
			621.9	634.6	635.2	638.4	640.0	647.3	.(a)	.(a)
1-4	Ba	621.9								
5-10	Ba	634.6	12.69							
5-10	Ma	635. 2	13.25	0.56	.					
1-4	Ma	638.4	16.49	3.79	3.24					
11-19	Ma	640.0	18.10	5.40	4.85	1.61				
20+	Ma	647.3	25.34	12.65	12.09	8.85	7.24			
11-19	Ba	.(a)								
20+	Ba	.(a)								

Tukey's HSD = 15.2698

2005-06 Mathematics 4th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	648.677	2.550	643.671	653.683
5-10	651.575	4.801	642.151	660.999
11-19	650.089	4.147	641.948	658.229
20+	670.154(a)	2.526	665.195	675.113

a Based on modified population marginal mean.

2005-06 Mathematics 4th Grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Ma	660.830	2.439	656.041	665.618
Ba	642.506(a)	3.303	636.022	648.990

a Based on modified population marginal mean.

2005-06 Mathematics 4th Grade Post Hoc Analysis for Interaction of Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	95% Confidence Interval Lower Bound
1-4	5-10	-5.5706	4.89589	.666	-18.1756	7.0343
	11-19	-12.4498(*)	2.93281	.000	-20.0006	-4.8991
	20+	-26.7411(*)	3.31543	.000	-35.2770	-18.2053
5-10	1-4	5.5706	4.89589	.666	-7.0343	18.1756
	11-19	-6.8792	4.83239	.485	-19.3206	5.5622
	20+	-21.1705(*)	5.07373	.000	-34.2333	-8.1077
11-19	1-4	12.4498(*)	2.93281	.000	4.8991	20.0006
	5-10	6.8792	4.83239	.485	-5.5622	19.3206
	20+	-14.2913(*)	3.22091	.000	-22.5838	-5.9988
20+	1-4	26.7411(*)	3.31543	.000	18.2053	35.2770
	5-10	21.1705(*)	5.07373	.000	8.1077	34.2333
	11-19	14.2913(*)	3.22091	.000	5.9988	22.5838

Based on observed means.

* The mean difference is significant at the .05 level.

2005-06 Mathematics 5th Grade Comparison of Means Based on Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	676.354	5.136	666.272	686.436
5-10	664.282	2.981	658.430	670.133
11-19	668.053	4.558	659.108	676.999
20+	677.327	4.203	669.076	685.577

2005-06 Mathematics 5th Grade Comparison of Means Based on Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	675.896	2.871	670.260	681.531
Bachelors	667.112	3.191	660.848	673.376

2005-06 Mathematics 5th Grade Post Hoc Analysis for Interaction Between Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	95% Confidence Interval Lower Bound
1-4	5-10	7.5043	4.13119	.266	-3.1303	18.1388
	11-19	-4.4994	3.98458	.672	-14.7565	5.7578
	20+	-4.3827	3.87266	.670	-14.3517	5.5864
5-10	1-4	-7.5043	4.13119	.266	-18.1388	3.1303
	11-19	-12.0036(*)	4.05625	.017	-22.4453	-1.5620
	20+	-11.8870(*)	3.94636	.014	-22.0457	-1.7282
11-19	1-4	4.4994	3.98458	.672	-5.7578	14.7565
	5-10	12.0036(*)	4.05625	.017	1.5620	22.4453
	20+	.1167	3.79261	1.000	-9.6463	9.8796
20+	1-4	4.3827	3.87266	.670	-5.5864	14.3517
	5-10	11.8870(*)	3.94636	.014	1.7282	22.0457
	11-19	-.1167	3.79261	1.000	-9.8796	9.6463

Based on observed means.

* The mean difference is significant at the .05 level.

2005-06 Mathematics 6th Grade Post Hoc Analysis for Interaction Between Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	Lower Bound
1-4	5-10	-4.0595	4.50502	.804	-15.6561	7.5371
	11-19	-5.3621	3.66302	.460	-14.7913	4.0670
	20+	-19.5965(*)	3.44082	.000	-28.4537	-10.7393
5-10	1-4	4.0595	4.50502	.804	-7.5371	15.6561
	11-19	-1.3026	4.19504	.990	-12.1013	9.4961
	20+	-15.5370(*)	4.00249	.001	-25.8400	-5.2340
11-19	1-4	5.3621	3.66302	.460	-4.0670	14.7913
	5-10	1.3026	4.19504	.990	-9.4961	12.1013
	20+	-14.2344(*)	3.02364	.000	-22.0177	-6.4511
20+	1-4	19.5965(*)	3.44082	.000	10.7393	28.4537
	5-10	15.5370(*)	4.00249	.001	5.2340	25.8400
	11-19	14.2344(*)	3.02364	.000	6.4511	22.0177

Based on observed means.

