An Investigation of the Relationship between Mathematics Textbook Alignment Preferences, Mathematics Beliefs, Professional Development, Attention to the NCTM Standards, and Teaching Experience

A dissertation presented to

the faculty of

the College of Education of Ohio University

In partial fulfillment

of the requirements for the degree

Doctor of Philosophy

Valerie N. Blom

June 2009

© 2009 Valerie N. Blom. All Rights Reserved.

This dissertation titled

An Investigation of the Relationship between Mathematics Textbook Alignment Preferences, Mathematics Beliefs, Professional Development, Attention to the NCTM Standards, and Teaching Experience

by

VALERIE N. BLOM

has been approved for

the Department of Teacher Education

and the College of Education by

George Johanson

Professor of Educational Studies

Renée A. Middleton

Dean, College of Education

ABSTRACT

BLOM, VALERIE N., Ph.D., June 2009, Curriculum and Instruction <u>An Investigation of the Relationship between Mathematics Textbook Alignment</u> <u>Preferences, Mathematics Beliefs, Professional Development, Attention to the NCTM</u> <u>Standards, and Teaching Experience</u> (179 pp.)

Director of Dissertation: George Johanson

This study examined the relationship between a teachers' degree of agreement with *Standards*-based mathematics textbook characteristics (textbook alignment preferences) and influencing factors. Cluster sampling was utilized to obtain a sample of K-6 teachers from Ohio to respond to a 60 item web-based survey. A return rate of 48% was realized with 273 completed surveys suitable for analysis. Responses to the 24 items that constituted teachers' degree of agreement with *Standards*-based mathematics textbook characteristics represented the dependent variable, textbook alignment preferences. Beliefs about the teaching and learning of mathematics, emphasis of professional development, hours of professional development, years of teaching experience, and level of attention to the NCTM *Standards* represented the independent variables. Data were analyzed using descriptive methods, regression methods, and factor analysis.

Eighty-four percent of the teachers did not disagree (mean score was neutral or agreed) with the characteristics of *Standards*-based textbooks while less than one-fourth agreed. Additionally, teachers' beliefs about the teaching and learning of mathematics were close to agreement with those espoused by the NCTM *Standards*. Seventy-three percent of the participants reported teachers in their school had implemented the *Standards* in their teaching and about half reported being able to explain the *Standards*

and that they had been thoroughly discussed in their school. Participation in professional development activities was found to be relatively low for this sample of teachers.

A significant regression model where textbook alignment preferences were predicted by mathematics beliefs, prior number of years of teaching experience, emphasis of professional development, hours of professional development, and teacher attention to the NCTM *Standards* was constructed. The statistically significant predictors for this model were mathematics beliefs and prior number of years of teaching experience.

The 24-item scale of textbook alignment preferences, where the items represented differences between traditional and *Standards*-based mathematics textbooks was factor analyzed. Parallel analysis indicated a four-factor solution. One factor represented characteristics of traditional textbooks and another represented characteristics of *Standards*-based textbooks. The third factor represented technology characteristics of textbooks. The last factor represented structure of mathematics topics among textbooks. Also, a two-factor solution was explored since the items for this scale represented traditional and *Standards*-based textbooks. Most characteristics loaded on the appropriate factor (traditional (10 out of 12) and *Standards*-based (10 out of 12)). For the remaining items, three did not meet the loading criteria and one item loaded on the other type of factor. Overall, the factor analysis indicated that there is evidence of construct validity for this scale.

Approved: _____

George Johanson

Professor of Educational Studies

ACKNOWLEDGMENTS

I first want to extend my utmost gratitude to my Lord Jesus Christ. His unyielding strength and comfort helped me persevere on a daily basis through this endeavor.

Furthermore, I want to extend my sincerest thanks to my committee members Dr. George Johanson, Dr. Jim Schultz, Dr. Gordon Brooks, and Dr. Jeff Connor. These professors have given much time and energy in providing me with the guidance needed to accomplish this research. Also, I want to thank Dr. Gregory Foley for his assistance with part of the last leg of my journey.

I would also like to thank my family, dearest friends, and colleagues for their prayers, patience, and encouragement while I worked on the completion of this life long goal: Allen (I did it Dad!), Anita, and Janet Whitehead, Mitzi Jones, Mark Cooper, Barbara Rogers, Cathy Singleton, Noushi Stouffer, Melanie Musheno, Diane Polczynski, all members of the Stouffer Home Church, Rose Teuta, Colleen McKimpson, Godwin Dogbey, Sue Nichols, Holly Raffle, Mike Waters, and Jane Barnard. A special thank you to Cathy Singleton for her assistance in regards to the numerous reports she coauthored and helped disseminate to various schools in Ohio.

TABLE OF CONTENTS

Page
Abstract
Acknowledgments
List of Tables
List of Figures
Chapter 1: Introduction
Background of the Study 14
Reports and Recommendations
The Standards15
Influence of Adoption States
Controversy
Statement of the Problem
Significance of the Problem
Research Questions
Definition of Terms
Chapter 2: Review of the Literature
Introduction
History of Mathematics Textbooks
Critical Review of the Relevant Literature
Textbook Preferences, Professional Development, and Years of Teaching
Experience

Professional Development	2
Professional Development and Years of Teaching Experience	4
Textbook Use and Professional Development	5
Mathematics Beliefs, Professional Development, Years of Teaching Experience, and	d
NCTM Standards	7
Mathematics Beliefs, Professional Development, and Years of Teaching Experience)
	8
Mathematics Beliefs	8
Mathematics Beliefs and Professional Development	9
Mathematics Beliefs, Professional Development, and Years of Teaching	
Experience	0
Studies Related to the Standards Beliefs Instrument	1
Textbook Alignment Preferences, Mathematics Beliefs, Professional Development,	
Years of Teaching Experience, and Teacher Attention to the NCTM Standards 4	6
Mathematics Beliefs and Textbook Preferences	6
Mathematics Beliefs, Textbook Preferences, and Professional Development 4	7
Teacher Attention to the NCTM Standards, Textbook Use, Years of Teaching	
Experience, and Professional Development 4	8
Mathematics Beliefs, Textbook Preferences, Years of Teaching Experience, and	
Professional Development	0
Summary	3
Chapter 3: Methodology	6

7

Research Design	56
Research Questions	
Null Hypothesis	
Identification of the Population	
Sampling Plan	
Sample Size	
Participants	
Instrumentation	59
Selection/Development of Instrument	59
Pilot Study	65
Operational Definition of the Variables	
Data Collection Procedures	
Data Analysis Procedures	
Chapter 4: Results	
Data Collection and Preliminary Analysis	75
Missing Data and Data Entry Error Concerns	
Reliability Analyses	80
Teacher Background Information	
Results Relating to the First Research Question	
Descriptive Statistics for Variables	
Summated Scores	86
Pertinent Frequencies	

Results Relating to the Second Research Question	
Description of Standard Multiple Regression	
Regression Assumptions	
Sample Size	
Multicollinearity and Singularity	
Outliers	
Normality, Linearity, Homescedasticity, and Independence of Errors	
Evaluating the Model	
Evaluating the Independent Variables	
Additional Analyses	100
Factor Analysis Assumptions	101
Missing Values and Sample Size	101
Outliers	102
Factorability of R	102
Normality, Multicollinearity, and Singularity	102
Linearity	103
Factor Extraction & Rotation	103
Summary	106
Chapter 5: Summary and Conclusions	107
Methodology and Data Collection	108
Findings	109
Discussion of Research Question One	109

9

Textbook Alignment Preferences	110
Mathematics Beliefs	112
Emphasis of Professional Development	114
Hours of Professional Development	115
Years of Teaching Experience	116
Teacher Attention to the NCTM Standards	117
Summary of Research Question One	118
Discussion of Research Question Two	121
Additional Results	
Limitations of the Study	126
Recommendations for Further Research	128
References	131
Appendix A: Studies from Literature Review	146
Appendix B: Recruitment of Participants Protocol	148
Appendix C: Instrument	150
Appendix D: References for Textbook Alignment Preferences	
Appendix E: Description of Key Areas for Textbook Differences	162
Appendix F: References for Emphasis of Professional Development	163
Appendix G: Phone Scripts for Superintendents and K-6 Principals	
Appendix H: Contacts	
Appendix I: Histograms of Summated Scores	171

10

	11
Appendix J: Percentage of Responses Per Item for Variables	174
Appendix K: Component Matrix for Textbook Alignment Preferences	179

LIST OF TABLES

Page

Table 1: Correlation of Textbook Alignment Preferences and Predictor Variables	68
Table 2: Dissemination of Contacts to K-6 Teachers	78
Table 3: Missing Data Summary	80
Table 4: Reliability Analysis	81
Table 5: Percentage of Grade Levels Taught by K-6 Teachers	83
Table 6: Descriptive Statistics for Variables	85
Table 7: Descriptive Statistics for Summated Scores	87
Table 8: Agreement with Items from Textbook Alignment Preferences	89
Table 9: Agreement with Items from Mathematics Beliefs	91
Table 10: Correlations of Textbook Alignment Preferences and Independent Variab	oles 95
Table 11: Correlations of Independent Variables	96
Table 12: Summary of Standard Regression Analysis for Variables Predicting Text Alignment Preferences	book 100
Table 13: Actual and Simulated Eigenvalues	104
Table 14: Varimax Rotation of Four Factor Solution	105

LIST OF FIGURES

Page

Figure 1: Districts That Participated in Study	77
Figure 2: Residual Scatterplot	

CHAPTER 1: INTRODUCTION

Background of the Study

The launch of the Russian satellite Sputnik in 1957 was a catalyst for change in mathematics education. Before this event, members of the mathematics and science communities had grown concerned about the low mathematics achievement levels of college-bound students and military personnel (Grouws & Cebulla, 2000). Grouws and Cebulla stated that not only had these community members grown concerned but also business leaders had begun attacking American schools for ill preparing students.

