THE RELATIONSHIP BETWEEN FOURTH-GRADE LITERACY LEVELS AND EIGHTH-GRADE STUDENT ACHIEVEMENT

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Submitted to the Faculty
of the School of Education of Baker University
in partial fulfillment of the requirements for the degree

Doctor of Education

In

Educational Leadership

May 2010

Clinical Research Study Committee

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ABSTRACT

The purpose of this study was to investigate the predictive usefulness of the Gates-MacGinitie Reading Test (GMRT) measure of fourth-grade literacy on the Missouri Assessment Program (MAP) test of student achievement for eighth graders. This research was a quantitative, correlational study. It was non-experimental in design and utilized purposive sampling. The independent variable for this study was fourth-grade literacy level as measured by the GMRT. The GMRT scores were examined using a grade equivalent score as a benchmark. Those subjects that scored below the benchmark were labeled as the At-Risk Literacy group. Those that scored at or above the benchmark were placed in the Proficient Literacy group. Correlation coefficients were calculated to determine the strength of the relationship between fourth-grade literacy level and eighth-grade student achievement in communication arts, mathematics, and science for the At-Risk group, the Proficient group and a combined total sample. A linear regression and scatter plot was used to visually demonstrate if GMRT scores can predict success on the MAP test. The research results demonstrated a strong positive correlation between fourth grade GMRT scores and the eighth grade MAP assessments in communication arts. The correlation between GMRT scores and MAP mathematics scores was also positive but resulted in a moderate relationship. Likewise, there was a moderate positive relationship between GMRT scores and MAP science scores.

ACKNOWLEDGMENTS

This study would not have come to fruition without the guidance and support of the Baker University School of Education faculty. I am grateful for the countless hours of revisions and unlimited amount of patience as you guided me through this research process. A special thanks goes to my committee, major advisor Dr. Bill Neuenswander, Dr. John Laurie, and research analyst Peg Waterman, for your assistance and attention to detail. I also want to thank Dr. William Scully for your continued guidance over the past 15 years. Thanks for always being there when I need you.

Much gratitude goes to the Lexington School District in allowing me to use their resources and data to complete this project. Special recognition is needed for Ms. Michelle Roush, Assistant Superintendent, and Anneliese Gould, Literacy Coach, for their knowledge and technical resources.

I would be remiss in these acknowledgements if I didn't mention my family and dear friends. It is because of your belief in me and unwavering support that this study has been completed. Special thanks goes to Samantha Grimes for sending me to the basement every weekend to write and to Karen Brown for your help in editing. I know this would have not been possible without your love and support.

Finally, I am forever indebted to my parents, William and Judith Grimes for teaching me persistence and to never quit once I start something. You both deserve much of the credit for the completion of this long tedious project. Thank you all for not allowing me to quit!

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Introduction and Rationale

Public schools in America are moving into an accountability era that requires them to be led by the best the profession has to offer. In addition to the many tasks they must already perform as school administrators, educational leaders feel pressure to demonstrate an increase in student achievement. One significant element in leading schools to perform is data-driven decision-making. In order to make good decisions, it is important to review the data to determine if programs need to be revised (Wagner et al., 2006). Cherie Mothershead, a researcher from the University of Southern Mississippi, discussed the importance of data collection in her dissertation *Factors that are associated with students' standardized reading achievement scores.* She said policy-makers require information to indicate whether current programs are educating all students effectively and providing proper scope and sequence. In addition, standardized testing allows educators to gather the necessary information about students in comparison to state standards and national norms to make educated decisions for students, individual schools and school districts (2008).

The Change Leadership Group at the Harvard University Graduate School of Education determined that graduation rates and college-readiness rates were lower in the 1970s than in 2006. However, the 2006 college-readiness rates may be considered a crisis because "the skills required in most workplaces today directly correspond to those that are needed for success in college" (Wagner et al., 2006, p. 3). Jack Robinson also realized the need for an increase in skills and specifically addressed the literacy issue in a

2008 dissertation "Adolescents in the 21st century will need to be able to read and understand what they read more than any other time in history" (p.1).

The United States Department of Education has fashioned many versions of school reform and they once again responded to the new "crisis" by addressing educational deficits with the No Child Left Behind (NCLB) Act of 2001, also known as Public Law 107-110. NCLB raised school accountability and mandated that schools demonstrate student achievement as evidenced by standardized test scores. According to the principles of NCLB, standardized testing is a required step in improving academic performance. Standardized testing provides the information to determine if schools and school districts meet the NCLB requirement of Adequate Yearly Progress (AYP).

According to the Missouri Department of Elementary and Secondary Education (DESE) released resource, "Understanding AYP," the AYP requirement is met only when all three of the targets are met (2009). States are required to establish AYP targets in three ways. The first is the Annual Proficiency Target. This refers to a target test score set for all students and subgroups to meet each year. By the year 2014, all students will be considered to be at the proficient level if their annual scores meet these yearly proficiency targets. Another target of student achievement is the Attendance/Graduation Rate, which measures not only average daily attendance but also the completion of secondary education with the awarding of a high school diploma. The last target is the Participation Rate (Mo. DESE, 2009c). The law requires all tested subgroups to meet a 95% participation rate on the state tests every year (Mo. DESE, 2009c). Mo. DESE utilizes Missouri Assessment Program (MAP) data, attendance rates, graduation rates,

and a formula from the NCLB Act to provide schools with specific targets to address AYP.

Literacy has always been an important aspect of the learning process, but because the federal mandate in NCLB is to have every student on grade level in reading by the year 2014, there has been an increased effort to target and monitor those students who are falling behind. Mothershead supported the emphasis in reading as she wrote, "research consistently shows that students who cannot read well are more likely to become drop-outs and face challenges with lower-paying jobs" (2008, p. 21). In her article for The National Institute for Literacy, Denise Hawkins also supported the need to focus on literacy, "To meet the demands of life in the 21st century, today's adolescents must develop and use sophisticated literacy skills. But approximately two-thirds of eighth- and twelfth-grade students read at less than the 'proficient' level, as described by the 2005 National Assessment for Educational Progress. They may struggle to understand their textbooks and find themselves poorly prepared for post-secondary education and work" (2009, p. 1).

The United States ranks 17th in the world in adult literacy rate according to a 2007 report on adult literacy rates from the United Nations Educational Scientific and Cultural Organization (UNESCO). Therefore, U.S. schools must continue to focus on increasing literacy levels to meet the demands of today's world. Literacy is the foundation needed to operate successfully because the way we communicate has changed drastically. What used to be done verbally is now done electronically, thus increasing the need for individuals to read and write effectively (Mothershead, 2008). This situation requires

American schools to take a serious look at how we address literacy as it pertains to student success.

Problem Statement

Because the educational system uses reading as its primary delivery system, children who read poorly will struggle throughout their schooling (Reddick, 2003). These poor readers will then be left behind as adults in an economic system where communication is required. There is a plethora of literature on literacy and its importance in this global society. Colasent (2002), Greene & Winters (2005), Kolbach & Forester (2006), Erickson (2008), and Lamons (2009) all write about literacy and its relevance to society.

A strong emphasis on literacy is apparent at the elementary level as schools have coaches to support literacy and increased literacy assessment in the self-contained classrooms. Middle schools do not always have a literacy coach (Mo. DESE, 2007). Middle schools begin to move students from the self-contained elementary style classroom to a more mobile type of environment (Guthrie& Davis, 2003). Students no longer have one teacher for all core classes after the fifth-grade but travel to different teachers and therefore lose that strong relationship bond that exists at the elementary level. The transition from self-contained elementary classrooms to departmentalized middle-school classrooms can create an additional obstacle for some students as they do not have the opportunity to create the same trusting relationship with one adult (Teale, 2008). Tony Wagner et al. discussed the importance of relationships for effective instruction " . . . students who struggle academically, and students who take advanced

courses all say the one thing that makes the greatest difference in their learning is the

quality of their relationships with their teachers" (2006, p.42).

Background and Conceptual Framework

Lexington R-V School District was chosen for this study. Lexington is a historic

town located about 40 miles northeast of Kansas City, Missouri. It overlooks the

Missouri River, as shown in Figure 1. The population was estimated at 4,551 people in

July 2008, with the median age of 38.3 years. There are only 6.3% of Lexington

residents over the age of 25 with graduate or professional degrees. There are 17% with

bachelor's degrees and 76.9 % of Lexington residents 25 years of age or older have at

least high school diplomas. The December 2009 cost of living index is lower in

Lexington (75.0) than the U.S. average (100.0) (City-data.com, 2010).

Figure 1. The location of Lexington, Mo. in relationship to major cities in the state.
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The Lexington R-V School District is housed in seven separate buildings: the Board of Education Building; the Early Childhood Center (ECC), which is housed in the 4 Life Center; Leslie Bell Elementary (LBS), which serves kindergarten through fourth grade; Lexington Middle School (LMS), which serves fifth through eighth grade; Lexington High School (LHS), which serves ninth through 12th grade; the Student Success Center (SSC), an alternative high school; and Lex-La-Ray Career and Technical Center. Both the SSC and Lex-La-Ray serve students from a consortium of schools in the surrounding area. The SSC serves students from six other school districts and the Lex-La-Ray Career and Technical Center serves students from eight other school districts (Lexington Website, 2009).

The Lexington R-V School District retains a full time literacy coach who provides an additional resource for struggling readers. The coach models lessons for teachers, provides professional development opportunities, works with individual students, and administers and analyzes these three literacy assessments: Dynamic Indicators of Basic Early Literary Skills (DIBELS), Gates-MacGinitie Reading Test (GMRT), and the Developmental Reading Assessment (DRA). These assessments provide educators with instructional guidance (Lexington Website, 2009).

The literacy coach is at the middle school one day of the week, which results in the need for middle school teachers to do more testing and progress monitoring than do teachers at the elementary school. Several of the literacy assessments given at the elementary level also are given in middle school. The middle school continues to utilize the DIBELS for seasonal benchmarks three times a year through the sixth grade. All middle-school grade levels are administered the GMRT at the end of each year. The

DRA is used mostly in the Special Services Department in Lexington in order to identify specific areas of weakness with the deficient readers (A.Gould, personal communication, October 2009).

Lexington Middle School provides a transition step for incoming fifth graders. Instead of requiring a full day of movement from class to class, the students stay with the same teacher, except for three hours of the day which include their exploratory class and two core classes ending with a third core class taught by their homeroom teacher. The sixth- through eighth-grade classes are departmentalized, so students switch classes and teachers every hour.

The enrollment of Lexington R-V School District has decreased in the past five years. Table 1 shows the enrollment for the district in comparison to the rest of the state. Table 2 shows only the Lexington Middle School enrollment data. Lexington Middle School (LMS) had 261 students for the 2008-09 school year with 32 certified teachers and five classified staff. The 44 percent of the student population at the middle school falls in the lower socioeconomic status level (this figure is based on the state's free and reduced meal qualification). The breakdown includes 87 percent Caucasian, 7.6 percent African-American, 4 percent Hispanic, with the remaining 1.4 percent Asian ethnicities. Table 2 shows the enrollment for the past five years, which illustrates the decreased enrollment from 352 in 2005 to 271 in 2009.

Table 1

Lexington R-V and state of Missouri total enrollment data disaggregated by ethnicity (%)

for the years 2004 2008.

			Year		
Ethnicity	2005	2006	2007	2008	2009
Lexington R-V					
Asian	0.40	0.70	1.10	0.90	1.4
Black	6.90	8.40	7.40	6.60	7.6
Hispanic	4.50	5.10	4.70	3.50	4.0
Indian	0.10	0.10	0.20	0.20	0.0
White	88.1	85.7	86.6	88.7	87.0
Total Enrollment	1,021	1,009	964	951	944
Missouri					
Asian	1.5	1.6	1.7	1.8	1.9
Black	17.9	18.1	18.1	18.0	17.8
Hispanic	2.8	3.1	3.4	3.6	3.8
Indian	0.4	0.4	0.4	0.4	0.4
White	77.4	76.8	77.2	77.4	76.1
Total Enrollment	894,809	899,941	899,525	894,609	892,279

Note. From the Department of Elementary and Secondary Education, 2009b.

Table 2

Lexington Middle School Enrollment

Ethnicity	2005	2006	2007	2008	2009
Asian	0.3%	0.6%	1.1%	0.8%	1.1%
Black	7.8%	7.3%	6.5%	6.1%	5.2%
Hispanic	5.4%	5.4%	4.3%	2.3%	4.1%
Indian	0.3%	0.3%	0.4%	0.4%	0.0%
White	86.1%	86.3%	87.7%	90.4%	89.7%
Total	332	314	277	261	271

Note. From Department of Elementary and Secondary Education, 2009b.

Students throughout the country are tested on their literacy levels by the third grade through the eighth-grade. Beginning in the first grade in the Lexington School District, the GMRT is used to assess a student's literacy level. The same test is given each year until students enter high school. GMRT is a norm-referenced literacy assessment for kindergarten through adults. There are two parts to the GMRT test, vocabulary and comprehension, which compute to an overall total score. GMRT scores are reported as national equivalent scores, percentile rank, stanine scores, grade equivalency, and scaled scores (Riverside Publishing, 2009).