*The mean difference is significant at the .05 level.

2005-06 Mathematics 7th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	617.756	5.582	606.801	628.712
5-10	674.132(a)	2.427	669.368	678.896
11-19	644.330	6.129	632.302	656.359
20+	680.838(a)	1.919	677.072	684.604

a Based on modified population marginal mean.

2005-06 Mathematics 7th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4	11-19	1-4	5-10	11-19	20+	5-10	20+
			Ma	Ba	Ba	Ma	Ma	Ma	Ba	Ba
			589.2	608.4	646.3	674.1	680.2	680.8	.(a)	.(a)
1-4	Ma	589.2								
11-19	Ba	608.4	19.28							
1-4	Ba	646.3	57.18	37.9						
5-10	Ma	674.1	84.97	65.69	27.79					
11-19	Ma	680.2	91.05	71.77	33.87	6.08				
20+	Ma	680.8	91.67	72.39	34.49	6.71	0.62			
5-10	Ba	.(a)								
20+	Ba	.(a)								

Tukey's HSD = 26.23668

2006 Mathematics 8th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	704.008	1.830	700.416	707.600
5-10	678.130	3.780	670.712	685.549
11-19	705.421	5.303	695.013	715.829
20+	690.307(a)	2.369	685.657	694.957

a Based on modified population marginal mean.

2005-06 Mathematics 8th Grade Comparison of Means for Teacher Degree Levels

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	685.635	2.516	680.697	690.573
Bachelors	707.628(a)	3.115	701.513	713.743

a Based on modified population marginal mean.

2005-06 Mathematics 8th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			11-19	5-10	20+	5-10	1-4	1-4	11-19
			Ma	Ba	Ma	Ma	Ma	Ba	Ba
			657.8	663.9	690.3	692.4	702.1	705.9	753.1
11-19	Ma	657.8							
5-10	Ba	663.9	6.12						
20+	Ma	690.3	32.52	26.40					
5-10	Ma	692.4	34.57	28.44	2.04				
1-4	Ma	702.1	44.31	38.19	11.79	9.74			
1-4	Ba	705.9	48.13	42.01	15.61	13.57	3.82		
11-19	Ba	753.1	95.27	89.15	62.75	60.70	50.96	47.14	

Tukey's HSD = 21.32318

2005-06 Mathematics 10th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	712.973(a)	5.350	702.472	723.474
5-10	712.926	2.690	707.647	718.205
11-19	736.046	3.004	730.150	741.942
20+	678.108	5.016	668.263	687.953

a Based on modified population marginal mean.

2005-06 Mathematics 10th Grade Comparison of Means for Degree Levels

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Master +	727.854(a)	1.941	724.045	731.664
Bachelor	695.892	3.166	689.678	702.107

a Based on modified population marginal mean.

2005-06 Mathematics 10th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4 Ma .(a)	20+ Ba 639.0	5-10 Ma 712.0	1-4 Ba 713.0	5-10 Ba 713.9	20+ Ma 717.3	11-19 Ba 717.8	11-19 Ma 754.3
1-4	Ma	.(a)								
20+	Ba	639.0								
5-10	Ma	712.0		73.01						
1-4	Ba	713.0		74.01	1.01					
5-10	Ba	713.9		74.93	1.92	0.91				
20+	Ma	717.3		78.30	5.29	4.28	3.37			
11-19	Ba	717.8		78.80	5.79	4.78	3.87	0.50		
11-19	Ma	754.3		115.38	42.37	41.37	40.45	37.08	36.58	

Tukey's HSD = 20.96137674

APPENDIX E: Results from Factorial ANOVA 2006-07 Mathematics

2006-07 Mathematics 3rd Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	622.522	2.220	618.166	626.879
5-10	641.116	2.391	636.424	645.808
11-19	593.916	13.398	567.619	620.212
20+	619.659(a)	5.857	608.163	631.154

a Based on modified population marginal mean.