Although concerns had begun before Sputnik, this event had dramatically increased public and governmental attention towards mathematics education. It specifically propelled the National Science Foundation (NSF) to award unprecedented financial support for new and experimental course-content material (Grouws & Cebulla, 2000; National Council of Teachers of Mathematics [NCTM], 1970; Schoenfeld, 2001). Prior to this event, there had been relatively little change in the content of mathematics textbooks over the years in America (Carpenter, 1963; Nietz, 1961).

The unprecedented financial support from NSF ushered in an era of change named the *new math*. However, this change was short lived. Vocal critics and a major reduction in funding for innovative mathematics textbooks gave rise to a movement of the 1970s called *back to basics* (Schoenfeld, 2001). Thus, the belief that the new math was the appropriate direction for mathematics education was replaced with the direction of the movement back to basics. "Although most schools readily retreated 'back to the basics', not everyone was pleased with this movement. There was growing concern among mathematics educators that 'back-to-basics' was an overreaction to the new math reforms and had too narrow a focus" (Grouws & Cebulla, 2000, p. 219).

Reports and Recommendations

The 1980s ushered in an era that has become known as a time of reports and recommendations. The National Council of Teachers of Mathematics (NCTM) responded with a publication in 1980 named *Agenda for Action*. It called for problem solving to be the focus of school mathematics (NCTM, 1980). A few years later, a *Nation at Risk* (Gardner et al., 1983) alerted the public to the problems with the educational system in America.

Also within this decade, a National Report on the Second International Mathematics Study published results concerning curriculum, achievement, and instructional practices at grades 8 and 12 (McKnight et al., 1987). Amidst the reports, recommendations, and research, NCTM felt the need to clarify their position with regard to the mathematics curriculum (Grouws & Cebulla, 2000). Thus, with the onset of this clarification came the *Standards* documents.

The Standards

In 1989, NCTM published the *Curriculum and Evaluation Standards for School Mathematics*. Other documents followed that amplified and extended this publication (Schultz, 2002). These documents included the *Professional Standards for Teaching Mathematics* (NCTM, 1991) and *Assessment Standards for School Mathematics* (NCTM, 1995). In the early 1990s, these three documents collectively came to be known as the *Standards*. Also in 1989, *Everybody Counts* established the need for change in the way we teach mathematics and outlined a plan for action (National Research Council [NRC], 1989).

The following year, the Mathematical Sciences Education Board (MSEB) and NRC published *Reshaping School Mathematics* (1990) and its purpose was to "complement *Everybody Counts* and the *Standards*" and to "propose a framework for reform of school mathematics in the United States" (p. xi). This framework for reform of school mathematics stated, "real curriculum change is possible only if it is accompanied by new curricular materials" (MSEB, 1990, p.49). The *Curriculum and Evaluation Standards for School Mathematics* document had at its core a series of four process standards (problem solving, connections, communication, and reasoning) along with a list of content standards, such as geometry and algebra.

The *Standards* suggested a mathematics curriculum very different from what schools had been using. It proposed "a vision of mathematical power for all in a technological society" (NCTM, 1989, p. 255). "The efforts to reform school mathematics embodied in the NCTM *Standards* documents created opportunities to develop curricula that would follow these recommendations. The NSF funded development projects that have produced new forms of curriculum materials" (Chavez-Lopez, 2003, p. 8). Additionally, the curriculum materials which were developed based on the vision of the *Standards* documents and funded by the NSF for K-8 mathematics are *Everyday Mathematics, Investigations in Number, Data, and Space, Math Trailblazers, Think Math!, Connected Mathematics Project, Mathematics in Context, MathTHEMATICS*, and *MathScape* (Chavez-Lopez, 2003). These mathematics textbooks are recognized by the mathematics education community to reflect the ideas of the *Standards* documents and from this point forward are called NSF-funded textbooks or *Standards*-based textbooks. Additionally, non-NSF-funded textbooks are those mathematics textbooks published without NSF-funds.

A subsequent edition of the *Standards* documents was published in 2000, *The Principles and Standards for School Mathematics* (*PSSM*). This document built on, consolidated, and clarified messages from the previous *Standards* documents (NCTM, 2000). Although a subsequent edition of the original *Standards* was published in 2000, *PSSM*, the core concepts have stayed consistent for both publications.

Recently, NCTM (2006) published *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics*. This document's intention was to extend *PSSM* and provide "a starting point in a dialogue on what is important at particular levels of instruction" (p. vii).

For the remainder of this document the term *Standards* will collectively refer to the following publications by NCTM: *Curriculum and Evaluation Standards for School Mathematics, Professional Standards for Teaching Mathematics, Assessment Standards for School Mathematics, PSSM*, and *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics.*

Influence of Adoption States

Along with the publication of the *Curriculum and Evaluation Standards of School Mathematics* in 1989, the efforts to reform school mathematics were evident to varying degrees in the 1980s and 1990s. This evidence was apparent by both California's and Texas' curriculum guidelines and adoption criteria. The book *A History of School Mathematics* described that,

Both Texas and California tended to reflect national reform directions in the 1980s and into the 1990s. In California, state guidelines of the late 1980s and early 1990s were quite consistent with, and actually outdistanced,

recommendations made in the NCTM (1989) *Standards*. (Seeley, 2003, p. 972) Seeley described that since California and Texas accounted for nearly one-fifth of the total market for textbooks and instructional materials, these large adoption states possibly inadvertently pushed the national market in innovative directions.

Controversy

In the late 1980s and early 1990s, a push for innovative directions was on the horizon for mathematics education, but eventually controversy arose. Dissension regarding the California Mathematics Framework soon followed "what seemed to be an overwhelming national consensus on directions for change in mathematics education" (Schoen, Fey, Hirsch, & Coxford, 1999, p. 444). "In California, the claim that the 1992 framework had failed its elementary students was widespread by early 1995, in spite of the fact that curricula aligned with the framework would not be available until fall of the same year" (Becker & Jacob, 2000, p. 530). Ultimately, the dissension led to the rewriting of the California Mathematics Framework in the late 1990s. It reflected "a shift away from reform mathematics and towards a basics-only approach" (Seeley, 2003, p. 973).

The dissension went beyond California and spread throughout the nation due to "passionate resistance from some dissenting mathematicians, teachers, and other citizens" (Schoen & et al., 1999, p. 444). Schoen et al. reported that the spirited debates about mathematics reform have led some for and against the change to indulge in such angry rhetoric where the controversy has come to be called the "math wars". Through reports in the media, internet mailings, and debates in the meetings and journals of mathematics professional societies, the dissemination of criticisms for both traditional and reform mathematics has been evident and has brought national attention to the *Standards* (Schoen & et al., 1999).

In the midst of this national attention, are the textbooks that teachers' use and students learn from. Differing beliefs "with regard to what is important to learn and how it should be taught are nothing new in mathematics education. And at the heart of the discussion are the written curricula (i.e., the textbooks) that American students use in their mathematics classes" (Reys, 2001, p. 255).

Statement of the Problem

Research has shown that K-6 teachers use mathematics textbooks as their principle curriculum guide and source of lessons (St. John, Fuller, Houghton, Huntwork, & Tambe, 2004; Weiss, Banilower, McMahon, & Smith, 2001; Stigler & Hiebert, 1999). A mathematics textbook "often determines what teachers will teach, how they will teach it, and how their students will learn" (Reys, Reys, & Chavez-Lopez, 2004, p. 61).

Most mathematics textbooks looked alike until the NSF launched a major initiative to create new mathematics textbooks based on the *Standards* (Reys et al., 2004). With *Standards*-based mathematics textbooks available, do teachers prefer or desire them? Since the onset of the *Standards*, research has reported relatively low numbers of K-6 teachers using *Standards*-based textbooks (ARC Center, 2002; Weiss et al., 2001). Thus, what are the characteristics K-6 teachers' prefer in a *Standards*-based mathematics textbook? What is the degree of textbook alignment of these preferences to the *Standards*? Are there factors that predict the degree of textbook alignment preferences to the *Standards*? If so, then how well do they predict the alignment of these textbook preferences to the *Standards* for K-6 teachers?

A study conducted by Chavez-Lopez (2003) employed mixed methods to investigate how middle grades teachers use district-adopted mathematics curriculum materials. Pertinent to this research, survey data for hours of professional development and three case studies were examined. The case studies examined the relationship between the teachers' stance towards or preferences for their middle grades textbook and beliefs in the teaching and learning of mathematics, professional development (hours and emphasis), years of teaching experience, and the level of teacher attention to the *Standards*.