Lexington R-V School District has been utilizing the GMRT in the elementary grades since 1998. The middle school added GMRT to its testing calendar in 2002 to meet the requirements of NCLB. The Mo. DESE lists the GMRT as one of the identified

and approved instruments to analyze and track literacy progress (Mo. DESE, n.d.). The most recent edition of the GMRT was published in 2000. According to a test review from the *Journal of Reading*, "The Gates-MacGinitie grows out of a long tradition of reading assessments" (Jongsma, 1980, p.341). Gates first published a test in 1926. It was one of the first nationally used standardized literacy assessments (Jongsma, 1980).

Student achievement can be measured in a variety of ways. As the previously used Missouri Mastery and Achievement Tests (MMAT) began to be phased out, in accordance with the educational reform mandated by the Outstanding Schools Act of 1993, Mo. DESE set out to identify the knowledge, skills, and competencies which students should acquire by graduation. The MAP became the official the state test in 1998 and is Missouri's response to the mandated educational reform. Because Missouri's nickname is the ``Show Me State,'' these new standards have become known as the Show Me Standards (Mo. DESE, n.d.). MAP evaluates the student proficiency of the Show-Me Standards.

In accordance with the state assessment alignment analysis, the MAP is also able to measure students' depth of knowledge level in core subjects (Mo.Dese, 2006). Students are tested every year in communication arts and math. Science standards are tested during the fifth and eighth grade years only. The test was designed by CTB/McGraw-Hill. CTB is a division of the McGraw-Hill Companies and was founded in 1926 in order "to help the teacher help the child" (CTB McGraw-Hill: Our History, 2009, para. 1).

Scores on the MAP are reported in four qualitative categories which describe student performance: Advanced, Proficient, Basic, and Below Basic. To meet the NCLB

standards, all students must reach the Proficient or Advanced level by 2014. Students who fall into the bottom two categories, Basic and Below Basic, are targeted for intervention (Mo. DESE, 2009c).

Significance

Literacy problems can have an extremely adverse effect on a person's quality of life, opportunities in education and employment, and access to enjoyable activities (Daly, Chafouleas, & Skinner, 2005). Because literacy is such an important part of education, educators need to ensure every attempt is made to identify students who have limited literacy skills. This study was conducted to determine the predictive usefulness of the GMRT on eighth-grade student achievement in communication arts, mathematics, and science. This study will potentially help educators determine if more emphasis should be placed on literacy before the middle-school level in order to provide students the skills needed to demonstrate sufficient achievement levels. Understanding the impact fourth-grade literacy level has on middle-school student achievement will help educators narrow their focus to better assist students in becoming successful. This study will assist the Lexington School District complete an evaluation on the GMRT in order to determine if there is a need to continue with this particular assessment tool. This study will also add to the wealth of knowledge on literacy by potentially providing additional documentation of the bearing literacy levels potentially have on student achievement in specific areas of communication arts, mathematics, and science. This research could possibly provide information to educators as they make decisions on curricular needs and budgetary necessities. Students who score poorly on the fourth-grade GMRT may need additional intervention strategies in order to help them succeed by their eighth-grade year.

Data-driven decision making will be beneficial to schools as they review

programs and revise curriculum. The results of this study will assist the Lexington

District in review of the GMRT and its usefulness by answering the following questions:

Does the GMRT predict student achievement? Does the GMRT predict achievement for

both proficient and at-risk groups? If this test does not provide predictive results, should

we continue to test all students at every grade level through the eighth grade?

Purpose Statement

The purpose of this study was to identify the relationship between literacy, as

measured by fourth grade Gates-MacGinitie Reading Test (GMRT), and student

achievement in communication arts, mathematics, and science, as measured by the

Missouri Assessment Program (MAP) tests in the eighth grade. This research completed

the final step in the program evaluation of this particular literacy measurement tool used

in the Lexington School District.

Delimitations

This study was delimited to one rural Missouri middle school using data from

students in grades four in the Lexington School District and were given a GMRT literacy

assessment in 2004 and 2005. The same class of students was then given eighth-grade

MAP test four years later in 2008 and 2009. Only students who were continuously

enrolled in the Lexington School District in grades four through eight during those years

were included in this study. The study was also delimited in comparing Lexington

students to other geographic locations because of the homogenous subjects found in this

district and the lack of history taken for each individual study. This study only focused

on two classes, the 2008 and 2009 Lexington Middle School eighth grade classes which limited the data collection and ability to make generalizations.

Assumptions

The study was conducted under the assumption that all students in this study received the same instructional practices, coursework, and time spent on each subject. The researcher assumed that the GMRT and MAP tests were given in accordance with their standardized instructions to include students with Individualized Education Plans (IEP) and required accommodations. The researcher assumed all subjects took the test to the best of their ability and that the results therefore presented a valid representation of achievement levels.

Research Questions

Three research questions were formulated from this study. Each question examined literacy in terms of specific core subjects.

1. Is there a relationship between fourth-grade literacy scores and student achievement on the eighth-grade MAP communication arts test?

2. Is there a relationship between fourth-grade literacy scores and student achievement on the eighth-grade MAP mathematics test?

3. Is there a relationship between fourth-grade literacy scores and student achievement on the eighth-grade MAP science test?

Definitions of Terms

Achievement levels: "Descriptions of an individual's competency in a particular area of knowledge or skill, usually defined as ordered categories on a continuum, often

labeled from `basic' to `advanced,' that constitute broad ranges for classifying

performance'' (American Educational Research Association, 1999).

Developmental Reading Assessment (DRA): a series of leveled books and recording

sheets designed to allow teachers to determine students' reading accuracy,

fluency, and comprehension levels (Mo. DESE (n.d)).

Dynamic Indicators of Basic Early Literary Skills (DIBELS): a formative early literacy

assessment created for instructional guidance for kindergarten through sixth grade

(Mo. DESE (n.d)).

Gates-MacGinitie Reading Test (GMRT): a standardized literacy assessment given in

large groups for kindergarten through adult; measures comprehension and reading

level (Mo. DESE (n.d)).

Individualized Education Plan (IEP): ``a written statement for each child with a

disability that is developed, reviewed, and revised in a meeting and must include'':

a statement of the child's present levels of academic achievement and functional

performance; a statement of measurable annual goals; a statement of the special

education and related services and supplementary aids and services; a statement

of the child's participation in physical education; a statement of any individual

appropriate accommodations; and a statement of the projected date for the

beginning of the services and modifications (Mo. DESE, 2007, p.40).

Literacy: as measured by the Gates-MacGinitie Reading Test given in the month of April;

Proficient at the fourth-grade level = 494 scaled score (Gates-MacGinitie, 2009).

Missouri Assessment Program (MAP): Missouri-mandated standardized tests given in

the areas of Communication Arts and Math every year from third through

eighth-grade and science at fifth and eighth grade. Results are given in four

levels: Below Basic, Basic, Proficient, and Advanced (Mo. DESE, 2009a).

MAP-A: Alternative state assessment determined by the students' IEP team using

DESE-established criteria at a 1% participation rule; student must meet all five of

the following to become eligible (Mo. DESE, 2009a):

1) Student has demonstrated significant cognitive disability and adaptive

behavioral skills. Therefore, the student has difficulty acquiring new skills,

and skills must be taught in very small steps.

2) The student does not keep pace with peers, even with the majority of students

in special education, with respect to the total number of skills acquired.

3) The student's educational program centers on the application of essential

skills to the Missouri Show-Me Standards.

4) The IEP team, as documented in the IEP, does not recommend participation in

the MAP subject area assessments or taking the MAP with accommodations.

5) The student's inability to participate in the MAP subject-area assessments is

not primarily the result of excessive absences; visual or auditory disabilities;

or social, cultural, language, or economic differences.

MAP Advanced Level: top level of achievement as determined by a panel from

educational, business, and professional communities (Mo. DESE, 2009a);

Eighth-Grade Communication Arts: scaled score of 723-875

Eighth-Grade Math: scaled score of 741-885

Eighth-Grade Science: scaled score of 735-895

MAP Basic Level: one level below the minimum achievement level as determined by a

    panel from educational, business, and professional communities (Mo. DESE,

    2009a);

    Eighth-Grade Communication Arts: scaled score of 670-709

    Eighth-Grade Math: scaled score of 639-695

    Eighth-Grade Science: scaled score of 671-702

MAP Below Basic Level: lowest level of achievement as determined by a panel from

    educational, business, and professional communities (Mo. DESE, 2009a);

    Eighth-Grade Communication Arts: scaled score of 530-638

    Eighth-Grade Math: scaled score of 525-669

    Eighth-Grade Science: scaled score of 540-670

MAP Proficient Level: required proficiency standards for Missouri public school as

    determined by a panel from educational, business, and professional communities

    (Mo. DESE, 2009a);

    Eighth-Grade Communication Arts: scaled score of 696-722

    Eighth-Grade Math: scaled score of 710-740

    Eighth-Grade Science: scaled score of 703-734

Student Achievement: scoring at the proficient level or above on the Missouri

    Assessment Program test

Success: Demonstrating literacy skills at or above grade level, and/or scoring at the

    Proficient Level or higher on the Missouri Assessment Program test.

WebSis: web-based student information system used in this study to determine

    enrollment

Overview of Methodology

This quantitative, correlational research examined if there is a relationship between literacy skills at the fourth-grade level and student achievement in the areas of communication arts, mathematics, and science at the eighth-grade level. This study was non-experimental in design and utilized purposive sampling as the subjects were selected based upon enrollment and attendance at school during the stated testing window. The population for this study was comprised of fourth-grade students from Leslie Bell Elementary in the spring of 2004 and 2005 that remained in Lexington Middle School through the eighth grade in 2008 and 2009 respectively. Only those students who had a fourth-quarter GMRT score their fourth-grade year, remained in the Lexington R-V School District throughout all four of their middle-school years, completed all three MAP subtests (communication arts, mathematics, and science) and were not retained were sampled.

The independent variable for this study was fourth-grade literacy skills as measured by the GMRT score. This was correlated with each of the dependent variables of student achievement as measured by the MAP scores. Literacy scores were gathered from the literacy coach's historical database. The student's individual MAP scores on the subtests of communication arts, mathematics, and science were gathered from the Missouri Department of Elementary and Secondary Education's assessment database. To ensure anonymity, no names were used and each student was given a code reference. Because this study completed a program evaluation, the district did not require parental approval.

The subjects were grouped into two categories, those who were proficient on the GMRT and those scoring below grade level. Correlation coefficients were calculated on each, Proficient Literacy group, At-Risk Literacy group, and a combined group to determine the strength of the relationship between GMRT scores and student achievement using the three MAP-scaled scores, communication arts, mathematics, and science. Three linear regression lines and scatter plots were used to visually demonstrate if GMRT scores can predict success on the MAP test.

Organization of the Study

The remaining chapters of this study are organized in the following manner. Chapter 2 presented a review of literature dealing with literacy as it relates to student achievement. Chapter 3 explained the research design and methodology for this study. It included the population and sample, a description of the instrumentation, the procedures used for data collection, an explanation of the data analysis process, and finally the limitations found in this study. Chapter 4 presented the findings of the research with a discussion of the findings. The final chapter, Chapter 5, contained the conclusion and recommendations.

Chapter Two

Review of Literature

Future United States workers face great challenges in an economy dominated by high skill, knowledge based intensive jobs. Essential to meeting challenges of economic success and social unity is the literacy level and problem-solving capacity of all of its citizens. The general belief that many Americans currently lack these indispensable skills is fueling concerns that, as a nation, we face a literacy crisis (Smith, Cianci & Levin, 1996, p.602). Rita Colasent, Kent State Graduate Student, goes on to say, "The literacy demands faced by Betsy Ross were different from those faced by school children today. What has changed is the quantity of printed materials encountered every day. Today's literacy expectations exceed those from 150 years ago. . . With the increase in quantity of printed material has come a demand to read faster, which has been reinforced by technological changes" (2002, p.29).

Organization of the Chapter

This chapter began with an examination of the definition of literacy and its importance to education. Literacy rates are the result of major changes in individuals, societies, or states (Colasent, 2002). The understanding of how the definition of literacy has evolved is significant to educational practice and its focus due to changes in policy. The literature reviewed for this chapter then investigated the status in the United States in literacy development and explained how the United States compares to other countries in literacy. This chapter discussed numerous literacy assessments on the market and provides advantages and disadvantages of the currently being used in schools.

The last part of this chapter reviewed literature on student achievement. Researchers have examined many factors that relate to student achievement such as attendance, social economic factors, and motivation. This section described how student achievement is defined and how it is measured. The chapter concludes with a look at the relationship of literacy and student achievement and its importance. The literature describes how literacy levels can effect student achievement.

Literacy

Rita Colasent wrote about the importance of defining literacy: "Debates over the definitions are not just academic issues but part of empowerment: the power to name and define literacy is crucial to real educational practices, to policy making, and to the design of educational programs" (2002, p. 30). Defining and understanding literacy is a task many professions have undertaken. In a position paper for a literacy symposium, Dr. Richard Venezky defined the study of literacy as a "navigation among aspirational, psychological, educational, and political intentions" (1989, p.4). Colasent further explained the importance of defining and fully comprehending the term literacy: "One's understanding of what literacy or illiteracy is shapes politics" (2002, p. 18). The understanding could be as simple as a voting requirement to sign one's name or as complex as education-reform campaign platforms. "Choices about who reads, what they read, and how they use what they read always have been connected to the distribution of power in society" (Colasent, 2002, p.37). Lev Vygotky, a Soviet psychologist, made a similar statement in 1979 when he said that to understand literacy, one must first understand the social conditions (as cited by Colasent, 2002, p.40). Venezky mentioned

how the definition of literacy is established in accordance with the needs of pedagogy and national policy (1989, p. 4).