2006-07 Mathematics 3rd Grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	629.087	2.167	624.835	633.340
Bachelors	606.139(a)	8.943	588.587	623.692

a Based on modified population marginal mean.

2006-07 Mathematics 3rd Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			11-19	1-4	20+	1-4	11-19	5-10	5-10
			Ba	Ba	Ma	Ma	Ma	Ma	Ba
			554.0	619.0	619.7	626.0	633.8	636.8	645.4
11-19	Ba	554.0							
1-4	Ba	619.0	65.01						
20+	Ma	619.7	65.66	0.65					
1-4	Ma	626.0	72.03	7.02	6.38				
11-19	Ma	633.8	79.83	14.82	14.17	7.80			
5-10	Ma	636.8	82.83	17.82	17.17	10.79	2.99		
5-10	Ba	645.4	91.41	26.40	25.75	19.37	11.58	8.58	

Tukey's HSD = 44.41108

2006-07 Mathematics 4th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	641.026	2.483	636.151	645.900
5-10	639.293	3.408	632.603	645.982
11-19	648.226	2.823	642.685	653.766
20+	653.130(a)	2.566	648.094	658.167

a Based on modified population marginal mean.

2007 Mathematics 4th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4	5-10	11-19	5-10	1-4	20+	11-19	20+
			Ma	Ba	Ba	Ma	Ba	Ma	Ma	Ba
			631.2	633.1	643.1	645.5	650.9	653.1	653.4	.(a)
1-4	Ma	631.2								
5-10	Ba	633.1	1.90							
11-19	Ba	643.1	11.90	10.01						
5-10	Ma	645.5	14.36	12.46	2.45					
1-4	Ba	650.9	19.72	17.82	7.82	5.36				
20+	Ma	653.1	21.97	20.07	10.06	7.61	2.24			
11-19	Ma	653.4	22.22	20.32	10.32	7.86	2.50	0.25		
20+	Ba	.(a)								

Tukey's HSD = 16.40586609

2006-07 Mathematics 5th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	678.435(a)	2.849	672.843	684.026
5-10	659.763	3.946	652.017	667.509
11-19	660.349	5.338	649.871	670.826
20+	684.418	3.666	677.221	691.615

a Based on modified population marginal mean.

2006-07 Mathematics 5th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4	11-19	5-10	5-10	20+	11-19	1-4	20+
			Ma	Ba	Ma	Ba	Ba	Ma	Ba	Ma
			.(a)	644.6	648.6	670.9	674.2	676.1	678.4	694.7
1-4	Ma	.(a)								
11-19	Ba	644.6								
5-10	Ma	648.6		4.04						
5-10	Ba	670.9		26.31	22.27					
20+	Ba	674.2		29.60	25.56	3.29				
11-19	Ma	676.1		31.52	27.48	5.21	1.92			
1-4	Ba	678.4		33.85	29.81	7.54	4.25	2.33		
20+	Ma	694.7		50.06	46.02	23.75	20.47	18.54	16.22	

Tukey's HSD = 22.75006979

2006-07 Mathematics 6th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	688.183	3.490	681.333	695.032
5-10	681.526	3.533	674.592	688.461
11-19	690.883	2.602	685.777	695.990
20+	703.706	4.429	695.012	712.400

2006-07 Mathematics 6th Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

			1-4 Ba	5-10 Ma	11-19 Ba	5-10 Ba	20+ Ma	11-19 Ma	1-4 Ma	20+ Ba
			670.2	676.9	683.1	686.1	687.7	698.6	706.2	719.7
1-4	Ba	670.2								
5-10	Ma	677.0	6.72							
11-19	Ba	683.1	12.92	6.20						
5-10	Ba	686.1	15.9	9.17	2.98					
1-4	Ma	687.7	17.5	10.78	4.58	1.60				
11-19	Ma	698.6	28.4	21.69	15.50	12.52	10.92			
1-4	Ma	706.1	35.9	29.21	23.01	20.03	18.43	7.51		
20+	Ba	719.7	49.48	42.76	36.56	33.58	31.98	21.06	13.55	