Chavez-Lopez (2003) investigated two items by quantitative means (hours of professional development and years of teaching experience) and this research was conducted at the middle grades level. Elementary NSF funded textbooks are published and written at the K-6 level and elementary mathematics lays the foundation for subsequent mathematics learning. Thus, there is a need to investigate mathematics beliefs, emphasis and hours of professional development, years of teaching experience,

teacher attention to the NCTM *Standards*, and textbook alignment preferences at the K-6 level quantitatively.

In conclusion, this study proposes to use quantitative methods to analyze the relationship between K-6 teacher textbook alignment preferences, mathematics beliefs, emphasis of professional development training, hours of professional training, years of teaching experience, and teacher attention to the NCTM *Standards*. In addition, comments will be solicited from participants to gain a better understanding of the quantitative results.

Significance of the Problem

Standards-based textbooks funded by NSF differ in substantive ways from traditional textbooks since the later tend to focus on the attainment of skills, cover many topics superficially, and are highly repetitive (Trafton, Reys, & Wasman, 2001).

As an illustration of the differences in traditional and *Standards*-based mathematics curriculum materials, Reys and Bay-Williams (2003) compared a lesson from these materials. Their lesson examples "illustrate that a textbook (if used as presented) influences both the coherence of the mathematics (integrating mathematical ideas) and the way in which it is taught (through explicit explanation or through exploration and discovery)" (p. 124). Further, "mathematics textbooks have the potential to promote good instructional methods and a well-articulated, coherent, and comprehensive mathematics curriculum" (Reys & Bay-Williams, 2003, p. 124).

Since differences exist among traditional and *Standards*-based textbooks, then textbook adoption committees may find difficulty in the selection process. Specifically,

criteria for selection of textbooks are not always based on the differences among characteristics of these textbooks. In *Getting Together Over a Good Book*, Bush, Kulm, and Surati (2000) described the circumstances that typically pervade mathematics textbook adoption. They stated the following:

Unfortunately, research shows that teachers often make textbook choices based on factors unrelated to learning, teaching, or *Standards*. Instead, they choose materials that look and feel familiar, for example, or materials that are offered with an attractive array of support materials. What's more, many teachers – even if they are familiar with the NCTM *Standards* – are unprepared to judge how well a particular book reflects those standards. (p. 34)

A teacher's level of attention given to the *Standards* (teacher attention to the NCTM *Standards*) is in question since they struggle with how well a mathematics textbook aligns with the *Standards*. Further, is it possible that a teacher who preferred a *Standards*-based textbook would have a high degree of agreement with the characteristics consistent with these texts (textbook alignment preference)?

Researchers have reported other factors that influence the selection process. St. John et al. (2004) reported items such as the state standards, district or state standardized tests, and district framework had influenced the selection of K-12th mathematics instructional materials. Another researcher found that elementary teachers who teach mathematics considered instructional effectiveness, curriculum requirements, affordability, and student appeal as the most important factors when selecting instructional materials (Schwab, 2002).

While these items from St. John et al. (2004) and Schwab (2002) are important considerations in the selection of K-6 mathematics textbooks, they were not found among the literature as differences for traditional and *Standards*-based textbooks. Additionally, while this study would have implications for textbook selection, this is not an objective of this research.

Again, a mathematics textbook often influences instruction for K-6 mathematics (Reys et al., 2004). Other researchers have found that mathematics instruction, the teaching and learning of mathematics, were influenced by teachers' beliefs. For instance, Thompson (1984) concluded that mathematics teachers' views, beliefs, and preferences did influence their instructional practice. "Because most mathematics teachers rely quite heavily on the textbook, one might think that changing the textbook would change teaching" (Stigler & Hiebert, 1999, p.98). However, Battista (1994) believes that it is teachers' mathematics beliefs that will bring about change. He stated "all our efforts to make the mathematics curriculum consistent with the NCTM *Standards* will fail if teachers' beliefs about mathematics do not become aligned with those of the reform movement" (p. 468).

Researchers Zollman and Mason (1992) created a mathematics beliefs instrument (*Standards* Beliefs Instrument) that measured the consistency of an individual's beliefs about mathematics teaching and learning with the *Standards* (mathematics beliefs). Thus, with this instrument a degree of agreement with the *Standards* can be measured regarding an individuals mathematics beliefs.

A study by Furner (1996) examined the relationship between mathematics beliefs and years of teaching experience. This study was published seven years after the initial release of the *Standards* document. It found that recent college graduates had mathematics beliefs that were more aligned with the *Standards*. He reported "this may be attributed to the dissemination of the *Standards* during pre-service training" (p. 47). Thus, this researcher found teachers with fewer years of teaching experience may have beliefs more aligned with the *Standards*.

Thompson and Zeuli (1999) called for mathematics professional development training that can change teachers' beliefs and practices. The National Commission on Teaching and America's Future (1996) noted that "there is a mismatch between the kind of teaching and learning teachers are now expected to pursue with their students and the teaching they experience in their own professional development" (p. 84).

Ma's (1999) book, *Knowing and Teaching Elementary Mathematics*, discussed the findings from a study that compared the mathematical understanding among U.S. and Chinese elementary school teachers. Specific to this research, the findings for this study "may relate to our understanding of teachers' work and their career long professional development" (p. xi). Particularly,

Teachers' work in China includes time and support for serious deliberations and seminars on the content of their lessons...American teachers are offered no opportunities within the school day for these collaborative deliberations, and therefore can teach for many years with out deepening their understanding of the content they teach. (p. xi)

Thus, time and emphasis of professional development training is important for growth as an educator.

Researchers Thompson and Zeuli (1999) found professional development characteristics that were successful in changing educators' teaching of mathematics were its emphasis and the total hours of professional development training. Further, Battista (1994) stated that mathematics professional development programs must last at least several weeks and must demand that teachers learn both pedagogy and mathematics.

Since professional development is a mode for changing teacher's beliefs regarding the teaching and learning of mathematic, then its emphasis is pertinent to this research. Specifically, where the emphasis of this training (emphasis of professional development) gives rise to understanding student thinking, learning how to use inquiry/investigation oriented teaching strategies, assessment, technology, and deepening mathematics content knowledge (Weiss et al., 2001).

Professional development training has been shown to influence beliefs (Thompson & Zeuli, 1999) and wide acceptance of the NCTM *Standards* would depend on teachers' beliefs (Zollman & Mason, 1992). Also, years of teaching experience may influence beliefs regarding the *Standards*.

Since *Standards*-based textbooks reflect the vision for the teaching and learning of mathematics as embodied in the *Standards* document, then it is beneficial to study the characteristics teachers prefer in textbooks. Because textbooks (Reys et al., 2004), mathematics beliefs (Thompson, 1984), and professional development (Thompson & Zeuli, 1999) influence instructional practices then these items are worthwhile to study. It

is also beneficial to study the level of teacher attention to the NCTM *Standards* since teachers are unprepared to assess how well a textbook reflects them (Bush et al., 2000). Lastly, it is beneficial to study years of teaching experience since it may influence mathematics beliefs with regards to the *Standards* (Furner, 1996).

Research Questions

This study was designed to answer the research questions listed below.

- What are the mathematics textbook alignment preferences, mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards*, as reported by K-6 teachers?
- 2. For K-6 mathematics textbooks, how well do mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* predict textbook alignment preferences?

Definition of Terms

Traditional textbooks: This refers to commercially generated textbook materials that reflect a learning perspective focused primarily on procedures and direct teaching methods (Chavez-Lopez, 2003).

Standards: This term refers collectively to the Curriculum and Evaluation Standards for School Mathematics (1989), Professional Standards for Teaching Mathematics (1991), Assessment Standards for School Mathematics (1995), Principles and Standards for School Mathematics (2000), and Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics (2006) documents (Chavez-Lopez, 2003).

Standards-based: This term refers to teaching practices or curriculum materials that reflect the view of mathematics teaching and learning represented by the *Standards* documents (NCTM, 1989; 1991; 1995; 2000).

CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

Studies have been conducted with respect to textbook alignment preferences, mathematics beliefs, professional development (emphasis and number of hours), teacher attention to the NCTM *Standards*, and years of teaching experience. This chapter's purpose is to review relevant research for the variables of interest and provide a context for how these variables were used in previous studies. Some studies are described with more detail than others. This is due to their relevance to this research.

The chapter begins with a brief history of mathematics textbooks and their pedagogical approaches. Next, it provides a description of qualitative and quantitative studies regarding the above named variables (See Appendix A for brief overview of studies). Some studies include only one variable or a combination of two or more. These studies are categorized first by the emphasis and hours of professional development, years of teaching experience, and textbook alignment preferences. The next section includes studies that describe mathematics beliefs, years of teaching experience, and emphasis and hours of professional development training. It concludes with two sections that describe four or more of the variables and a summary for the chapter.

History of Mathematics Textbooks.

In 1729, the first mathematics textbook written and published by an American, Isaac Greenwood, was *Arithmetic, Vulgar, and Decimal* (Carpenter, 1963). Carpenter described that in the same century Nicholas Pike authored the mathematics textbook the *New and Complete System of Arithmetic*. These textbooks included lessons on enumeration, the four arithmetic operations, decimals, fractions, interest, compound interest, pounds, shillings, pensions, annuities, and weight systems. They exemplified the pedagogical focus of the early colonial era.