The definition of literacy drives instructional practices and even political policy. Until the 18th century, the Western world believed religion should be the primary purpose of reading (Colasent, 2002). Being able to read the Bible aloud in church or in community settings became the goal. Cobb wrote in 1840 that literacy would build character and make students morally good (as cited by Colasent, 2002). Most adults were not able to read and so literacy was a highly valued part of the curriculum. After the American Revolutionary War, literacy instruction focused more on the use of the American version of English.

Maurice Champagne from the University of Maryland took it one step further in 2008 as he compared literacy to power. "Power is rooted in tradition and connected to literacy and language" (p.15). He went on to explain that definitions of literacy are connected to social groups. If one changes the definition, then it will restrict the freedom of some groups within the society and give a "measure of supremacy to the literate" (p. 3). Champagne's comments suggest that it is important to examine the definition of literacy from a historical perspective and to consider how the definition has changed as society has changed.

Matthew Gandal, executive vice president of Achieve, a policy research group, voiced his opinion on how important literacy is. "If you don't have advanced literacy skills today, you don't have much of a chance at the good life" (as cited by McGrath, 2005, p.69). Gary Hart, director at California State University's Institute for Educational Reform, was passionate about the impact of literacy education on society. In his

conclusion in the *Journal of Literacy Research* in 1997, he wrote the Clinton Administration "has underscored that the strength of our nation – our economy, our work force, our democracy, and our society – depends on the capacity of all of our people. Literacy is integral to that capacity" (p.607).

Literacy changed in the United States during the 18th and 19th centuries. The general wealth and population density increased along with advances in technology and printed materials (Colasent, 2002). The need for basic literacy skills then increased with new requirements for job acquisition, which sparked the idea of literacy for all.

The twentieth and twenty-first centuries have increased the need for literacy skill with the world-wide web and increased information flow. In order to prepare students to participate in this global society schools must understand society's definition of literacy (Colasent, 2002).

Defining Literacy

Scholars in the Middle Ages defined a *literatus* as a person who could read Latin. Writing was excluded from this early definition because of the difficulty in using parchment and quills (Venezky, 1989). After the Reformation, a literate person was one who could read and write in his/her native language. Since then, Asheim (1987) described literacy in terms of the material a person could read, such as Faulkner and Wittgenstein (as cited by Colasent, 2002, p.28). Others have described literacy in terms of levels. Wormald (1977) used the phrase, "pragmatic literacy" and "cultural literacy" to refer to lower and higher levels of literacy (as cited by Colasent, 2002, p. 28). Lower level literacy referred to a level of reading and writing skill necessary for self-sustained growth with a minimal level of functioning ability. The higher level of literacy referred

to the ability for full participation as an equal member of society which included more cultural awareness and understanding (Colasent, 2002).

More recent research defines literacy as more than just reading and writing. Linda Kalbach and Lyn Forester (2006) discussed literacy from different perspectives. One perspective, the functional view, includes the ability to read and write well enough to function in society. Another perspective, critical literacy, is `` . . . the ability of an individual to construct a sense of self grounded in one's experiences and historically connected within the context of one's environment. This would include an understanding of power relations, what group holds the cultural capital of the social order, and who defines the dominant morals and values of that society'' (pp.72-73). This critical literacy view is relevant as new policy and mandates are being written by federal and state education offices such as the No Child Left Behind Act (NCLB).

The 2006 Program for International Student Assessment (PISA) report defined literacy in broader terms. "Literacy is no longer considered ability only acquired in childhood during the early years of schooling. Instead, it is viewed as an expanding set of knowledge, skills and strategies which individuals build on throughout life in various situations and through interaction with their peers and with the larger communities in which they participate" (p.46).

In their study of Australian primary schools, Marion Meiers and Siek Toon Khoo defined literacy for all. They wrote that literacy "requires the ability to read and use written information to write appropriately in a range of contexts for many different purposes and to communicate with a variety of audiences" (2006, p.254). A recent study of basic writing by Maurice Champagne (2008) used this definition: Literacy refers to the knowledge and skills that students need to perform effectively within a particular

environment. Literacy is an amorphous term that changes with various contexts. A construct that influences representations of students, literacy serves to differentiate those who fit in an academic environment from those who do not. To be literate is to be "in the know" (p. 17).

Champagne further explained how literacy describes the necessary skills and abilities to be successful in particular activities surrounding a particular context. For example, if a person has the skill to use several software programs, he/she would be considered computer literate (2008, pp.16-17).

The definition of literacy is not a constant. Colasent (2002) understood this fact as she reflected on the definitions of literacy. Definitions of literacy are copious, diverse, without order or rules. They cannot be generalized, lumped, or widely accepted into one solid, rational, or sensible definition. Many definitions of literacy appear in the educational research or can be assumed from the school districts' prescribed formats. As the curriculum changes so may the literacy definitions (p. 24). Colasent did not think just one definition was an advantage. Colasent wrote that teachers would develop more effective instructional strategies and become exemplary teachers if they examined and used multiple definitions that would fit the unique needs of a variety of students. She described how exemplary teachers use a variety of definitions and strategies to apply to the variety of learners in their classrooms (2002). Duffy and Hoffman made similar remarks in their 1999 article for *The Reading Teacher*: "…effective teachers are thoughtfully eclectic, modifying programs to meet the needs of their students. No two situations are exactly the same; no two days are the same" (p.11).

This study will use the definition of literacy promoted by the Organization for Economic Cooperation and Development (OECD) which is considered in generalized terms. OECD defines literacy as "the ability to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate effectively in society" (as cited by Rasmussen, 2003, p. 427).

U.S. Literacy Status

The success gap between those who are literate and those who are illiterate is widening as society becomes more dependent upon electronic communication. Those adults who cannot read or write are finding they can no longer compete for the same type of jobs (Smith, Cianci & Levin, 1996). The time for focused literacy instruction in schools is upon us. It is imperative that educational leaders monitor literacy progress or the lack thereof and make decisions for improving instruction to improve the literacy level to reach proficiency.

The International Association for the Evaluation of Educational Achievement (IEA), including the United States and thirty-four other countries, assessed the literacy of nine-year olds (mostly fourth grade students). The IEA used a literacy comprehension assessment known as Progress in International Reading Literacy Study (PIRLS). Findings from the PIRLS of 2001 showed the United States dropping to ninth from its fourth-place rank in 1991. The PIRLS assessed three aspects of literacy with fourth-grade students, the purpose of reading, the processes of comprehension, and reading behavior and attitudes. Although this drop is not statistically significant for the U.S., it does imply that other countries are making greater gains as we stand relatively still (Ogle et al., 2003). The most recent results show the U.S. losing ground as the 2006 results indicate a 2 point

drop from 2001 with the U.S. currently sitting in tenth place (Mullis, Martin, Kennedy, & Foy, 2006).

The fourth grade year is a focal point for the IEA because it represents a time in schooling, world-wide, when students have been taught how to read and are now using reading to learn. Students in the U.S. system of education often leave the elementary setting following the fourth-grade and enter secondary school. There are many changes for students as they enter into the secondary system. The transition to middle school could indicate a true chokepoint for students in their educational progression. In a 2008 article for *The Reading Teacher*, William Teale referred to the timeline of events in literary education. "The problem is, we wake up around middle school to discover that our students can't develop interpretations, read critically, write a decent extended response to a piece of literature, and so on" (p. 360).

To increase the odds against deficient readers in middle school, Guthrie & Davis found that middle-level textbooks were more complex than elementary textbooks and students reported less teacher support in literacy at the middle school (2003). After a few years at the middle level with increased difficulty in texts and fewer interventions the literacy gap will increase. According to the National Assessment of Educational Progress (NAEP), only 31 percent of 2007's eighth graders scored proficient on the literacy assessment (Lee, Grigg, & Donahue, 2007).

The need for an increase in literacy instruction is evident. Research by Showers, Joyce, Scanion, & Schnaubelt (1998) and also by Cziko, Greenleaf, & Hurwitz (1999) agree that the sooner students receive assistance in literacy deficiencies, the better their chances to recover and be successful in secondary school. Literacy is an important

indicator for success and has become increasingly apparent as technology advances at a tremendous pace. A literacy interventionist, Elizabeth Erickson, believes society is becoming more demanding and schools need to modify their instructional practices and teach how to obtain and use information (2008).

Literacy Measurement Tools

Educators are faced with decisions of how to teach and what to teach. The answers must come from evidence-based information. Kalbach and Forester agreed: "The era of accountability heavily influences not only what we teach but how we teach" (2006, p.70). To obtain this information, educators must use reliable measurement tools to provide decision-makers with the data they need. E.D.Hirsch, Jr. wrote an article for *Educational Horizons* in 2007 about how productive testing can be. He wrote, "Test scores in early grades predict scores in later years. Scores predict school grades. Scores predict job performance and income" (p.105).

The U.S. Department of Education believes additional testing will help educators guide their instructional practices and increase achievement, as evidenced by the mandates set forth in the NCLB. One such mandate requires states to test students each year in the area of communication arts and mathematics in grades three through eight. The Missouri Department of Elementary and Secondary Education (Mo. DESE) has provided educators with an assessment list of state approved resources to choose from which provide a choice of formal and informal instruments used to satisfy the Section 167.346, RSMo (House Bill 889) (Mo. DESE, n.d.). Mo. DESE's assessment department suggests, "Multiple measures, not just a single instrument, should be used over time to obtain complete and accurate information about a student's reading ability" (Alexander,

2007, para.1). The first step in this deliberate process is to assess all students to determine their literacy level.

The No Child Left Behind Act has identified the relationship between accountability and student achievement specifically in the area of literacy achievement. According to NCLB, this relationship calls for additional evaluations in reading with a mandated annual assessment (Benway, Jordan, & Rosell, 2008).

However, many educators and researchers do not agree with increased testing. Benway, Jordan, and Rosell wrote that assessment has become one of the "big variables" in school improvement initiatives (2008, p. 5). Even the International Reading Association (IRA) disagrees with high-stakes tests. As Mothershead explained in her 2008 paper on literacy achievement, "The IRA's stance is that testing has become a mechanism for controlling instruction rather than gathering information about the individual child" (p. 3).

Taylor, Harris, Pearson, & Garcia (1995) believed additional assessments could actually hinder reading progress. They commented that when educators found deficiencies on literacy tests they would automatically focus all instruction on drills and isolated skills with little time for reading. ``Taylor et al. (1995) stated that `…children labeled as poor readers tend to receive instruction that is qualitatively different from that offered to better readers…which can adversely affect reading development' (p. 56)'' (as cited by Erickson, 2008, p. 170).

These screening tests provide educators with a baseline from which to start. Such screening tools include, Gates-MacGinitie Reading Test (GMRT), Dynamic Indicator of

Basic Early Literacy Skill (DIBELS), Phonological Awareness Literacy Screening (PALS), or Scholastic Reading Inventory (SRI).

The GMRT has two parts, vocabulary and comprehension, which compute to an overall total score. The latest edition of the GMRT was published in 2000. This test can be given from kindergarten through post secondary school. It is, a group administered exam which provides an efficient delivery method. Laura Forston from Boston Middle School believes the GMRT is one accurate answer to identifying the weak readers. She writes, in an article for the Middle Grades Reading Network Webpage, "In less than one hour of time you can determine a students' reading level—and have it be accurate!! The Gates-MacGinitie Reading Test (GMRT), which is published by Riverside Publishing, will identify your students' level of reading achievement" (2009, para. 1).

DIBELS was created by Dr. Roland Good and Dr. Ruth Kaminski of the Dynamic Measurement Group at Oregon University in the late 1980s (2009). It is being used in more than 40 states as a screening tool and can assess students from kindergarten through eighth grade. Educators who prefer this test cite the efficiency of testing and scoring as well as the predictability in determining literacy issues (Good & Kaminski, 2009). Critics suggest the DIBELS lacks a comprehension element which is needed at the higher grades (Dessoff, 2007).

Another early screening test is the Phonological Awareness Literacy Screening test also known as PALS, which was developed at the University of Virginia in 1997. Many Reading First (a federally funded program designed to help schools increase reading proficiency) schools use this type of assessment (Rector and Board of Visitors at U of V, 2007). Some schools prefer PALS over DIBELS because the latter gives scores

only in accordance with benchmarks and therefore is not as specific as the PALS. PALS website indicates the test specifically addresses basic skills in literacy; however, it is designed only for kindergarten through third grade (2007).

SRI is a step one screening tool and is a computer-based comprehension assessment (Scholastic Inc, 2010). The latest editions include grades one through 12, which is an advantage over most programs which typically address only elementary and middle school students. This test is also administered on-line which creates an efficient means of delivery as well as quick results, although SRI only measures the comprehension component of literacy.

Literacy assessments are designed to identify "at-risk" students in the screening process. This process provides a diagnosis to determine the specific deficiency needing attention. Schools often use a battery of assessment tools for this step since most tests are specific to certain elements of literacy and do not provide all the possible solutions. The Diagnostic Reading Assessment (DRA) is a good example of a more time-intensive test that provides additional information beyond the GMRT, DIBELS, PALS, or SRI. The DRA is time intensive and administered individually. The DRA is designed to provide educators with information on the specific element of literacy deficiency. The specific elements of literacy include phonemic awareness, phonics, fluency, vocabulary, and comprehension (Mo. DESE, n.d.).