Tukey's HSD = 21.57526273

2006-07 Mathematics 7th Grade Comparison of Means for Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	Lower Bound
1-4	5-10	-21.7797(*)	4.92806	.000	-34.4646	-9.0949
	11-19	-27.3829(*)	5.05098	.000	-40.3841	-14.3816
	20+	-22.6658(*)	5.08913	.000	-35.7653	-9.5664
5-10	1-4	21.7797(*)	4.92806	.000	9.0949	34.4646
	11-19	-5.6032	3.42910	.360	-14.4297	3.2234
	20+	-.8861	3.48505	.994	-9.8566	8.0844
11-19	1-4	27.3829(*)	5.05098	.000	14.3816	40.3841
	5-10	5.6032	3.42910	.360	-3.2234	14.4297
	20+	4.7171	3.65680	.570	-4.6955	14.1297
20+	1-4	22.6658(*)	5.08913	.000	9.5664	35.7653
	5-10	.8861	3.48505	.994	-8.0844	9.8566
	11-19	-4.7171	3.65680	.570	-14.1297	4.6955

Based on observed means.

* The mean difference is significant at the .05 level.

2006-07 Mathematics 8th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	663.718	5.943	652.054	675.382
5-10	698.477(a)	2.319	693.925	703.030
11-19	737.409(a)	8.065	721.580	753.238
20+	701.045	2.117	696.890	705.201

a Based on modified population marginal mean.

2006-07 Mathematics 8th Grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	696.384	3.577	689.364	703.404
Bachelors	689.938(a)	2.497	685.038	694.839

a Based on modified population marginal mean.

2006-07 Mathematics 8th Grade Post Hoc Analysis of Interaction Between Years of Experience

Tukey HSD

Yrs Exp (I)	Yrs Exp (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	Lower Bound
1-4	5-10	-26.4271(*)	3.95906	.000	-36.6178	-16.2364
	11-19	-65.3587(*)	8.67975	.000	-87.7005	-43.0169
	20+	-26.2069(*)	3.67368	.000	-35.6630	-16.7508
5-10	1-4	26.4271(*)	3.95906	.000	16.2364	36.6178
	11-19	-38.9316(*)	8.39184	.000	-60.5324	-17.3309
	20+	.2202	2.92930	1.000	-7.3199	7.7602
11-19	1-4	65.3587(*)	8.67975	.000	43.0169	87.7005
	5-10	38.9316(*)	8.39184	.000	17.3309	60.5324
	20+	39.1518(*)	8.26103	.000	17.8878	60.4158
20+	1-4	26.2069(*)	3.67368	.000	16.7508	35.6630
	5-10	-.2202	2.92930	1.000	-7.7602	7.3199
	11-19	-39.1518(*)	8.26103	.000	-60.4158	-17.8878

Based on observed means.

* The mean difference is significant at the .05 level.

2006-07 Mathematics 10th Grade Comparison of Means for Years of Experience

Yrs Exp	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1-4	713.737(a)	3.730	706.417	721.058
5-10	713.058	2.318	708.508	717.609
11-19	728.108	2.772	722.666	733.550
20+	702.177	4.591	693.166	711.188

a Based on modified population marginal mean.

2006-07 Mathematics 10th Grade Comparison of Means for Degree Level

Degree Level	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Masters +	737.256(a)	1.996	733.338	741.175
Bachelors	697.164	2.676	691.911	702.417

a Based on modified population marginal mean.

2006-07 Mathematics 3rd Grade Post Hoc Analysis for Interaction of Years of Experience and Degree Level

		1-4 Ma	20+ Ba	5-10 Ma	1-4 Ba	5-10 Ba	11-19 Ba	11-19 Ma	20+ Ma
		.(a)	641.4	710.4	713.7	715.7	717.8	738.4	763.0
1-4	Ma	.(a)							
20+	Ba	641.4							
5-10	Ma	710.4	69.03						
1-4	Ba	713.7	72.34	3.31					
5-10	Ba	715.7	74.29	5.27	1.95				
11-19	Ba	717.8	76.43	7.40	4.09	2.13			
11-19	Ma	738.4	96.99	27.96	24.65	22.70	20.56		
20+	Ma	763.0	121.55	52.53	49.22	47.26	45.13	24.56	

Tukey's HSD = 18.71379