From early colonial times in North America until about the 1820s, the only pedagogical focus found in mathematics textbooks was deductive. Called the rule method, texts with this pedagogical approach presented definitions, rules, and tables to be memorized. The rules were then practiced in exercises provided." (Michalowicz & Howard, 2003, p. 82)

The rule books were more concerned with applications of arithmetic and algebra to business and daily life (Michalowicz & Howard, 2003).

In the 1820s, other mathematics textbooks were published that espoused different pedagogical approaches to teaching mathematics, the inductive and analytic methods. The first approach was "based on the theoies of Johann Heinrich Pestalozzi" (Michalowicz & Howard, 2003, p. 86). Pestalozzi was influenced by the child-centered philosophy of Frenchman Jean-Jacques Rousseau. Thus, Pestalozzi "believed that by using the senses as the basic tools of education, mathematics teaching could help children abandon rote and mechanical approaches to problem solving and help them discover the basic principles involved" (p. 87).

Warren Colburn's texts, *An Arithmetic on the Plan of Pestalozzi, with Some Improvements* printed in 1821, was an excellent example of the inductive approach. This text and subsequent editions advocated lessons that involved the use of concrete objects or illustrations to explain number concepts and practical and appealing applications as the means of instruction (Michalowicz & Howard, 2003).

The analytic method was a companion strategy to the inductive method. "The analytic method presented an operation with an accompanying analysis-that is, a detailed explanation of a particular way to think through the solution of the problem" (Michalowicz & Howard, 2003, p. 90). A mathematics textbook that advocated the analytic method was Loudon M'Cormick's 1851 text *M'Cormick's Arithmetic*.

The proponents of the inductive and analytic texts were interested in the applicability of concepts taught, but "were more concerned with the understanding of processes than with their memorization" (Michalowicz & Howard, 2003, p.104). And those individuals that advocated for these mathematics textbooks held the belief that children could understand and not just do arithmetic (Michalowicz & Howard, 2003).

The pedagogical approach of the inductive mathematics textbooks resonates with the teaching recommendations of the *Standards* document. "With their insistence on concept attainment, analysis, and mental calculations, the texts seemed far more concerned with reasoning out a problem situation than simply applying a rule that someone else developed" (Michalowicz & Howard, 2003, p. 105).

In the 20th century, "mathematics education in the United States has been a revolving door for revisions" (Ellis & Berry, 2005, p. 8). Edward L. Thorndike's Stimulus-Response Bond theory, had a profound influence on the teaching and learning of mathematics.

Thorndike and his colleagues contended that mathematics is best learned in a drill and practice manner and viewed mathematics as a hierarchy of mental habits or connections that must be carefully sequenced, explicitly taught, and then practiced with much repetition in order for learning to occur. (Ellis & Berry, 2005, p.8) Thorndike's view of mathematics learning has failed to account for the nature of mathematical thinking as students apply this understanding in problem-solving situations.

The Progressive Movement of the 1920s was "in part a reaction against the highly structured rote schooling practices supported by Thorndike's theories" (Ellis & Berry, 2005, p. 8). Early progressive educators theorized that learning occurs best when it is connected to students' experiences and interests.

By the mid-twentieth century, NSF funding was used to create the School Mathematics Study Group (SMSG). This era of time was discussed in chapter one as the new math. This group "swiftly produced and distributed textbooks that reflected the content and viewpoint of modern mathematics...these textbooks were sent to schools nationwide in a massive dissemination effort that, for the most part failed miserably" (Ellis & Berry, 2005, p. 10). The response to this failure was the movement back to basics, also mentioned in chapter one. "This basic skills mentality dominated textbook publishing through the early 1980s, leading to another generation of Thorndike-like mathematics textbooks" (p. 10).

Further stated in chapter one, NCTM's reaction to various movements, new math and back to basics, was the publication of the *Standards* document. "This document, the cornerstone of the reform, presents NCTM's vision of how mathematics should be learned, taught, and evaluated in grades K-12" (Zollman & Mason, 1992, p. 359). With the assistance of NSF funds, this document was used to write and publish *Standards*based textbooks, which espoused the vision of the *Standards* (Martin, Hunt, Lannin, Leonard, Marshall, & Wares, 2001).

To sum up, researchers Michalowicz and Howard (2003) found that although the rule method had and still has its champions, the inductive and analytic approaches were very popular with educators and found wide use in classrooms. "Using these methods, nineteenth-century teachers promoted what in the late twentieth century was referred to as mental mathematics, logical reasoning, and number sense" (Michalowicz & Howard, 2003, p. 106). Today, textbooks still "differ in their pedagogical orientation - how the mathematics is presented to the students" (Reys & Reys, 2006, p. 379).

Critical Review of the Relevant Literature

Textbook Preferences, Professional Development, and Years of Teaching Experience Professional Development

Mid-Continent Research for Education and Learning synthesized recent research regarding education focused on different subject areas (Apthorp, Dean, Florian, Lauer, Reichardt, & Snow-Renner, 2001). This synthesis found professional development training that had a positive impact on teacher and student learning included eight characteristics. Related to this study are three training characteristics. They are the following: Focused on a content area with direct links to the curriculum; Aligns with goals and standards for student learning; Sufficient duration for practice and revision. Another study surveyed 3,560 teachers on the preparation and qualifications of public school teachers that teach different grade levels (Lewis et al., 1999). This report was undertaken by the National Center for Education Statistics (NCES) using its Fast Response Survey System (FRSS). It found that "increased time spent in professional development and collaborative activities was associated with the perception of significant improvements in teaching" (p. v). Further, "a larger portion of teachers who participated for more than eight hours believed it improved their teaching a lot compared with teachers who participated for eight hours or less" (p. v).

In 2000, the NCES conducted a second FRSS (Parsad, Lewis, & Farris, 2000). In this report researchers found the following:

More than one-half participated in professional development programs focused on the integration of educational technology into the grade or subject taught (74%), in-depth study in the area of the main teaching assignment (72%), implementing new methods of teaching (72%), and student performance assessment (62%). (p.

2)

Also, this study had the same findings as the 1999 FRSS study regarding the number of hours that teachers spent in professional development.

Cohen and Hill (1998) researched the impact of professional development in mathematics on the classroom practices of a random sample of 1,000 second through fifth grade teachers in California. These researchers found that teachers who spent more time in curriculum-centered workshops versus special topics/issues workshops reported using more instructional practices that were aligned with California's mathematics curriculum.

In Kennedy's (1999) Form and Substance in Mathematics and Science

Professional Development, 10 studies from a total pool of 93 were examined. This researcher found that "the more successful professional development programs were not simply courses in mathematics and science, but instead what to teach and how students learn that subject matter" (p.6). Further, this review found a lack of a clear benefit regarding the number of contact hours for professional development training. "The reason for the lack of clear benefit for these programs is likely related to the important role of program content" (p. 6).

Professional Development and Years of Teaching Experience

Researchers Garet, Birman, Porter, Desimone, and Herman (1999) authored a study that evaluated the Eisenhower Professional Development Program. Eisenhower Professional Development Program's focus is to assist teachers' development of knowledge and skills in mathematics and science. These researchers collected data from a national sample of 1,027 science and mathematics teachers and asked them to respond to questions regarding the emphasis and hours of Eisenhower Professional Development Program.

Garet et al. (1999) provided correlations among several variables. Two variables that are pertinent to this study were years of teaching experience and hours of professional development training. The correlation between years of teaching experience and hours of professional development was significant at alpha = 0.05 (r = 0.08).

These same researchers also found significant differences among two groups regarding the duration of time of teachers that participated in district level activities and

those that participated in university level activities, F(1, 1007) = 51.28, p = 0.00 (Garet et al. 1999). The authors reported that the teachers who participated at the university level spent more than 80 hours in professional development training and it spanned a period of several months or more. Activities supported under the district component tend to be of shorter duration.

Furthermore, the researchers conducted an analysis of the duration of time with both groups and the teacher reported improvements in skills and knowledge (Garet et al., 1999). The analyses showed that the difference in reported outcomes (in-depth knowledge of mathematics and science, instructional methods, approaches to assessment, and use of technology) between teachers from district level activities and university level activities can be explained almost entirely by the fact that teachers from the university level activities are longer and give more emphasis to content, active learning, and coherence.

Textbook Use and Professional Development

In 2004, Inverness Research Associates published *Mathematics Curricular Decision-Making: The National Landscape*. These researchers received responses from 1,386 elementary and middle school mathematics leaders across all 50 states and the District of Columbia (St. John et al., 2004). Additionally, the authors of this report stated that the respondents may represent a sample that is biased towards the vision of the NCTM *Standards*.

The data from the Inverness report indicated that teachers' preferences about textbooks were influenced by their involvement with professional development (St. John et al., 2004). "Respondents state almost all teachers have their vision of good curricula somewhat or strongly influenced by their professional development activities (93%)" (p. 13). Lastly, this study reported on the market share and teachers considering using several of the NSF-funded K-6 mathematics textbooks. It found that approximately 50% of the respondents said that they were using or considering *Everyday Mathematics* or *Investigations in Number, Data, and Space*. Another 20% said that they were using or considering *Math Trailblazers*.