The multiple assessment approach is intended to be a continuous process of individual progress monitoring. This process is normally completed with quick Curriculum-Based Measurement (CBMs). The Mo. DESE defines, "Curriculum-based measurement as an approach to measurement that is used to screen students or to monitor

student progress in mathematics, reading, writing, and spelling. CBMs are typically quick, one to five minutes, and can be given to the entire class at one time. Since CBM provides an index of student proficiency, teachers and schools can assess individual responsiveness to instruction. When a student proves unresponsive to the instructional program, CBM signals the teacher/school to revise that program. A student's unresponsiveness will be evaluated in terms of the rate of learning as reflected in the slope of his/her plotted scores and the level of the performance" (Alexander, 2007, p.1). Some Missouri school districts use a second end of the year GMRT which is a quick efficient tool as their progress monitor. Other districts use DIBELS which provides benchmarks scores three times a year. Benchmark testing provides educators a nationally normed score to compare their students' progress throughout the year (CTB/McGraw Hill, 2009). Throughout the entire literacy assessment process, educators review and analyze literacy assessment results and use the results to guide literacy instruction and curriculum.

Student Achievement

State and federal lawmakers have begun to focus their attention on educational reform specifically to hold schools accountable for student achievement. The most recent and widely publicized initiative is Public Law 107-110, called No Child Left Behind (NCLB), which addressed the public's concern by mandating that schools demonstrate student achievement in terms of a state and nationally recognized standard. By 2003 all states were required to submit their accountability plans to the U. S. Department of Education. This accountability plan required states to address the following 10 performance indicators: All Schools, All Students, Method of AYP (Annual Yearly

Progress) Determination, Annual Decisions, Subgroup Accountability, Based on Academic Assessments, Additional Indicators, Separate Decisions for Reading/Language Arts and mathematics, System Validity and Reliability, and Participation Rate (Mo. DESE, 2004, p.4). During his tenure as Missouri commissioner of education, Dr. Robert E. Bartman wrote in 1997:

> Individual success, as well as the collective well-being of our nation and state during the next decade and beyond, hinges on our intellectual competency. The prosperity of our future depends on what *all* citizens know and are able to do. It is no longer acceptable to educate a portion of our citizens to high levels, while leaving large groups are undereducated a circumstance which, most assuredly, will leave them unemployable and segregated from any hope of prosperity. Indeed, such an outcome would leave us as a nation divided: those with hope and the hopeless; those who "have" and those who "have not" – and who have no way to get. (as cited by Benway, Jordan, & Rosell, 2008, p. 29).

There are many factors that go into whether a student is achieving in school. David Chang studied student achievement while at the University of Southern California. He wrote in 2008 that "understanding the factors that allow students to achieve will lead to not just academic success but overall national success in both academics and post-high school careers" (p.6). Christopher Walker and Barbara Greene completed a study in 2009 that examined student engagement as a factor in student achievement as they quoted a 1989 study by Finn, "When a sense of belonging was absent, students were likely to have a higher rate of truancy, disruptive behavior, and dropping out" (p.464). Researches

Klem and Connell found in 2004, "by creating a personalized student environment, levels of engagement would increase, along with student attendance and test scores" (as cited by Lamons, 2009, p.27). R. Moore also wrote about increasing attendance as an achievement factor, "Attendance has long been viewed as possessing a strong correlation to academic performance in the classroom" (as cited by Lamons, 2009, p. 26). Researchers have identified other factors that may have a direct relationship to student achievement. Walker and Greene wrote about student motivation as one primary factor in achievement (2009). Chang (2008) mentioned several additional factors including pedagogy, teacher retention, and safety. Stephanie Loan Vu agreed, "A school that does not have theft, crime, and other safety challenges is a school that can promote learning at its fullest" (2008, p.26). Adam Nwandwo has written about student performance as a major national concern.

> Factors that influence student performance outcomes range from
> readily quantifiable variables such as teacher certification, class size,
> attendance rate, and the level of technology in a school to less
> quantifiable variables such as household environmental factors, school
> culture, peer effect, early intervention at the kindergarten level, and
> student motivation (2009, p. 31-32).

One product of the NCLB state accountability plan is the definition of student achievement. This definition is determined by each state and has become the standard to measure all public schools. Missouri defines student achievement as basic, proficient, and advanced. The Mo. DESE states, "Student achievement levels of *proficient* and *advanced* determine how well students are mastering the materials in the State's

academic content standards; and the *basic* level of achievement provides complete information about the progress of lower-achieving students toward mastering the *proficient* and *advanced* levels" (Mo. DESE, 2004, p.9).

States have been given the flexibility to develop their own definition of proficiency (US Department of Education, 2007). On the surface this autonomy appears positive. It enables states to maintain some governing rights. However, some educators see the flexibility as a negative. Benway, Jordan, and Rosell commented that Missouri's definition of proficiency is more stringent than the National Assessment of Educational Progress (NAEP) definition. They went on to claim that "some states have set demanding proficiency levels for their students, while others have used lower standards in what can only be assumed to be an attempt to inflate reported performances and escape sanctions" (2008, p. 45).

Measures of Student Achievement

The next logical step is to examine the actual measurements used to determine student achievement. States have chosen many different methods to measure student achievement including high school graduation. Mo. DESE includes high school graduation rates as a measure of student achievement (Mo. DESE, 2004, p. 5). The inverse of graduation rates is the drop out rate of schools which is another way to look at student achievement or lack thereof. Thirty countries from the Organization for Economic Co-Operation and Development (OECD), including the United States, conducted a study using the Program for International Student Assessment (PISA) on high school completion rates and college enrollment. The U.S. declined in the international standings on high school graduation rate and college enrollment over a 10-

year period. According to a 2006 OECD report, one explanation for the U.S. decline in the initial high rank follows:

> "However, this advantage is largely a result of the "first-mover advantage" which the US gained after World War II by massively increasing enrollments. While the US had, well into the 1960s, the highest high school completion rates among OECD countries, in 2005 it ranked, with a high school completion rate of 76%, 21st among the 27 OECD countries with available data, followed only by Spain, New Zealand, Portugal, Turkey and Mexico." Similar trends are visible in college education, where the US slipped between 1995 and 2005 from the 2nd to the 14th rank, not because US college graduation rates declined, but because they rose so much faster in many OECD countries. (Schleicher, 2006, p. 1).

A very traditional method of assessing student achievement and progress is through a grading system. Sandra Keow from the University of Tennessee referred to grades in her 2008 paper. "Within a class, school, or district, a certain grade represents a level of achievement. A grade of 98 means superior, nearly perfect, or excellent. A grade of 60 *means failing or failure*. Those grades carry significant meaning to every student impacted by them. In order to make certain grades, students understand what level of effort they have to invest" (p.39). Loan Vu also discussed grades as a valuable tool for educators and students alike: "Progress, quarter, and semester grades all provide students with feedback throughout the school year on how they are achieving academically in each content area" (2008, p. 78). Examining grades over a period of time result in a Grade Point Average (GPA). High schools will often recognize graduates with

high GPA's as honor students. Post Secondary Institutions use GPA as one criterion for acceptance to their school.

High stakes testing has become more popular as states attempt to demonstrate student achievement and hold their students accountable. The state of California has implemented a test to measure student achievement. To graduate, students must pass the California High School Exit Examination (CAHSEE). This test was designed to ensure that students with a high school diploma can demonstrate grade level competency in literacy, writing, and mathematics (Chang, 2008, p. 36-37).

Missouri uses an assessment to identify grade level competency and measure student achievement in communication arts, mathematics, and science. The Missouri Assessment Program (MAP) is administered to all students in grades three through eight. Once students enter high school they are assessed using End of Course Exams which occurs at the conclusion of each semester. For the purpose of this study, MAP assessments were used.

Relationship Between Literacy and Future Success

Some research has indicated there is a connection between literacy levels and student achievement. Leslie Blue, Temple University, suggested, "The relationship between literacy achievement and the breadth and depth of a person's knowledge are logical. Both abilities stem largely from the acquisition of declarative and procedural knowledge and, in fact, may be considered types of academic achievement" (2009, p.41).

Julie Lamons, East Tennessee University, completed research specifically looking at the state of Tennessee's standardized test scores. She wrote about the connection of literacy with math and science testing. She mentions the growing concern that reading

comprehension is being tested on math and science assessments. Lamons' article cites Marlow Ediger (2005) who encouraged science teachers to be knowledgeable in science content and also an instructor of reading (2009). Marcia Valencia and Sheila Buly agreed with Lamons as their research discovered the same students failing many of the standardized tests were also the students exhibiting literacy difficulties (2002).

The National Education Association mentions how important literacy is in education, "All of the data suggest how powerfully reading transforms the lives of individuals – whatever their social circumstances. Regular reading not only boosts the likelihood of an individual's academic and economic success…but it also seems to awaken a person's social and civic sense. Literacy correlates with almost every measure of positive personal and social behavior surveyed. The cold statistics confirm something that most readers know but have mostly been reluctant to declare as fact – books change lives for the better" (as cited by Robinson, 2008, p.15).

Students with deficient literacy levels are not able to demonstrate sufficient achievement and many quit school (Fears, 2004). David Jones reported about schools in New York, "it becomes increasingly more difficult to raise student achievement in high school for those who have fallen seriously behind by the eighth-grade, early intervention strategies are critical" (p.5). Stephanie Reddick (2003) analyzed four southeast Missouri school districts and found that poor literacy skills are one of the most common factors in school dropouts. R. Castro from the University of North Texas drove home the point when he/she wrote, ``poverty, incarceration, crime, and violence all have a common denominator in our society. Most of these children grew into adulthood unable to read in an information society'' (as cited by Reddick, p.10).

Cherie Mothershead cited an article by Francie Alexander which appeared in

Scholastic,

> . . . because of the demands in society, reading is more important
> today than ever, it is crucial to being an informed citizen, to succeed in
> one's chosen career, and to personal fulfillment. But first things first:
> Children who read well do better in other subjects and in all aspects of
> schooling and beyond" (2008, p.9).

Summary

This chapter defined literacy as well as student achievement. The definition of literacy has evolved over the years but for the purpose of this study the following definition for OECD will be used, "the ability to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate effectively in society" (as cited by Rasmussen, 2003, p. 427).

Student achievement is mandated by NCLB and is reported through performance indicators such as assessment and subgroup accountability. States have the autonomy to define student achievement standards in their own states. The state of Missouri uses the MAP to measure student achievement along with attendance and graduation rates. Researchers from Achieve, Inc., a bi-partisan educational reform organization created in 1996 by governors and business leaders, stated a disturbing fact about U.S. high school graduates when they reported that 70 percent of college professors and 41 percent of employers said ``students' inability to read and understand complicated material is a serious deficiency'' (as cited by McGrath, 2005, p.70). Researchers, Green and Winters, reported only 34 percent of high school graduates are prepared for the rigors of college

work. Therefore, 66 percent of high school graduates are required to enroll in remedial coursework (2005). Allington and Walmsley go on to say, "It is distressing to think that our schools are so ineffectual with children who begin school with few literacy experiences that we can predict with horrifying accuracy what lifestyle these "different" six-year-olds will attain when they reach adulthood" (1995, p.2).

Measurement tools for both literacy and student achievement were discussed in this chapter, including advantages and disadvantages. For the purpose of this study, literacy levels were determined by a Gates-MacGinitie Reading Test score. Student achievement was based upon a student's Missouri Assessment Program score on the communication arts subtest, mathematics subtest, and science subtest.

The final section of this chapter discussed research on literacy and its relationship to student achievement and future success. Several researchers agreed, literacy can help or hinder student achievement and academic success. If students are not prepared to read by the time they reach secondary education they have an uphill battle.

Chapter Three

Methodology

Literacy has always been a necessary skill to gain success in American society but advances in technology have increased the rate of information flow making literacy even more important. High school graduates are being asked to process information and communicate as quickly and efficiently as college graduates were a decade ago. With the demand for higher and more efficient literacy skill, elementary schools have increased the focus on literacy and at-risk support by providing federally funded entitlement services and literacy coaches. Many secondary schools are left to meet the increased demand of literacy intervention without the additional support.

The purpose of this study was to identify the relationship between literacy, as measured by fourth grade Gates-MacGinitie Reading Test (GMRT), and student achievement in communication arts, mathematics, and science, as measured by the Missouri Assessment Program (MAP) tests in the eighth grade. This chapter presents the research design and the methodology used to determine the relationship between GMRT and MAP. The population and sample size was defined, followed by a detailed description of the instrument to include reliability and validity. An explanation of how the data was collected and how the data was analyzed is included in this chapter. Chapter Three concludes with a review of the research hypothesis and the study's limitations.

Research Design and Methodology

This quantitative, correlational research sought to discover if there is a relationship between fourth-grade literacy skills and eighth-grade student achievement in communication arts, mathematics, and science. The independent variable for this study is

literacy skill as measured by the fourth-grade GMRT score. This study compared the GMRT scores with the dependent variable of eighth-grade student achievement as measured by the MAP assessments. Correlations were calculated using GMRT scores and MAP scores in three areas resulting in a total of three dependent variables. The three achievement areas were communication arts, mathematics, and science.