While the researchers from Inverness reported on the teachers who were considering or using NSF-funded mathematics textbook, a 2007 publication by NCTM also noted the market share. "At the elementary and middle school levels, the market penetration is quite large, at between 20% and 25% of the market" (Bradley, 2007, p. x). The market share for NSF-funded mathematics textbooks at the high school level was not as large.

Almekbel (2000) researched the impact of a two-week inservice teacher enhancement program for 7th through 12th grade mathematics teachers. This qualitative study "described the ways in which the program impacted teachers in using nontraditional activities, technology, and non-traditional assessments" (p. 5). The inservice program influenced the teachers' textbook alignment preferences. Namely, "they felt that textbooks should include different activities, real-life problems, cooperative learning opportunities, connections to science, technology components, and accommodate different learning styles" (p. 99).
Mathematics Beliefs, Professional Development, Years of Teaching Experience, and

NCTM Standards

To begin this section, Perrin (2008) utilized mixed-methods to analyze 73 seventh- and eighth-grade teachers' mathematics beliefs and its relation to the NCTM's vision of school mathematics. As expected, those teachers who were aware of the *Standards* and had fully read these documents had significantly higher beliefs that aligned with NCTM's vision than those who were unaware.

Another study examined professional development training as it relates to the implementation of the *Standards* (Watson, 1995). An intensive professional development program was offered to more than 100 Ohio middle school mathematics teachers and five were randomly selected and interviewed. This professional development course was one-week in duration and emphasized alternative teaching methods aligned with the *Standards*. As a result of professional development training, Watson found that all five of the teachers "reported that they have changed or modified their teaching methods over the past few years as a result of ongoing professional development activities, interaction with other teachers, and reflecting on their students and the needs of their students" (p. 13). Also, all five of the teachers commented that they were aware of the *Standards*.

The last study in this section, the Appalachian Rural Systemic Initiative (ARSI) undertook reform efforts for mathematics, science, and technology education in Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia. Catalyst schools were formed to provide guidance for "implementation of standards-based practices and are used as models for other schools in the district and region"

(Appalachian Rural, 2000, p. 1). The study the found the following results:

Two-thirds of the catalyst schools mathematics and science teachers indicate that ARSI has influenced their teaching. Furthermore, those catalyst school teachers who report ARSI influence have greater levels of: participation in math/science professional development; attitudes aligned with standards (particularly regarding inquiry-based teaching); and use of standards-based instructional strategies (e.g. hands-on activities, student-designed investigations, cooperative group work, portfolio entries, and using technology for data collection/analysis. (p. 7)

Additionally, the ARSI project (Appalachian Rural, 2000) initially identified that no school district had a fully developed and aligned curriculum. Thus, this was a major focus of the initiative. Ultimately, this led to "many ARSI schools selecting and purchasing resources consistent with national and state standards" (p. 3).

Mathematics Beliefs, Professional Development, and Years of Teaching Experience Mathematics Beliefs

Some researchers investigated teachers' beliefs about how to teach mathematics and how students learn. Namely, Battista (1994) described two elementary teachers' beliefs as that which "consists of set procedures and that teaching means telling students how to perform those procedures" (p.462). Other researchers, Cobb, Wood, Yackel, and McNeal (1992), reported similar findings on the beliefs of an elementary teacher.

A third grade teacher was teaching the concept of place value... in one instructional activity the students looked at pictures of tens and ones blocks and

answered a series of questions-How many tens? How many ones? What number is that? - with a memorized litany of responses. There was never a discussion about why these responses were valid. (p. 579)

Cobb and his colleagues concluded that all of the instruction for this educator suggested that students understand mathematics when they can successfully follow procedural instructions.

Mathematics Beliefs and Professional Development

The two previous studies focused on the mathematics beliefs of elementary teachers. Other research has investigated the effects of professional development or training on mathematics beliefs.

First, researchers Carpenter, Fennema, Peterson, Chiang, and Loef (1989) examined the effects of a program designed to provide teachers with detailed knowledge about children's thinking. Forty first grade teachers participated in the study where half were randomly assigned to a treatment group. This treatment group (cognitively guided) "participated in a four-week summer workshop that was designed to familiarize them with the findings of research on the learning and development of addition and subtraction concepts in young children" (p. 503). The others participants, who served as the control group, attended two workshops that were two hours in duration and focused on nonroutine problem solving. Participants for this study were administered a mathematics beliefs instrument developed by the authors before the training and one year after training. Group by Time analyses of variance (ANOVA) indicated a significant time by treatment interaction, F(1,38) = 9.16, p < 0.01. This result indicated that after the workshop and one year of teaching the treatment group of teachers were more cognitively guided in their beliefs than were control teachers.

A different study analyzed data regarding the Local Systemic Change (LSC) to "improve instruction in science, mathematics, and technology through professional development within whole schools or school districts" (Banilower, Boyd, Pasley, & Weiss, 2005, p. 1). These researchers found that teachers' over time and with participation in the LSC professional development, grew in content knowledge, understanding student thinking, how to assess students, understanding of technology, how to use inquiry-oriented teaching methods. Additionally, teachers advocated that new beliefs about how students learn were due to their time spent exposed to inquiry-based instruction in LSC.

Mathematics Beliefs, Professional Development, and Years of Teaching Experience

This next study found results for teachers' beliefs, professional development, and years of teaching experience. Namely, Horizon Research conducted nationwide observations for mathematics and science lessons (Weiss, Pasley, Smith, Banilower, & Heck, 2003). This study collected data from 364 mathematics and science lessons using a structured observation protocol. The investigation found that teachers' knowledge, beliefs, and experience influenced the selection of instructional strategies in 9 out of 10 mathematics/science lessons. Further, teachers' knowledge, beliefs, and experience influenced the observed mathematics and science lessons. The textbook/program designated for the class influenced the selection of instructional strategies in 71% of the mathematics and science lessons. And teacher professional

development that is provided by the district influenced 31% of mathematics and science lessons. Additionally, content was influenced by teacher professional development that was provided or encouraged by the district in a small percentage, 2%, of the mathematics and science lessons.

Studies Related to the Standards Beliefs Instrument

Zollman and Mason (1992) conducted research with the purpose to create an instrument (*Standards* Beliefs Instrument-SBI) that could be used to evaluate the consistency of teachers' beliefs regarding teaching and learning with the *Standards*. As part of its development, the researchers compared the reliability of the measure for two distinct groups. One group, which consisted of a general population of teachers (N = 123), did not have explicit training of the *Standards*. The other group (N=13) consisted of a trained population of graduate students that studied the *Standards* as part of a graduate course. Zollman and Mason reported the reliability of the SBI as evidence for the consistency of ratings from individuals more familiar with the *Standards*. Cronbach's alpha coefficient = 0.79 for the trained group and 0.65 for the general population of teachers.

Other researchers have used the SBI for research regarding mathematics beliefs. To begin, Furner (1996) investigated the mathematics beliefs and years of teaching experience of 41 seventh and eighth grade mathematics teachers using the SBI (Zollman & Mason, 1992). The researcher utilized ANOVA methods to analyze if there was a significant difference between the SBI scores of teachers with five or less years of teaching experience and those of more than five years. The results of the ANOVA test indicated no significant difference existed. Furner further reported that the overall mean on the SBI was 43.07 (scale: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree) which "may suggest that overall the teachers do not display high levels of knowledge or beliefs about using the *Standards*" (p. 46). Additionally, teachers with less than five years of experience had a slightly higher mean score (45.13 for less than five years and 42.58 for five or more years) on the SBI. Furner reasoned this might be due to the publication of the *Standards* just a few years prior and teachers just entering the teaching profession from a teacher preparation program that included a study of the document.

Other researchers have used the SBI to measure preservice teachers mathematics beliefs before and after a mathematics methods course. Hart (2002), conducted a study on an alternative preparation program for elementary preservice teachers. The participants for the study included 14 preservice teachers that took "6 semester hours of mathematics content and 6 semester hours of mathematics education" (p. 2). Students were administered the SBI (Part A), another beliefs instrument (Part B), two teacher efficacy questions at the beginning of their coursework and afterwards. Another researcher developed the other beliefs instrument for this study. The mean scores for Part A (10.71) and B (36.00) in the beginning of the year indicated a more traditional perspective on teaching and learning mathematics. And the higher mean scores at the end of the coursework (Part A = 12.07 and Part B = 41.93) demonstrated that more students held beliefs consistent with the *Standards*.

A subsequent study by Hart (2004) followed eight of the 14 teachers into their first year of teaching in an urban classroom. These teachers were administered the SBI again after completing four semester hours of preparation work for their master's degree. The researcher found the participants' responses suggested "a rather stable belief perspective across the teacher and year" (p. 10).

Different researchers, Wilkins and Brand (2004), conducted a study using Hart's (2002) research design for evaluating the impact of an elementary mathematics methods course and preservice teachers' beliefs. This study included 89 preservice teachers that were enrolled in a graduate-level mathematics methods course intended for preservice teachers. Participants for this study completed the beliefs questionnaire before and after the course. The researchers evaluated whether the change over time of five classes (CLASS) was greater than what would be expected by chance by conducting a two-way ANOVA design with the pre and post beliefs questionnaire (TIME) as the repeated measure. Once the interaction effects between CLASS and TIME were found non-significant, then these researchers found overall that TIME was statistically significant for Part A and Part B of the beliefs survey (p < 0.00).