Population and Sample

The Lexington R-V School District in Lexington, MO provided the population for this study. All students enrolled in the fourth grade at Leslie Bell Elementary during the spring of 2004 and 2005 were examined which resulted in a sample size of 152 students. The sample was further reduced for this study by using only students who completed the fourth grade GMRT and remained enrolled at Lexington Middle School through their eighth grade year. The total sample for this study included 139 students who met all previously stated criteria. Subjects for this research were purposively selected. The subjects were not randomly placed into groups so this study is non-experimental in design.

Instrumentation

The literacy standardized test used in this study was the GMRT. The student achievement standardized test used for this study was the MAP in communication arts, mathematics, and science.

Measurement.

According to the Gates-MacGinitie website, "SSs (scaled scores) always measure achievement in equal units and can be averaged. The extended scale score (ESS) were developed so that progress in literacy can be followed over a period of years, on a single,

continuous scale" (2006, para. 10). The GMRT is a norm-referenced assessment for measuring literacy achievement. This particular test is designed to measure literacy achievement from pre-reading ability age through adult reading. The GMRT literacy assessment can be administered to individuals as well as groups. The GMRT is a silent literacy test that includes103 questions for which the possible answers are presented in a multiple-choice format. The number of correct answers obtained by each student is noted and raw scores are converted to standard scores. There are two parts to the GMRT test which have suggested time requirements in the standardized instruction but allow for all students to complete every question. This allows for students to answer all questions, but also gives them a sense of urgency during testing. The first 20 minute section is vocabulary and consists of 45 questions. This portion measures word knowledge, not the ability to derive meaning from context. The comprehension portion, part two, takes 35 minutes and has 48 questions. The comprehension section measures students' abilities to read and understand different types of prose taken from published books and periodicals. The content is selected to reflect the type of materials students typically read for their grade level school work and recreation. Some questions require students to construct an understanding based on a literal understanding of the passage. Other questions require students to make inferences or draw conclusions. The comprehension section also measures the ability to determine the meaning of words in an authentic context. The correct responses are calculated to provide a vocabulary score, a comprehension score, and a total overall score. GMRT scores are reported as national equivalent scores, percentile rank, stanine scores, grade equivalency, and extended scaled scores.

Student achievement was the dependent variable. Student achievement was measured through the individual student MAP scores on the eighth grade communication arts, mathematics, and science subtests. The results were reported with a scaled score, an achievement level (advanced, proficient, basic, and below basic), a TerraNova National Percentile (based on normative data from 2005), Median National Percentile (NP), and NP of the Mean Normal Curve Equivalent (NCE). NCE is "…is an equal-interval scale and can be treated arithmetically. The mean NCE is computed by adding the NCE scores of all the students in the group with MAP scores and then dividing by that number of students" (Missouri Assessment Program: Guide to Interpreting Results, 2009, p. 4).

The MAP test was designed to identify four levels of knowledge (recall, skill/concept, strategic thinking, and extended thinking) using three types of questions. The depth or level of knowledge was defined as "measuring the degree to which the knowledge elicited from students on the assessment is as complex within the context area as what students are expected to know and do as stated in the standards" (Vandeven, 2006). The first two levels, recall and skill/concept, were evaluated using multiple choice or selected-response type questions. The multiple choice/selected-response portion of the MAP was called the TerraNova, a nationally normed test. Depth of knowledge levels two through four demonstrated using constructed-response items**.** The constructed-response questions can be altered to address simple skill/concept knowledge (level two), strategic thinking (level three), or extended thinking (level four). Constructed-response questions was designed for students to provide (rather than select) an appropriate response. Students showed their work which measured content knowledge and provided information about how they arrived at their answers. The third type of MAP questioning,

the performance events, assesses strategic thinking (level three) and extended thinking (level four). In accordance with the *Missouri Assessment Program: Guide to Interpreting Results*, "…the performance events used in Missouri's statewide assessment require students to work through more complicated items. Performance events often allow for more than one approach to get a correct answer. The advantage of this type of assessment item is that it provides insight into a student's ability to apply knowledge and understanding in real-life situations" (2009, p.1).

Validity and reliability.

According to the technical manual, the GMRT internal consistency reliability ranges from .91 to .93 and alternate form reliability from .80 to .87 across levels. Validity and reliability for this reading test are reported to be high (MacGinitie, MacGinitie, Maria, & Dreyer, 2000).

The Missouri Department of Elementary and Secondary Education (Mo. DESE) was tasked by the State Board of Education to determine the validity of the MAP. According to the results posted by DESE, "The "item-to-standard" congruence ratings that these reviewers produced provide evidence for the meaningfulness of MAP scores" (2003, p3). The following chart contains information from the 2003 DESE report. It is important to note the grade levels that were tested have changed over the years. The current testing schedule requires every grade level to test communication arts and mathematics. Only the fifth and eighth grades test science. The information in Table 3 is based on the subtest required during the 1997-2000 years. What this testing year does verify is that the MAP provides a reliability consistency of .9 or above for every subject except in the 10th grade science.

Table 3

The Missouri Assessment Program's Scale Score Reliability Coefficients for the 1997 through 2000 school years

	1997	1998	1999	2000
MATH				
Grade 4	.919	.921	.915	.913
Grade 8	.931	.927	.927	.929
Grade 10	.936	.940	.929	.940
COMM ARTS				
Grade 3	NA	.920	.915	.913
Grade 7	NA	.932	.905	.907
Grade 11	NA	.919	.919	.917
SCIENCE				
Grade 3	NA	.907	.903	.903
Grade7	NA	.915	.875	.918
Grade 10	NA	.916	.908	.882

Note. From Department of Elementary and Secondary Education, 2008.

Data Collection

This study was approved by Lexington R-V School District attached as Appendix

A and Baker University attached in Appendix B. Parental approval was not required

because the results of this study completed a program evaluation and student names were not used. To ensure anonymity, each student was given a code reference to replace their names. All academic and enrollment records were collected from the school's database and the DESE website.

The research sample was acquired by gathering a list of all fourth grade students who completed the GMRT test in the spring of 2004 and 2005. This list was then cross-referenced with the student information system to determine if each student remained in the Lexington School District for the following four years by identifying enrollment records. The final list of students was completed after ensuring each student also completed a MAP in 2008 and 2009 respectively. The list included 139 students that remained in the Lexington School District from their fourth-grade year of 2004 and 2005 through the eighth grade in 2008 and 2009 respectively.

The fourth grade student names were exported into an Excel spreadsheet from the school's student information system (WebSis). The GMRT scaled scores for their fourth grade year were entered and the MAP scaled scores were exported from the DESE website. The names were cross-referenced with the enrollment information from WebSis to eliminate students who had moved out of the district during their middle school years. The names were then assigned a coded reference using class graduation year and four numbers of the state student identification and the names were eliminated from the data set.

The subjects were then grouped by their GMRT scores. Those students who scored below grade level or had a scaled score of 493 or below were placed in the group called "At-Risk". Those students that scored at or above grade level (scaled score of 494)

were placed in the group called "Proficient". Each student's individual GMRT scores were entered into the Excel spreadsheet as the independent variable for the correlation coefficient along with their literacy category of At-Risk or Proficient.

The next step added the dependent variables, the eighth-grade MAP scores, to the spreadsheet. The proficient literacy group's and the at-risk literacy group's communication arts MAP scores were entered to create a scatter plot. The proficient literacy group's and the at-risk literacy group's mathematic MAP scores were then entered to create another scatter plot. And finally the proficient literacy group's and the at-risk literacy group's science MAP scores were entered in order to create another scatter plot.

Data Analysis

A linear regression line was computed using Excel to provide a visual demonstration of the correlation. A linear regression line was calculated using the at-risk group's GMRT scores and MAP communication arts scores, the proficient group's GMRT scores and MAP communication arts scores, and then a combined group's GMRT scores and MAP communication arts scores.   The above process was repeated for the dependent variables of MAP mathematics and MAP science.

Analysis of the data provided information to indicate whether the fourth grade GMRT is a predictor of eighth grade student achievement on the MAP communication arts test, the MAP mathematics test, and/or the MAP science test. Further evaluation of the scores using the two groups determined if one group is a stronger predictor than the other group.

Research Hypotheses

The researcher formulated the following three research hypotheses:

Hypothesis One: There is a positive relationship between fourth-grade GMRT scaled scores and eighth-grade student achievement as measured by the MAP communication arts test scaled scores at the 0.05 significant level. This hypothesis was tested using a correlation coefficient to index the relationship between GMRT and MAP communication arts for the At-Risk, Proficient, and Combined groups. A t-test was calculated to determine if the correlation was significant.

Hypothesis Two: There is a positive relationship between fourth-grade GMRT scaled scores and eighth-grade student achievement as measured by the MAP mathematics subtest scaled scores at the 0.05 significant level. This hypothesis was tested using a correlation coefficient to index the relationship between GMRT and MAP mathematics for the At-Risk, Proficient, and Combined groups. A t-test was calculated to determine if the correlation was significant.

Hypothesis Three: There is a positive relationship between fourth-grade GMRT scaled scores and eighth-grade student achievement as measured by the MAP science subtest scaled scores at the 0.05 significant level. This hypothesis was tested using a correlation coefficient to index the relationship between GMRT and MAP science for the At-Risk, Proficient, and Combined groups. A t-test was calculated to determine if the correlation was significant.

Limitations

Several limitations have been identified that may have an impact on the results of this study. Student motivation has been linked to student achievement; therefore, this

study was limited by students' level of motivation in regard to schoolwork and testing. The accuracy of the literacy testing instrument is a limitation to this study as the results may have place a proficient reader into the at-risk group or vice versa. The accuracy of the MAP test is a limitation to this study.

Summary

This chapter addressed the methodology and design for this study. A quantitative, correlational research design was used to determine the relationship between elementary literacy skill and student achievement at the middle level. The population for the study was taken from Lexington R-V School District and reduced to a sampling of non-migrant students that remained in that school system from fourth-grade through the eighth-grade. This study examined if there is a relationship between literacy skill (independent variable) at the fourth grade and student achievement (dependent variable) at the eighth grade in communication arts, mathematics, and science. Each score was collected from historical records and students were assigned a code reference to protect their identity. The next chapter focuses on reporting the results of the analyses.

Chapter Four

Results

Introduction

The purpose of this study was to investigate the predictive usefulness of the

Gates-MacGinitie Reading Test (GMRT) given to all students at the end of the fourth-

grade year. This study examined the relationship between fourth grade literacy scores

and eighth grade student achievement as measured by the Missouri Assessment Program

(MAP) in three areas, communication arts, mathematics, and science. An analysis of the

relationship between literacy scores at the end of elementary and eighth-grade student

achievement scores four years later will also provide educators insight into scheduling,

departmentalization and necessary intervention at the middle level. Students who score

poorly on the fourth-grade GMRT may need additional intervention strategies in order to

help them succeed by their eighth-grade year.

This chapter provides the results of the study, beginning with an explanation of

the descriptive statistics followed by the results of the hypothesis testing. Hypothesis one

examined the relationship between fourth-grade GMRT scores and the eighth-grade MAP

communication arts scores. Hypothesis two examined the relationship between fourth-

grade GMRT scores and the eighth-grade MAP mathematics scores. The third

hypothesis examined the relationship between fourth-grade GMRT scores and the eighth-

grade MAP science scores. This chapter concluded with a summary section.

Descriptive Statistics

The population for this study was comprised of male and female students who

were enrolled in the fourth grade at Leslie Bell Elementary in Lexington, Mo. during the

spring of 2004 and 2005. In the 2004 school year there were 78 students in the fourth grade. There were 43 girls and 35 boys. In the 2005 school year there were 74 fourth-grade Lexington students with 32 girls and 42 boys. During the middle school years, several students moved away and some were retained, which placed them in a different graduating class. The enrollment for the fourth grade class in 2004 was 78. Only 71 of the 78 2004 fourth-grade class members entered the eighth-grade in 2008. The 71 students enrolled in the eighth grade in 2008 consisted of 39 girls and 32 boys. Likewise the fourth grade class in 2005 also experienced a drop in enrollment. The 2005 fourth-grade class started at 74 but dropped to 68 by the time these students reached the eighth grade in 2009. The eighth grade class in 2009 had 30 girls and 38 boys for an enrollment of 68 students. The total population for this study was fourth-grade Lexington students, with a sample size of 139. The 139 student sample took the GMRT as fourth-graders then took all three MAP tests four years later as eighth-graders.

The GMRT scores were sorted into groups. Students who scored at or above the grade-level literacy benchmark were categorized as proficient. Those who scored below the benchmark were labeled as at-risk. Figure 2 depicts the two groups from the fourth grade class in 2004. Thirty-seven students or 52% of the class, performed at or above grade level as measured by the GMRT. Thirty four out of seventy one, 48%, performed below grade level on the 2004 GMRT and were classified as At-Risk.
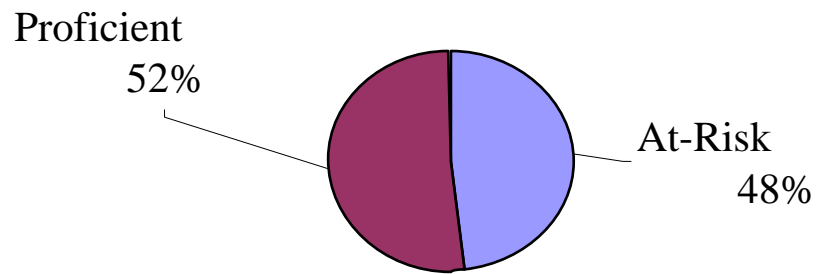
Figure 2. The literacy levels associated with the 2004 Gates-MacGinitie Reading Test for fourth-grade Lexington students. The scores were gathered from the historical records of Lexington School District.