Another researcher used the SBI to examine the extent to which a secondary mathematics methods course that emphasized the *Standards* affected the mathematics teaching beliefs of pre-service teachers (Furner, 2002). Using a pretest/posttest design the researcher administered the instrument to 25 preservice teachers. A paired t-test was performed and the difference in mean test scores were statistically significant t(24) = 4.30, p < .0002.

The last two studies discussed in this section utilized the SBI to measure mathematics teachers' beliefs before and after professional development training. The first study found that middle school mathematics teachers in a North Carolina middle school "felt growing discomfort with the mathematics they were being asked to teach...and wanted help in implementing new techniques of instruction and materials" (Snead, 1998, p. 287). Thus, professional development training was implemented to address these needs. It consisted of a yearlong program that combined pedagogy and mathematical content that aligned with the *Standards*. Also, while the instructors' modeled attitudes and strategies endorsed by the *Standards*, teachers discussed and reflected on these new methods and how to incorporate them.

Snead (1998) administered the SBI before the training to 42 middle school teachers and they were also asked to report their years of teaching experience. The researcher investigated if there was a significant correlation of mathematics beliefs and years of teaching experience. The correlation value (r = -0.02) was not significant (p = 0.92). After the professional development program was completed, the participants were asked to respond to how it had influenced their teaching. They replied that they were using more *Standards*-based instructional practices such as exploring open-ended and hands-on activities, extended projects, and group work. The researcher concluded that the professional development program helped "teachers grow intellectually and develop attitudes and strategies to help them respond appropriately to the changes envisioned by the *Standards*" (p. 293).

The last study in this section investigated the effectiveness of a national program that was offered by the Public Broadcasting System (PBS) to increase elementary and middle school teachers' understanding of the *Standards* (Svec, 1997). Teachers who participated in this professional development program spent "at least two-hours per week on project activities for a school year" (p.2). To increase the teachers understanding of the *Standards* it utilized videos and on-line communication technology. Specifically, the emphasis of the professional development training included 25 video programs for each participant that demonstrated:

Standards-driven instruction, unlimited opportunities to interact with other teachers using on-line communications technology, on-line access to a mentor who provides support to individuals and orchestrates group discussions, and the opportunity to participate in two national interactive video conferences involving teachers across the country. (Svec, 1997, p. 2)

This research included 120 participants (Svec, 1997). The participants were asked to complete a pre-project survey that evaluated their beliefs about mathematics teaching and learning and if their classroom teaching was consistent with their understanding of the *Standards*. The researcher used a variation of Zollman and Mason's (1992) *Standards* Beliefs Instrument (SBI). The results for the SBI indicated that overall the participants agreed with the *Standards*. A mean score for the SBI was not reported.

Svec (1997) also described self-reported responses regarding whether the teachers' classroom were consistent with their understanding of the *Standards*. 45% of the participants responded to this question and 63% (of the 45%) said their classroom was

consistent with their understanding of the *Standards*. "Twenty-two of the respondents stated why they believed it was consistent. The most frequently listed reasons were the use of manipulatives, verbal and written communication of mathematics, use of cooperative learning, and the focus of problem solving" (Svec, 1997, p. 8). After the participants completed the professional development program, the results indicated that it had a positive influence on teachers' beliefs and their implementation of the *Standards* (Svec, 1997). "Teachers reported that they are increasingly engaging the NCTM *Standards* and have changed the environment in their math classrooms to be more consistent with the *Standards*" (p.11).

Textbook Alignment Preferences, Mathematics Beliefs, Professional Development, Years

of Teaching Experience, and Teacher Attention to the NCTM Standards Mathematics Beliefs and Textbook Preferences

Recent research has indicated that the way textbooks are interpreted, how lessons are constructed and how teachers interact with students are governed by what teachers know and believe about mathematics and mathematics teaching (Putnam, Heaton, Prawat, & Remillard, 1992; Lubinski, 1994). The way textbooks are interpreted and teachers' preferences for textbooks are discussed in the next qualitative study. The researcher, Kalder (2001), found that the New York State district using *Everyday Math* preferred this textbook because it was a different approach to teaching, highly motivating for students, had a strong games component, program was clearly explained to teachers, and had a scope and sequence that spiraled. The other New York State district adopted a Silver-Burdett text for grades K-2 and Scott-Foresman for grades 3-5. This district preferred these elementary textbooks because of the support materials included with the program. For instance, decisions were made based on the workbook materials, transparencies, manipulatives, and remedial worksheets.

Mathematics Beliefs, Textbook Preferences, and Professional Development

Kauffman (2002) conducted research on the use of elementary mathematics curriculum materials of four female, second-year elementary teachers who taught from a traditional mathematics textbook, *Math Central*, and a *Standards*-based mathematics textbook, *Investigation in Number, Data, and Space (Investigations)*. Using a beliefs instrument developed by Kennedy, Ball, and McDiarmid (1993), this study found agreement between three of the four educators' beliefs and the curriculum materials they were using. Namely, two educators beliefs agreed with *Investigations*, one agreed with *Math Central*, and one disagreed *Math Central*.

Additionally, the researcher found that one of the educators, whose beliefs agreed with *Investigations*, had over 35 hours of professional development training where it emphasized the teaching and learning of the textbook materials (Kauffman, 2002). The other educator whose beliefs agreed with *Investigations* had none. The researcher also reported that the educator who did not have any professional development training with regards to the *Investigations*, doubted whether or not she was doing a good job of teaching and "explicitly relates this doubt to her own inexperience" (p. 11). The educator whose beliefs disagreed with *Math Central* had little professional development training where it emphasized the teaching and learning of the textbook materials. It was not

explicitly reported whether or not the educator whose beliefs agreed with *Math Central* had any professional development training.

Teacher Attention to the NCTM Standards, Textbook Use, Years of Teaching Experience, and Professional Development

Other researchers investigated various items in regards to science and mathematics for K-12 schools. A national study collected data from 5,728 science and mathematics teachers (Weiss et al., 2001). For the K-8th grade band, teaching experience consisted of approximately 18-20% for 0-2 years, 12-13% for 3-5 years, 14-16% for 6-10 years, 21-26% for 11-20 years, and 29-31% for greater than or equal to 21 years. Pertinent to this study, these researchers (Weiss et al., 2001) created a scale, named teacher attention to the *Standards*. This scale estimated the level of attention teachers had given to the Standards. The scale was created since a factor analysis of a series of items revealed a strong relationship among them. The items that compose this measure consist of efforts to make change inspired by the Standards, teacher implementation and discussion of the *Standards*, and extent to which the teacher is prepared to explain the Standards. Approximately 50% of K-8 teachers reported school-wide efforts to make changes inspired by the Standards and 55-59% of K-8 teachers have implemented the Standards in their teaching. Further, 30-33% of K-8 teachers have discussed the Standards school-wide and 38-41% of K-8 teachers are prepared to explain the Standards to a colleague.

This group of researchers also examined hours and emphasis of professional development training for K-8th teachers (Weiss et al., 2001). These two items are also

pertinent to this research. It reported the percentage of hours for professional development training for these teachers over the previous three years. Approximately 14% had none, 15-22% had less than six hours, 29-32% had 6-15 hours, 18-19% had 16-35 hours, and 14-23% had more than 35 hours. Further, K-8th mathematics teachers described the emphasis of professional development training in various areas. Approximately 32-34% had training regarding understanding student thinking in mathematics, 32% in learning how to use inquiry/investigation-oriented teaching strategies, 22-29% in learning how to use technology in mathematics instruction, and 20% in deepening teacher's mathematics knowledge.

The researchers also provided a list of the most commonly used elementary mathematics textbooks (Weiss et al., 2001). For grades K-5, they were *Math Advantage* (published by Harcourt Brace), *Addison-Wesley Math* and *Exploring Mathematics* (published by Addison Wesley Longman/Scott Foresman), *Everyday Math* (published by Everyday Learning Corporation), *Mathematics, The Path to Math Success* (published by Silver Burdett Ginn), and *Math in My World* (published by McGraw-Hill/Merrill).

Lastly, Weiss et al. (2001) asked mathematics teachers' to report on their familiarity with, agreement with, and implementation of the *Standards*. Sixty-two percent of K-4th and 73 percent of the 5th-8th mathematics teachers indicated that they were at least "somewhat familiar" with the *Standards*. "Further, those teachers who indicated they were familiar with the *Standards* were asked to indicate the extent to which they agree with the *Standards* and the extent to which have implemented the *Standards* in their teaching" (p. 20). Weiss et al. reported,

Approximately 75 percent of the mathematics teachers familiar with the *Standards* indicated they agreed with that vision of mathematics education. Similarly, roughly three-fourths of the mathematics teacher at each grade level who were familiar with the NCTM *Standards* indicated they have implemented the *Standards* at least to a moderate extent." (p. 20)

Mathematics Beliefs, Textbook Preferences, Years of Teaching Experience, and Professional Development

Other researchers, Peterson, Fennema, Carpenter, and Loef (1989), investigated first grade teachers' pedagogical content beliefs in mathematics, years of teaching experience and professional development training. "Thirty-nine teachers completed structured questionnaires and interviews regarding their beliefs about instruction, children's learning, and the mathematics content of addition and subtraction" (p. 1). Teachers scoring high on the beliefs assessment were regarded as having a more cognitively based perspective (CB). Those scoring low on the beliefs assessment were regarded as having a less cognitively based perspective (LCB).