Figure 3 depicts the GMRT results for the fourth grade class in 2005. 68 students were considered, with thirty-eight students scoring at or above grade level, which equates to 56% of that class literacy proficiency. Thirty students scored below grade level on the fourth-grade GMRT, for 44% of the class.
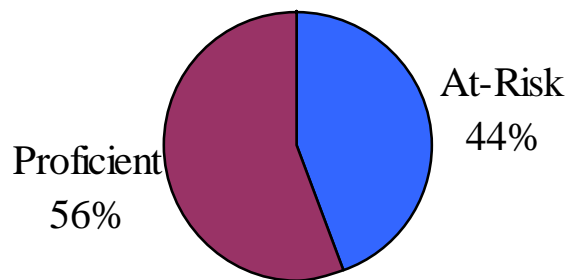

Figure 3. The literacy levels associated with the 2005 Gates-MacGinitie Reading Test for fourth-grade Lexington students.

The next figure shows the combination of the two classes, which results in a total of 139 students. The At-Risk literacy group was comprised of 64 students, or 46% of the sample, while the Proficient literacy group had a total of 75 students, which equates to 54%.
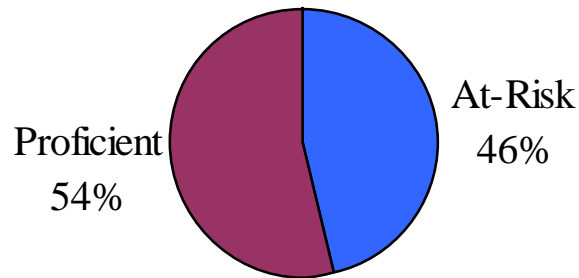

Figure 4. The literacy levels associated with the 2004 and 2005 Gates-MacGinitie Reading Test for fourth-grade Lexington students.

The descriptive statistics for the fourth-grade GMRT given in 2004 and 2005 is depicted in Table 4. The mean scores for the three groups (At-Risk, Proficient, and Combined) were all very close to the median score which indicates a symmetric distribution of scores. The variability between scores was highest with the combined group since the range of scores was the highest ($SD = 27$).

Table 4

The descriptive statistics for the sample of students at Lexington who took the GMRT in 2004 and 2005

	Range	Mean	Median	Variance	SD
At-Risk	70	475	483	292	17
Proficient	73	518	515	264	16
Combined	143	498	496	733	27

The descriptive statistics for the eighth-grade communication arts subtest from the Missouri Assessment Program (MAP) test given in 2008 and 2009 is depicted in Table 5. The mean scores for the three groups (At-Risk, Proficient, and Combined) were all very close to the median score which indicates a symmetric distribution of scores. The Proficient group had a slightly larger mean, which makes it positively skewed, while the other groups are negative with their mean scores less than the median scores (Salkind, 2005). The variability between scores was highest with the combined group since the range of scores was the highest ($SD = 23.6$) with the Proficient group showing the lowest variability ($SD = 15.9$).

Table 5

The descriptive statistics for the sample of students at Lexington who took the MAP communication arts test in 2008 and 2009

	Range	Mean	Median	Variance	SD
At-Risk	106	673	676	443	21.0
Proficient	82	703	700	252	15.9
Combined	129	690	691	559	23.6

The descriptive statistics for the eighth-grade mathematics subtest from the MAP test given in 2008 and 2009 is depicted in Table 6. The standard deviation was over 30 points for both the At-Risk and the combined groups. This is due to a wider range of scores for these two groups. The At-Risk group also had a negatively skewed distribution with the median 7 points higher than the mean score. The At-Risk group had the highest variability in scores ($SD = 33.4$) with the Proficient group showing the lowest variability ($SD = 23$).

Table 6

The descriptive statistics for the sample of students at Lexington who took the mathematics test in 2008 and 2009

	Range	Mean	Median	Variance	SD
At-Risk	222	685	692	1118	33.4
Proficient	135	715	716	529.9	23
Combined	246	702	704	1018.6	31.9

Table 7 depicts the descriptive statistics for the eighth-grade science subtest from the MAP test given in 2008 and 2009. All three groups, At-Risk, Proficient, and Combined had a fairly even distribution, with the highest standard deviation from the combined group ($SD = 21.2$) since the range for this group was the largest with a 126. The At-Risk literacy group and the Proficient literacy group did not demonstrate much difference in the variability of scores ($SD = 17.3$ and $SD = 17.1$ respectively).

Table 7

The descriptive statistics for the sample of students at Lexington who took the MAP science test in 2008 and 2009

	Range	Mean	Median	Variance	SD
At-Risk	108	680	683	301	17.3
Proficient	84	705	704	294	17.1
Combined	126	693	692	449	21.2

Hypothesis Testing

This study was designed to study the relationship between fourth-grade literacy scores and eighth-grade student achievement. The GMRT was used for the literacy score and MAP was used to measure student achievement. To address the three research questions and determine if the fourth-grade GMRT is an accurate predictor of student achievement at the eighth-grade level, this study tested the following hypotheses:

Hypothesis One: There is a positive relationship between fourth-grade GMRT literacy scores and eighth-grade student achievement as measured by the MAP communication arts scaled scores at the 0.05 significance level. A correlation coefficient

was calculated to index the strength and direction of the relationship between GMRT and MAP communication arts. The GMRT scores were plotted on the horizontal axis with the MAP scores on the vertical axis. A linear regression line was plotted on a scatter plot to examine the strength of the relationship. The correlation coefficient was calculated first for the At-Risk group, and then the Proficient group, followed by all the students combined.

The correlation ($r = .508$) between fourth-grade literacy scores and eighth-grade student achievement in MAP communication arts for the At-Risk literacy group was significant ($p = .000$). This indicates a moderate positive relationship between scores on the GMRT and the MAP communication arts test (Salkind, 2005). The higher the students scored on their literacy test (x), the higher they scored on the MAP communication arts test (*y*). In addition, the coefficient of determination was computed by squaring the correlation coefficient ($r^2 = .258$) which indicated that 26% of the variation in MAP communication arts scores can be explained by the GMRT. The standard error of measurement in predicting MAP scores on the communication arts test from the GMRT would be an average of 18 points. Table 7 depicts these relationships.
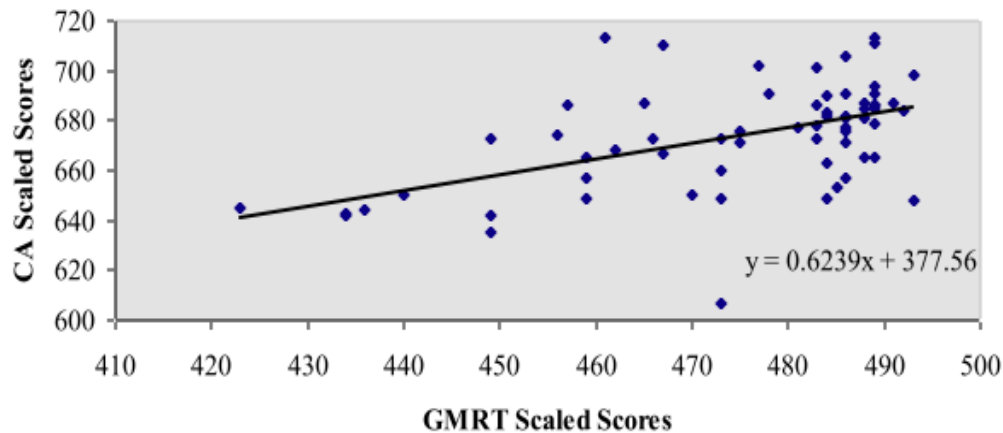
$$y = 0.6239x + 377.56$$

Figure 5. Scatter plot and regression line depicting the strength of the relationship between GMRT scores (*x*) and communication arts scaled scores (*y*) for the At-Risk Group.

     The correlation between the Proficient literacy group's fourth-grade literacy scores and their achievement scores on the MAP communication arts test ($r = .423$) was also significant ($p = .000$). This indicates a positive relationship between scores on the GMRT and the MAP communication arts test (Salkind, 2005). The better the students scored on their literacy test (*x*), the better they scored on the MAP communication arts test (*y*). The coefficient of determination ($r^2 = .179$) indicated that 18% of the variability in MAP communication arts scores can be explained by the GMRT. The standard error of measurement in predicting MAP scores on the communication arts test by using the GMRT model for the Proficient group was 15 points. The following figure depicts this relationship:
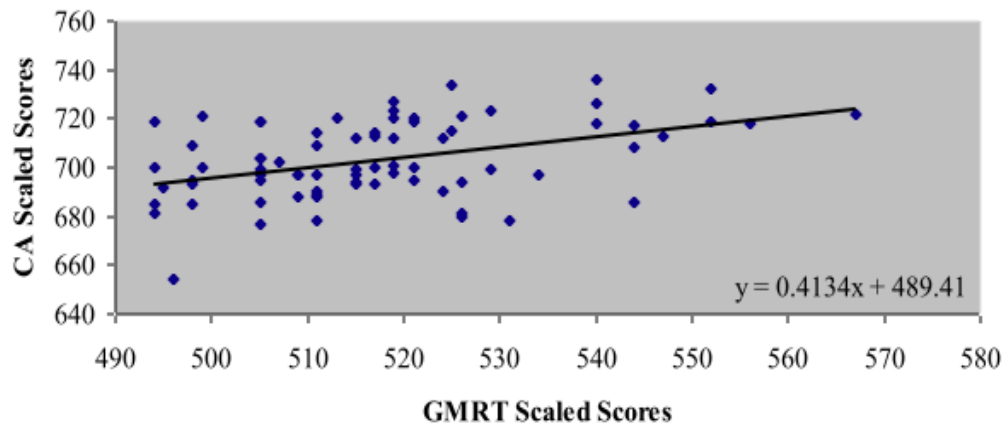
Figure 6. Scatter plot and regression line depicting the strength of the relationship between the GMRT scores(*x*) and MAP communication arts scaled scores (*y*) for the Proficient Group.

The scores from the two subgroups, At-Risk and Proficient, were combined to examine the relationship between GMRT scores and MAP communication arts scores. Table 8 contains the results of the scores for the Combined group. The correlation coefficient (*r* = .716) was significant (*p* = .000). The scores from the Combined group indicated a strong relationship and remained positive. As the literacy scores increased, the scores on the MAP communication arts test increased (Salkind, 2005). The coefficient of determination (r^2 = .512) indicated that 51% of the variability in MAP communication arts scores can be explained by the GMRT. The standard error of measurement in predicting MAP scores on the communication arts test by using the GMRT model for the Proficient group was 17 points. Figure 7 provides a visual representation using a scatter plot and regression line.
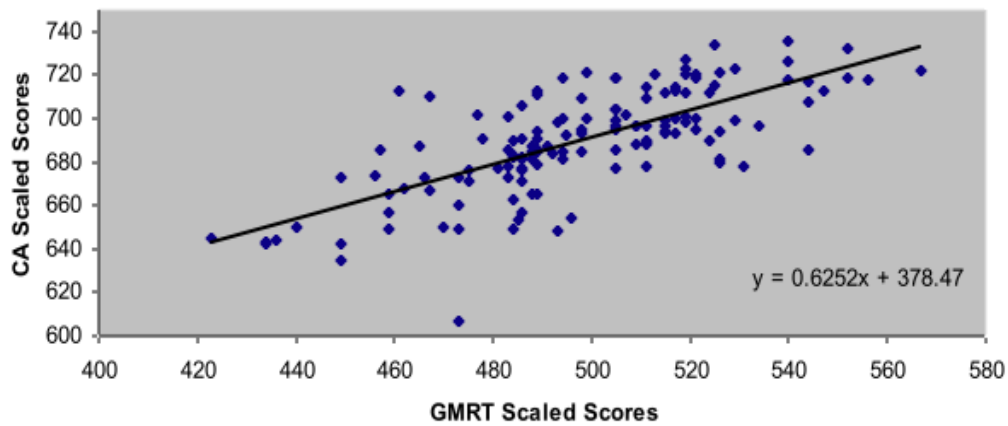
$y = 0.6252x + 378.47$

Figure 7. Scatter plot and regression line depicting the strength of the relationship between GMRT scores (*x*) and MAP communication arts scaled scores (*y*) with At-Risk and Proficient groups combined.

Table 8

The correlation coefficient, the coefficient of determination, and the standard error of measurement for the At-Risk literacy group, the Proficient literacy group, and the Combined group for MAP communication arts

	Correlation	Coefficient of determination	Standard error
At-Risk	.508	.258	18.3
Proficient	.423	.179	14.5
Combined	.716	.513	16.6

Hypothesis Two: There is a positive relationship between fourth-grade GMRT literacy scores and eight-grade student achievement as measured by the MAP mathematics scaled scores at the 0.05 significant level. A correlation coefficient was calculated to index the strength and direction of the relationship between GMRT and MAP mathematics. The GMRT scores were plotted on the horizontal axis with the MAP

scores on the vertical axis. A linear regression line was plotted on a scatter plot to examine the strength of the relationship. The correlation coefficient was calculated first for the At-Risk group, and then the Proficient group, followed by all the students combined.

The correlation ($r = .337$) between fourth-grade literacy scores and eighth-grade student achievement in MAP communication arts for the At-Risk literacy group was significant ($p = .000$). This indicates a weak positive relationship between scores on the GMRT and the MAP mathematics test (Salkind, 2005). The higher the students scored on their literacy test (x), the higher they scored on the MAP mathematics test (y). In addition, the coefficient of determination was computed by squaring the correlation coefficient ($r^2 = .114$) which indicated that 11% of the variation in MAP mathematics scores can be explained by the GMRT. The standard error of measurement in predicting MAP scores on the mathematics test from the GMRT would be an average of 27 points. The following figure depicts this relationship.
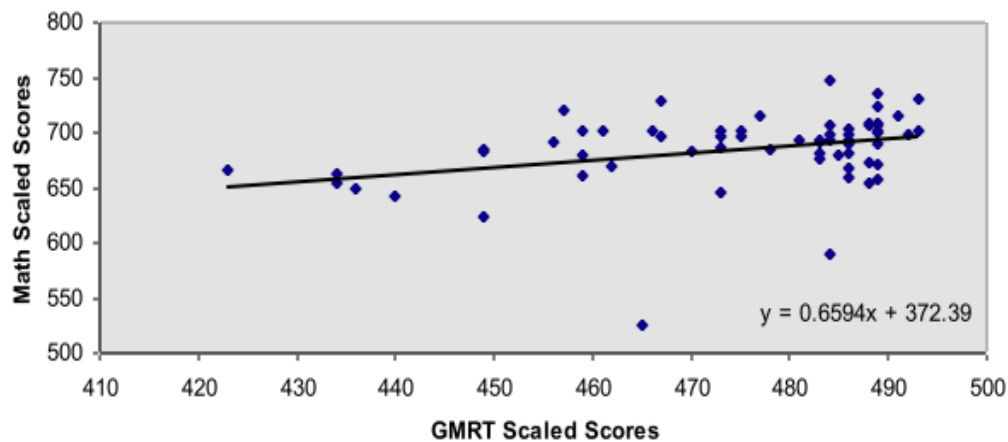

Figure 8. Scatter plot and regression line depicting the strength of the relationship between GMRT scores (*x*) and MAP mathematics scaled scores (*y*) with the At-Risk group.

The correlation ($r = .197$) between fourth-grade literacy scores and eighth-grade student achievement in MAP mathematics for the Proficient literacy group was significant ($p = .000$). This indicates a weak positive relationship between scores on the GMRT and the MAP mathematics test (Salkind, 2005). The higher the students scored on their literacy test (x), the higher they scored on the MAP mathematics test (y). In addition, the coefficient of determination was computed by squaring the correlation coefficient ($r^2 = .039$) which indicated that 4% of the variation in MAP mathematics scores can be explained by the GMRT. The standard error of measurement in predicting MAP scores on the mathematics test from the GMRT would be an average of 27 points. The following figure depicts this relationship.
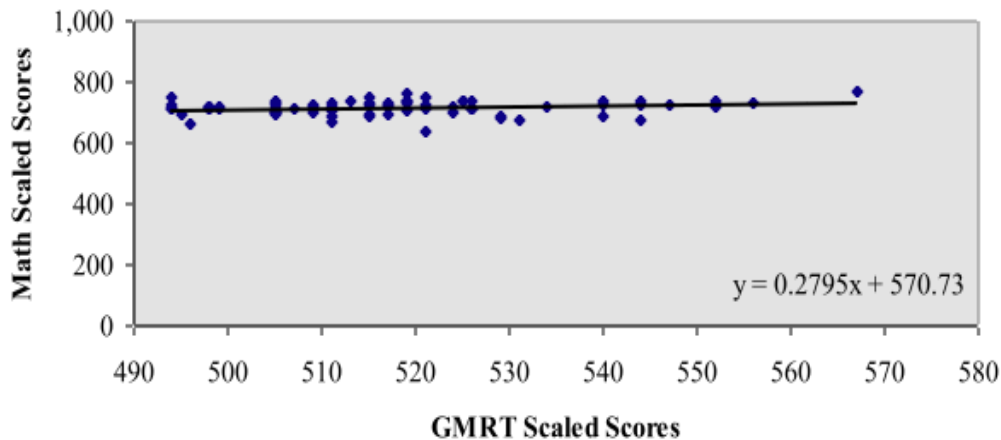

Figure 9. Scatter plot and regression line depicting the strength of the relationship between GMRT scores (*x*) and Math MAP scaled scores (*y*) for the Proficient group.

The scores from the two subgroups, At-Risk and Proficient, were combined to examine the relationship between GMRT scores and MAP mathematics scores. Table 9 contains the results of the scores for the Combined group. The correlation coefficient (*r* =

.518) was significant ($p = .000$). The scores from the Combined group indicated a

moderate relationship and remained positive. As the literacy scores increased, the scores

on the MAP mathematics test increased (Salkind, 2005). The coefficient of

determination ($r^2 = .269$) indicated that 27% of the variability in MAP mathematics

scores can be explained by the GMRT. The standard error of measurement in predicting

MAP scores on the mathematics test by using the GMRT model for the Proficient group

was 27 points. Figure 10 provides a visual representation using a scatter plot and
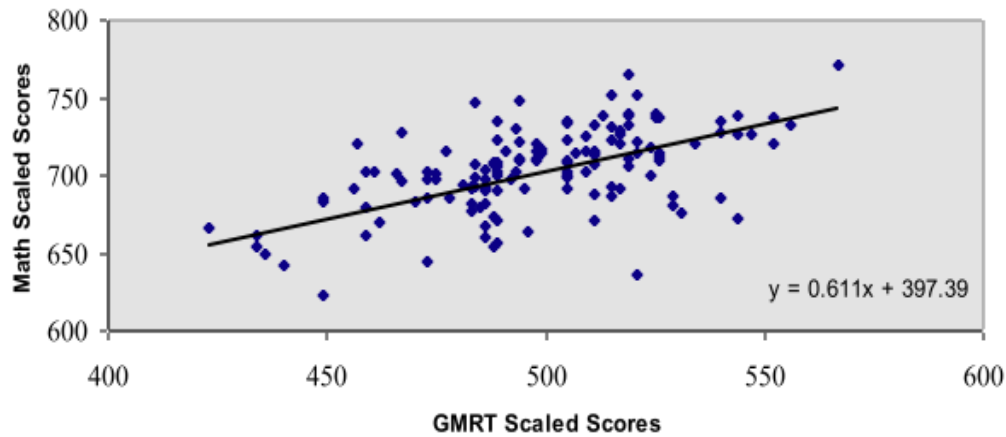
regression line.

Figure 10. Scatter plot and regression line depicting the strength of the relationship
between GMRT scores and MAP Math scaled scores for At-Risk and Proficient readers
combined.

Table 9

The correlation coefficient, the coefficient of determination, and the standard error of measurement for the At-Risk literacy *group, the Proficient* literacy *group, and the Combined group for MAP* mathematics

	Correlation	Coefficient of determination	Standard error
At-Risk	.337	.114	31.7
Proficient	.197	.039	22.7
Combined	.518	.269	27.4

Hypothesis Three: There is a positive relationship between fourth-grade GMRT literacy scores and eighth-grade student achievement as measured by the MAP science scaled scores at the 0.05 significance level. A correlation coefficient was calculated to index the strength and direction of the relationship between GMRT and MAP science. The GMRT scores were plotted on the horizontal axis with the MAP scores on the vertical axis. A linear regression line was plotted on a scatter plot to examine the strength of the relationship. The correlation coefficient was calculated first for the At-Risk group, and then the Proficient group, followed by all the students combined.

The correlation ($r = .088$) between fourth-grade literacy scores and eighth-grade student achievement in MAP science for the At-Risk literacy group was significant ($p = .000$). This indicates a weak positive relationship between scores on the GMRT and the MAP science test (Salkind, 2005). The higher the students scored on their literacy test (x), the higher they scored on the MAP science test (y). In addition, the coefficient of

determination was computed by squaring the correlation coefficient ($r^2 = .008$) which

indicated less than 1% of the variation in MAP science scores can be explained by the

GMRT. The standard error of measurement in predicting MAP scores on the

communication arts test from the GMRT would be an average of 17 points. Figure 11
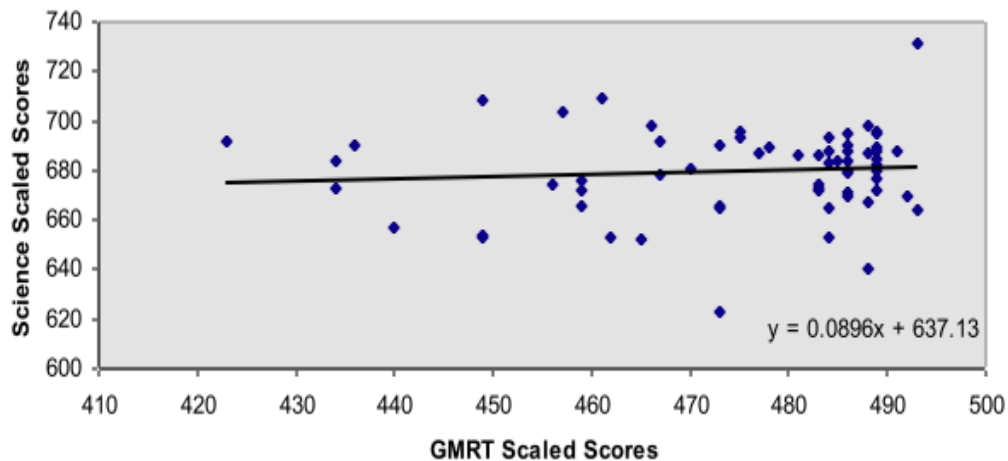
depicts these relationships.

Figure 11. Scatter plot and regression line depicting the strength of the relationship
between GMRT scores (*x*) and science MAP scaled scores (*y*) for the At-Risk Group.

The correlation ($r = .309$) between fourth-grade literacy scores and eighth-

grade student achievement in MAP science for the Proficent literacy group was

significant ($p = .000$). This indicates a weak positive relationship between scores on the

GMRT and the MAP science test (Salkind, 2005). The higher the students scored on

their literacy test (x), the higher they scored on the MAP science test (*y*). In addition, the

coefficient of determination was computed by squaring the correlation coefficient ($r^2 =$

.095) which indicated that 10% of the variation in MAP science scores can be explained

by the GMRT. The standard error of measurement in predicting MAP scores on the

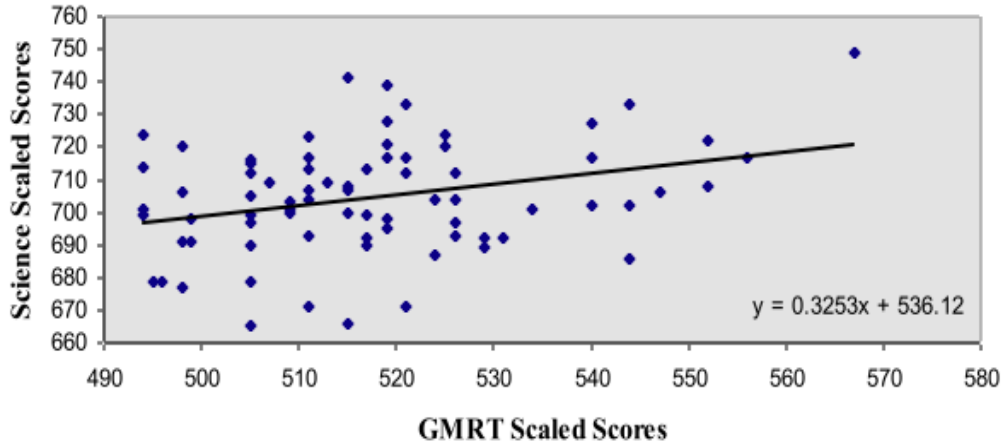science test from the GMRT would be an average of 16 points. The following figure depicts this relationship.

Figure 12. Scatter plot and regression line depicting the strength of the relationship between GMRT scores (*x*) and science MAP scaled scores (*y*) for the Proficient group.