Peterson et al. (1989) selected seven teachers who scored high (CB teachers) on the beliefs questionnaire and seven who scored low (LCB teachers). "Descriptive information on the teachers showed that CB teachers had more years of teaching experience (mean = 14.57) than did LCB teachers (mean = 8.00), and this difference was statistically significant, t(12) = 2.15, p < 0.05" (p. 15). Also, no differences were found for CB and LCB teachers and their participation for inservice courses or workshops or use of *Standards*-based textbooks. Another study reported on how middle school teachers use *Standards*-based and traditional textbooks (Chavez-Lopez's, 2003). This dissertation used data from the Middle School Mathematics Study, a project of the University of Missouri. Survey data that were pertinent to this study were hours of professional development training and years of teaching experience. An analysis of case studies were used to describe hour and emphasis of professional development, years of teaching experience, mathematics beliefs, and preference of the textbook they were using.

The survey data for Chavez-Lopez's (2003) study reported that 65% of the 53 participants had 11 or more years of teaching experience. Additionally, the survey data showed differences for the time spent in professional development in regards to NSF-funded (textbooks developed to reflect the vision of the *Standards*) versus non-NSF-funded (textbook materials that are not funded by the NSF) middle school mathematics textbooks. "When separated by the kind of textbook they use, the teachers using NSF funded textbooks seemed to have had as a group, more opportunities for professional development" (p. 65). Specifically, 19% of teachers using NSF-funded textbooks reported that they had 16 or more hours of professional development training in the last three years. Those using non-NSF-funded textbooks had 11% of 16 or more hours of professional development training.

Chavez-Lopez (2003) selected three teachers for case studies. Two of the participants used *Standards*-based curriculum (*Mathematics in Context*) while one used a traditional curriculum (*Saxon Math*). The two participants who used the *Standards*-based curriculum had 32 years of teaching experience (Participant A) and the other had seven

years (Participant B). The participant (Participant C) that used the traditional curriculum had 13 years of teaching experience.

During the last three years the Participants A and B had accumulated over 35 hours of professional development training that focused on mathematics teaching (Chavez-Lopez, 2003). The emphasis of their professional development training included learning how to use inquiry and investigation-oriented strategies and understanding student thinking in mathematics. Additionally, the professional development hours consisted of learning how to use the *Standards*-based text *Mathematics in Context*. Participant C's professional development hours were less than 6 hours. The researcher did not report the emphasis of the professional develop training for this individual.

Also, Chavez-Lopez (2003) reported the mathematics beliefs of the three participants. Participants A (used *Standards*-based text) and C (used traditional text) had similar mathematics beliefs. Chavez-Lopez (2003) reported their beliefs as, "mathematics teaching is viewed as a set of procedures and mathematics teaching as being concerned with students mastering those procedures" (p. 111). This researcher found that Participant A's belief of mathematics is what shaped his preference for the *Standards*-based textbook (did not prefer it) and his long career of teaching has shaped his teaching practices (Chavez-Lopez, 2003). Also, Participant C preferred the traditional textbook since she was on the adoption committee and was a strong advocate for its selection. Participant B (used the *Standards*-based textbook) had mathematics beliefs that agreed with the textbook (Chavez-Lopez, 2003). "Solving problems and being able to explain with clarity one's solution were of paramount importance...a view compatible with the tenets of the curriculum" (p. 131). Additionally, this participant was part of the adoption committee for selection of the reform textbook. Thus, the *Standards*-based textbook was a match for her beliefs about mathematics learning and teaching.

Summary

From colonial times to present day, mathematics textbooks have been a predominant entity in classrooms and have advocated different pedagogical approaches (Michalowicz & Howard, 2003; Reys & Reys, 2006; St. John et al., 2004).

Because mathematics textbooks advocate different pedagogical approaches, studies have examined teachers' preferences for mathematics textbooks that are available in today's market. Three studies that were reviewed reported the use of NSF-funded mathematics textbooks and/or purchase amount of these materials (St. John et al., 2004; Silver & Castro, 2002; Weiss et al., 2001). While an assessment of the most commonly used mathematics textbooks is worthwhile information, a quantitative study that included an instrument that measured K-6 teachers' mathematics textbook alignment preferences was not found.

Studies were found that reported some of the characteristics teachers' preferred in mathematics textbooks and some of them are aligned with *Standards*-based texts (Kalder, 2001; Almekbel, 2000). Research that quantitatively described the characteristics of K-6 mathematics textbooks teachers' prefer was not found.

Additionally, other studies have described professional development training that aligned with *Standards*-based pedagogy (St. John et al., 2004; Apthorp et al., 2001; Kennedy, 1999; Garet et al., 1999; Watson, 1995; Appalachian Rural, 2000; Snead, 1998; Svec, 1997; Weiss et al., 2001). These studies reported how the training had positively influenced the teachers' *Standards*-based pedagogy. Other research described how respondents stated that good mathematics curricula were influenced by professional development activities (St. John et al., 2004).

Studies from this review also found that teachers who had more than eight hours of professional development training did have positive impacts on teacher's perceptions of improvements in teaching (Lewis et al., 1999; Parsad et al., 2000). Also, researchers found that the number of hours of professional development and its emphasis did enhance teacher's mathematical knowledge and skills (Garet et al., 1999).

Further, researchers have found that mathematics beliefs impact the way textbooks are interpreted and how mathematics is taught (Putnam et al., 1994). Also, Thompson (1984) found that beliefs impact an individual's preferences. Thus, beliefs may impact a teacher's textbook alignment preferences.

Additionally, Furner's (1996) study showed that years of teaching experience did not influence mathematics beliefs and Peterson et al. (1989) demonstrated that it did. Thus, the researcher has not found conclusive evidence from the literature that years of teaching experience influences beliefs. However, it was not found in the literature that these variables do not have a relationship with teacher textbook alignment preferences.

Based on the previous research, mathematics beliefs, emphasis of professional development, hours of professional development, teacher attention to the NCTM *Standards*, and years of teaching experience were found to have an impact on *Standards*-based pedagogy. The literature had not clarified if a relationship existed between these

items and K-6 teachers' preference for mathematics textbooks. Since *Standards*-based textbooks espouse this pedagogy, then an investigation of the relationship between these items was the focus of this study.

CHAPTER 3: METHODOLOGY

Research Design

This study was designed to answer the research questions and hypothesis listed below.

Research Questions

- What are textbook alignment preferences, mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* as reported by K-6 teachers?
- 2. For K-6 textbooks, how well do mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards*, predict textbook alignment preferences?

Null Hypothesis

 $H_0: R^2 = 0$

 $H_a: \mathbb{R}^2 \neq 0$

The first research question was investigated using descriptive methods.

Specifically, the mean, standard deviation, and summated scores of the relevant variables are reported. Also, any pertinent frequencies per item are reported. The second research question was investigated by regression methods. The null hypothesis refers to the overall inferential test in multiple regression, which is "whether the sample of scores is drawn from a population in which multiple *R* is zero" (Tabachnick & Fidell, 2001, p. 142).

These authors also stated, "this is equivalent to the null hypotheses that all correlations between the dependent and independent variables and all regression coefficients are zero" (p. 142). For this research, textbook alignment preference is the dependent variable and mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* are the independent variables. Additionally, this study asked participants to comment on his/her mathematics textbook and/or the selection of his/her textbook. This chapter presents a full description of the research design and statistical analysis used in the study.

Identification of the Population

The target population for this study was Ohio's K-6 classroom teachers who teach mathematics. The population of teachers was chosen due to their use of textbooks for mathematics instruction. Namely, research has demonstrated that a majority of K-6 teachers use mathematics textbooks as their principal curriculum guide and source of lessons (Weiss et al., 2001; St. John et al., 2004). It was also chosen because K-6 mathematics lays the foundation for middle and secondary mathematics. Lastly, Ohio was chosen due to its convenience for the researcher.

Sampling Plan

Sample Size

Sample size for this research project was an important first consideration. The issue with sample size in regression is generalizability. For regression methods, the "required sample size depends on a number of issues, including the desired power, alpha

level, number of predictors, and expected effect sizes" (Tabachnick & Fidell, 2001, p.117).

Taking into consideration these issues, sample size and power calculations for the regression analysis was determined using Sample Power software (Borenstein, M, Rothstein, H, Cohen, J., Schoenfeld, D., & Berlin, J., 2000). For regression methods, the effect size for sample size calculations is R^2 . For a medium effect size, Cohen's (1987) estimate of $R^2 = 0.13$. Thus, the study design, which incorporates five predictors will utilize a minimum sample size of 104 based upon a medium effect size ($R^2 = 0.13$) and alpha = 0.05. The power to reject the null hypothesis for this study was calculated as 0.81.

Additionally, Stevens (1999) recommended approximately 15 participants per predictor, total of 75 participants, to yield a reliable regression equation. This agreed with the Sample Power software estimate of sample size, total of 104 participants, with a medium effect. Thus, a conservative sample size of N = 104 was established for this research.