The scores from the two subgroups, At-Risk and Proficient, were combined to examine the relationship between GMRT scores and MAP science scores. Table 10 contains the results of the scores for the Combined group. The correlation coefficient ($r =$ .565) was significant ($p = .000$). The scores from the Combined group indicated a moderate relationship and remained positive. As the literacy scores increased, the scores on the MAP science test increased (Salkind, 2005). The coefficient of determination (r^2 = .319) indicated that 32% of the variability in MAP science scores can be explained by the GMRT. The standard error of measurement in predicting MAP scores on the science test by using the GMRT model for the Proficient group was 18 points. Figure 13 provides a visual representation using a scatter plot and regression line.
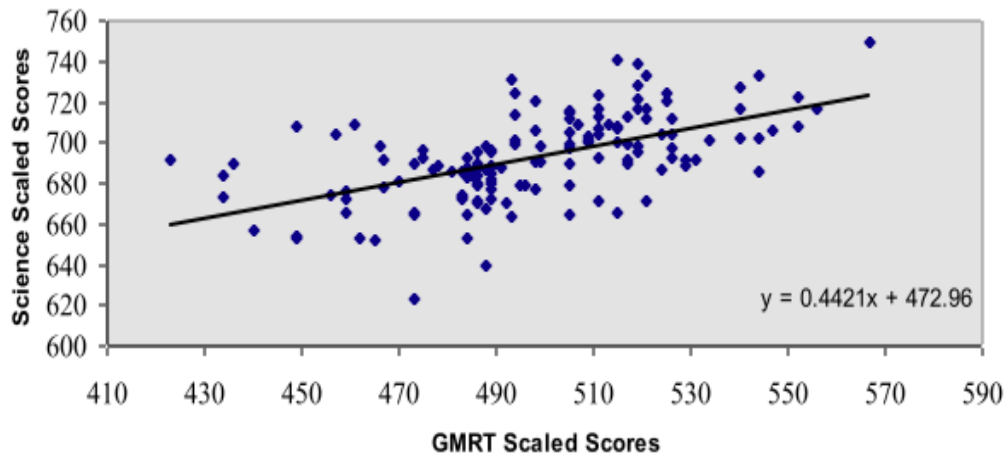
Figure 13. Scatter plot and regression line depicting the strength of the relationship between GMRT scores and MAP science scores for At-Risk and Proficient readers combined.

Table 10

The correlation coefficient, the coefficient of determination, and the standard error of measurement for the At-Risk literacy group, the Proficient literacy group, and the Combined group for MAP science

	Correlation	Coefficient of determination	Standard error
At-Risk	.088	.008	17.4
Proficient	.309	.095	16.4
Combined	.565	.319	17.6

Summary

      Chapter Four reported the results of the relationship between fourth-grade literacy scores and eighth-grade achievement test scores. This chapter detailed the descriptive statistics and tested the hypothesis. Hypothesis One stated that there is a positive

relationship between fourth-grade GMRT literacy scores and eighth-grade student achievement as measured by the MAP communication arts scaled scores at the 0.05 significant level. The results of the study indicated a strong positive relationship and therefore the researcher accepted Hypothesis One. Likewise Hypothesis Two was also accepted as there was a positive relationship between fourth-grade GMRT literacy scores and eight-grade student achievement as measured by the MAP mathematics scores. The final hypothesis for this study stated: There is a positive relationship between fourth-grade GMRT literacy scores and eighth-grade student achievement as measured by the MAP science scaled scores at the 0.05 significant level. The researcher accepted this hypothesis as the correlation indicated a moderate positive and significant relationship.

The final chapter for this study, Chapter Five, summarized the previous chapters. It provided an overview of the problem, the research questions, the methodology and major findings as related to the literature. Chapter Five concluded with implications for action and recommendations for future research.

Chapter Five

Interpretation and Recommendations

Introduction

This chapter presents an overview of the study with implications for action and recommendations for future research. The results from Chapter Four are interpreted and discussed. This study examined the relationship between fourth-grade literacy and eighth-grade student achievement on the Missouri Assessment Program (MAP) in the areas of communication arts, mathematics, and science.

Study Summary

Overview of the problem.

The twenty-first century is a text-rich world and students must be able to comprehend what they read more than any other time in history (Robinson, 2008). Initial literacy instruction begins at the early elementary level. As students progress through the educational system the structure of classrooms and instructional models change. Guthrie and Davis, researchers from the University of Maryland, specifically wrote about this change in regards to literacy. They reported, "As students make the transition from elementary to middle school, there are usually abrupt shifts in their school reading experience" (2008, p.66).

Purpose statement and research questions.

The purpose of this study was to investigate the predictive usefulness of the Gates-MacGinitie Reading Test (GMRT) administered to fourth grade students in determining eighth grade student achievement, as measured by the MAP. This research provides additional information to educators as they make decisions on curricular needs

and budgetary necessities as well as adding to the current literature on the relationship of literacy to student achievement. A comparison of the literacy /achievement relationship between varying grade levels will also provide educators insight into scheduling, departmentalization, and necessary intervention at the elementary and middle school. Students that score poorly on the fourth-grade GMRT may need additional intervention strategies in order to help them succeed by their eighth-grade year.

There were three research questions examined during this study. The first research question asked if there was a relationship between fourth grade literacy scores and student achievement on the eighth grade MAP communication arts test. The second research question asked if there was a relationship between fourth grade literacy scores and student achievement on the eighth grade MAP Math test. The third research question asked if there was a relationship between fourth grade literacy scores and student achievement on the eighth grade MAP science test.

Review of the methodology.

This research was a quantitative, correlational study. It was non-experimental in design and utilized purposive sampling. The independent variable for this study was fourth grade literacy skills as measured by the GMRT scaled scores. The GMRT scores were correlated with the dependent variable eighth-grade student achievement in communication arts, mathematics, and science as measured by the MAP scaled scores. A correlation coefficient was calculated to determine the strength and direction of the relationship between literacy and student achievement in communication arts, mathematics, and science. Three correlations were figured (communication arts, mathematics, and science) for three groups, an At-Risk literacy group, a Proficient

literacy group, and the total sample. A linear regression and scatter plot were used to visually demonstrate the strength and relationship between GMRT scores and MAP scores.

Major findings related to previous research.

The researcher found evidence that supported Hypothesis One which stated there is a positive relationship between fourth-grade GMRT literacy scores and eighth-grade student achievement as measured by the MAP communication arts scaled scores at the 0.05 level of significance. The correlation coefficient of the Combined group indicated a strong positive relationship. There was a moderate correlation between x and y for At-Risk and Proficient students. The positive nature of the trend line indicated that students who have higher literacy performance at the fourth-grade will perform better on achievement tests in later years. This supports research referenced in Robinson's paper on adolescent literacy when he concluded that reading boosts academic success (2008). He referred to a 2007 NEA report and stated that adolescents who read poorly have lower levels of academic achievement (2008, p.15).

Hypothesis Two was also supported. The study found a positive moderate relationship between fourth-grade GMRT literacy scores and eighth-grade student mathematics achievement as measured by the MAP. These results support research by F.Alexander who found "children who read well do better in other subjects" (as cited by Mothershead, 2008, p.9). Andrea Balas also wrote an article about the connection between reading and mathematics, stating, "Reading provides both context and motivation for the mathematics students" (2000, p.4). The positive and moderate relationship indicates the importance of literacy levels to achievement in mathematics.

The researcher found evidence to support Hypothesis Three, which states, there is a positive relationship between fourth-grade GMRT literacy scores and eighth-grade student achievement as measured by the MAP science scaled scores at the 0.05 level of significance. When the students were categorized as At-Risk Readers and Proficient Readers, the At-Risk Readers demonstrated a weak or no relationship. The Proficient Group's GMRT scores demonstrated a stronger relationship to the science MAP test but was still weak. The combined group showed a moderate positive relationship which was significant. The relationship between GMRT scores and MAP science scores did not indicate a strong relationship but all three literacy groups did demonstrate a positive relationship. This study also supports previous research by Valencia & Buly (2004), the Achieve, Inc (2010), and Fears (2004). All agree that the level of literacy is related to student achievement. Robinson reported, "Low-Level literacy skills in adolescents have been identified as the root cause of failure in many classes. . . "(2008, p.3). He went on to further the argument in describing textbooks as another problem for struggling readers rather than a resource for them. This implies all subjects, not just communication arts, will be affected by poor literacy skill.

Implications for action.

The results of this study were clear; literacy skills at the fourth-grade level demonstrated a positive relationship with eighth-grade student achievement in communication arts, mathematics, and science. Educators, students, and parents should benefit from this information. If students are identified as having weak literacy skills at the fourth-grade level, the district can anticipate that student achievement will suffer during the middle school years. The positive relationship between GMRT scores and

MAP scores shown by this study suggests that higher levels of literacy will lead to higher student achievement levels. If a student demonstrates a weak literacy level at the fourth-grade, educators and parents must immediately partner together and create intervention strategies. Additional support for students having limited literacy skills should increase the probability for future gains in student achievement.

Conclusions

The communication arts subtest on the MAP was the first used to test for a correlation between literacy level and student achievement as specified by hypothesis one and subsequently held the strongest correlation. Doak suggests that the ability to read is related to how well one can communicate (1995). This could have far reaching effects on students if interventions are not put in place immediately. "Reading problems can have an extremely adverse effect on a person's quality of life, opportunities in education and employment, and access to enjoyable activities" (Daly, Chafouleas, & Skinner, as cited by Dwyer, 2009). Educators must employ interventions at the first sign of distress in literacy.

The mathematics subtest was also examined which resulted in a moderate correlation to literacy. Once again, as the MAP results indicated, students without a proficient literacy level were not able to demonstrate their knowledge of mathematics. As Balas suggested, more reading with math context should be used at the elementary level. Mathematics can be taught as a language simultaneously with communication arts to help students make the connections (1997).

The science correlation was similar to the mathematics results. Both science and mathematics tests had a positive but moderate correlation to literacy. Even though

science is often a very kinesthetic, hands-on course, in order to demonstrate science achievement, it is imperative students are able to read on grade level. Many schools do not teach specific science objectives until upper elementary but they could introduce science vocabulary in early literature lessons to provide students the background information needed for achievement later.

The results of this study complete the Lexington R-V School District's program evaluation for the GMRT. The results of this study imply that literacy levels are a good predictor of student achievement. The GMRT is an extremely valuable test given at an appropriate time as it provides educators the needed information to place At-Risk students into remedial programs as they enter middle school.

Recommendations for future research.

Additional research on literacy and its relationship to student achievement could easily be extended from this current study. This particular study only examined the Lexington population. The population could be extended to include other geographic locations and a more diverse ethnic population. The sample could be limited to include non-IEP students or increase the subgroups to include an IEP group and a non-IEP group.

This study only utilized fourth-grade literacy as determined by the GMRT as the independent variable. A study could be conducted using other literacy assessments. In addition, a study could be conducted to determine what age or group level might be the best predictor of literacy skills. The sooner educators can predict deficiencies in literacy skill, the more time available for interventions.

As the literature suggests, there are a multitude of variables that could alter student achievement. Future research could include attendance, socio-economic status, or the number of office referrals to compare with student achievement.

The only measure of study achievement for this study was the MAP test in communication arts, mathematics, and science. A study could be conducted using other measures of student achievement as well as studying achievement in other areas besides communication arts, mathematics, and science.

Concluding Remarks

The No Child Left Behind (NCLB) Act has encouraged educators to become accountable for student achievement and which, in turn, has encouraged educators to analyze student achievement data. This in turn has created a change in the way decisions are made. Educators are examining data and using the analysis to assist in finding solutions. This study should help the Lexington School District use the GMRT to determine placement of incoming middle school students into literacy intervention programs. The additional support should assist students with at-risk literacy skills to become successful by the time they take the MAP test as eighth-graders. It is not just the communication arts subtest that will benefit from these interventions but other content areas as well. Lamons specifically addressed math and science when he looked at literacy comprehension levels. Because math and science are also testing a students' reading comprehension ability, it is extremely important students have those literacy skills necessary to be successful on standardized math and science tests. (2009).

If Good was correct when he stated, "Reading is a process that translates into meaningful personal, social, and economic outcomes for individuals" (as cited by Dwyer,

2009, p. 10), then a focused deliberate effort must be made to ensure students have the necessary literacy skills before they leave our schools. This study created a sense of urgency to implement the earliest possible interventions for students having limited literacy skills in order to have a meaningful adult life.

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Appendix A: Lexington R-V School District Data Use Permission Letter

Brad MacLaughlin
Superintendent of Schools

Michelle Roush
Assistant Superintendent

LEXINGTON R-V SCHOOL DISTRICT

~~To reach, teach, and challenge all students, every day, in a safe and caring environment . . . . together~~

August 5, 2009

Dear Ms. Grimes,

The Lexington R-V School District grants you permission to study historical data relating to the Gates-MacGinitie Reading Test and Missouri Assessment Program in partial completion for your doctoral degree from Baker University. It is understood that no names will be released to protect confidentiality of students and that the results of your study will be provided at no cost to the district.

Your study on the predictive nature of the Gates-MacGinitie Reading Test will provide valuable information as we continue to review and revise our literacy program. We wish you the best of luck to you in your research.
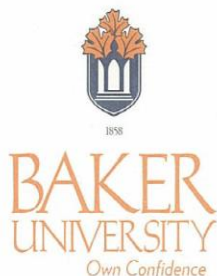
Sincerely,

Michelle Roush
Assistant Superintendent
Lexington R-V School District

Appendix B: Baker University IRB Permission Letter

March 08, 2010

Dr. Bill Neuenswander
Baker University School of Education
Baldwin City KS 66006

Dear Dr. Neuenswander:

The Baker University IRB has reviewed your research project application (M-0089-0304-0308-G) and approved this project under Exempt Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Baker University IRB requires that your consent form must include the date of approval and expiration date (one year from today). Please be aware of the following:

1.   At designated intervals (usually annually) until the project is completed, a Project Status Report must be returned to the IRB.
2.   Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
3.   Notify the OIR about any new investigators not named in original application.
4.   Any injury to a subject because of the research procedure must be reported to the IRB Chair or representative immediately.
5.   When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6.   If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform Office of Institutional Research (OIR) or myself when this project is terminated. As noted above, you must also provide OIR with an annual status report and receive approval for maintaining your status. If your project receives funding which requests an annual update approval, you must request this from the IRB one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Charmaine B.S Henry

Charmaine Henry, PhD
Chair, Baker University IRB

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