Participants

Participants for this study consisted of a sample of Ohio's K-6 classroom teachers who teach mathematics. This research utilized cluster sampling where an initial simple random sample of 50 school districts from the 612. These school districts were obtained from the Ohio Department of Education website (Ohio Department of Education, 2006). To obtain the participants (K-6 teachers who teach mathematics) for this study, the researcher first gained permission from the superintendent to the conduct the study in the district. Subsequently, K-6 principals in each district were contacted to gain their cooperation in enlisting teachers. Once this cooperation was obtained, K-6 teachers were invited to complete a survey (see Data Collection section for information regarding dissemination of survey). Appendix B includes a recruitment protocol for the study. Enlistment of participants also required considering the study's response rate. Research for response rates has reported that the average response rates are decreasing (Sheehan, 2001; Hamilton, 2003; Kaplowitz, Hadlock, & Levine, 2004). These researchers reported the average response rate was approximately 25% for emailed surveys, the primary distribution method of this research. Thus, this study observed a conservative 20% response rate where 500 K-6 teachers were sent the survey to gain the 104 participants needed for analysis.

Instrumentation

Selection/Development of Instrument

The instrument (Appendix C) that was used for this research collected data for teachers' textbook alignment preferences, mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* as reported by K-6 teachers. It is a compilation of researcher created and previously used measures.

The instrument utilized for this research consists of 60 items. Five items asked the K-6 teachers information regarding his/her background (gender, current grade level educator is teaching, highest degree earned, number of prior years of teaching experience, and name of school). Included in this background information was one of the independent

variables, number of prior years of teaching experience. A different item asked the participant to name the title, publisher, and copyright of the K-6 mathematics textbook he or she was using. Another item asked the participant to respond to whether or not the K-6 mathematics textbook was more traditional or aligned with the NCTM *Standards* document.

The other 54 items were used to create the dependent and most of the independent variables. The dependent variable, textbook alignment preferences, consisted of 24 items where participants were asked to indicate their extent of agreement (0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, 4 = strongly agree) with characteristics of *Standards*-based and traditional K-6 mathematics textbooks. Traditional textbook characteristics were considered to have negative valence and were reversed to coincide with the positive valence items (*Standards*-based textbook characteristics). Therefore, high composite mean scores (\geq 3.00) indicated that teachers' agreed with characteristics of *Standards*-based textbooks; conversely, low composite mean scores (< 2.00) indicated that teachers' disagreed with *Standards*-based textbooks (traditional mathematics textbooks).

One of the independent variables, mathematics beliefs, consisted of 16 items where participants were asked to indicate their extent of agreement (0 =strongly disagree, 1 =disagree, 2 =agree, 3 =strongly agree) with statements that are consistent with the mathematics teaching and learning as espoused by the NCTM *Standards*. This measure did not address beliefs about mathematics. Half of the items that agreed with the 1989 *Standards* were considered to have positive valence; conversely, the other half that disagreed with the 1989 *Standards* were considered to have negative valence (Zollman & Mason, 1992). After the negative items were reversed, high composite mean scores (\geq 2.00) indicated that teachers' mathematics beliefs agreed with the teaching and learning espoused by the *Standards*; conversely, low composite mean scores indicated that teachers' mathematics beliefs disagreed (< 2.00) with the teaching and learning espoused by the *Standards*.

Another independent variable, teacher attention to the NCTM *Standards*, consisted of four items where participants were asked to indicate their extent of agreement (0 = strongly disagree, 1 = disagree, 2 = agree, 3 = strongly agree) with the work NCTM has set forth in setting standards for mathematics curriculum, instruction, and assessment. High composite mean scores (\geq 2.00) for this variable indicated that teachers' had a high level of attention to the work NCTM has set forth in setting standards for mathematics curriculum, instruction, and assessment (Weiss et al., 2001). Conversely, low composite mean scores (< 2.00) for this variable indicated that teachers' had a low level of attention to the work NCTM has set forth in setting standards for mathematics curriculum, instruction, and assessment (Weiss et al., 2001).

A third independent variable, emphasis of professional development, consisted of five items where participants were asked to indicate the extent their training (0 = not at all, 1 = slightly, 2 = somewhat, 3 = a good deal, 4 = to a great extent) emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, and assessment for mathematics over the past five years. A composite mean score of 2.00 indicated that a teachers' professional development had somewhat

emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, and assessment for mathematics over the past five years.

A fourth independent variable, hours of professional development, consisted of five items where participants were asked to indicate how much time (0 =none, 1 = less than 6 hours, 2 = 6-15 hours, 3 = 16-35 hours, 4 = more than 35 hours) was spent in training that emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, and assessment for mathematics over the past five years. A composite mean score of 2.00 indicated that a teacher had spent 6-15 hours in professional development training that emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, assessment for mathematics content knowledge, student thinking, teaching strategies, technology, assessment for mathematics over the past five years. A composite mean score of 2.00 indicated that a teacher had spent 6-15 hours in professional development training that emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, assessment for mathematics over the past five years. Last, participants were asked to make comments regarding their mathematics textbook and/or the textbook selection process in their district.

Validity of Dependent Variable.

The researcher developed the dependent variable, textbook alignment preferences. It was developed using literature on the differences between traditional and *Standards*based textbooks. This literature established the content validity of the instrument. Appendix D provides a list of references that support each item for this variable. An existing measure of textbook alignment preferences could not be located.

The literature suggested that differences exist among traditional and *Standards*based textbooks (Kulm, 1999; Goldsmith, Mark, & Kantrov, 2000; Goldsmith & Mark, 1999; Martin et al., 2001; Trafton et al., 2001). Further, a national study by Horizon Research reported on the most commonly used textbooks (Weiss et al., 2001). This list consisted of both traditional and *Standards*-based curriculum materials. The key areas in which these differences exist were taken from Kulm's article on *Making Sure that your Mathematics Curriculum Meets the Standards* and Goldsmith, Mark, and Kantrov's (2000) book on *Choosing a Standards-based Mathematics Curriculum*. The researcher noted the key areas as the following: instruction, content, student work, organization, assessment, and technology. Appendix E provides the reader with a description of each area.

Using the list of most commonly used textbooks and the key areas of differences, websites, textbook evaluations, journals, and books, items were created for the dependent variable. This variable was a compilation of characteristics that represent the differences among K-6 traditional and *Standards*-based textbooks.

Validity of Independent Variables.

This study consisted of five independent variables. Prior researchers created the scales for the variables mathematics beliefs and teacher attention to the NCTM *Standards*. These scales, variables, were chosen because they are directly related to the NCTM *Standards* (Wilkins & Brand, 2004; Weiss et al., 2001; NCTM, 2000). The remaining three variables (number of years teaching, emphasis of professional development, and number of hours of professional development) were chosen due to the literature's support of them as relevant items.

Zollman and Mason (1992) created a mathematics beliefs instrument that measured the consistency of an individual's beliefs with regards to the teaching and learning as espoused by the *Curriculum and Evaluation Standards*, the 1989 version. The 16 items for the instrument used nearly direct quotes from this version of the *Standards* (NCTM, 1989). The core concepts of the original *Standards* document have stayed consistent with the subsequent edition (NCTM, 2000). Thus, its items captured the unchanged core concepts of the *Standards* documents. Also, the construct validity was established from a panel of "17 mathematics educators who had either edited, developed, and/or written parts of the *Standards*" (Zollman and Mason, 1992, p. 360).

Different researchers created another variable, teacher attention to the NCTM *Standards*, used in this study (Weiss et al. (2001). It consisted of four items that measured a teacher's self-reported implementation, school-wide implementation, teacher preparation to explain, and discussion of the *Standards*. These researchers conducted a national survey of mathematics education where strong relationships among these items existed.

Weiss et al. (2001) also created items where teachers' reported his/her emphasis of topics for mathematics professional development. Five items were used for the variable emphasis of professional development. These items measured the emphasis of a K-6 teacher's mathematics professional development training over the past five years. Appendix F provides references to support the content validity of the items.

The number of hours of professional development was a different variable for this study. It consisted of four items that measured the number of hours K-6 teachers spent in professional development over the past five years for mathematical topics from the variable emphasis of professional development.

The last variable for this study, prior number of years of teaching experience, consisted of one item.

Pilot Study

Participants (N = 23) for the pilot study were K-12 educators. They were enlisted from a graduate level curriculum and instruction course at Ohio University and a private K-12 school in Columbus, Ohio.

The initial pilot study was conducted to ascertain the reliability of the dependent variable, textbook alignment preferences. Revisions to the variable were made following suggestions of these respondents. Subsequently, a second pilot study was conducted with all variables with the educators from the private K-12 school in Columbus, Ohio (N = 16).

Descriptive Analyses.

The second pilot study population included two males (12.50%) and 14 females (87.50%). The mean score for textbook alignment preferences (3.73) was above the midpoint (3.00) and below for emphasis of professional development (2.85). Also, the mean scores were above the midpoint (2.50) for teacher attention to the NCTM *Standards* (2.45) and mathematics beliefs (2.98). The mean for prior number of years of teaching experience (8.84) was above the median (4.00) and the mean for hours of professional development (3.56) was below the median (5.00).

Reliability Issues.

Once all of the data were collected for the initial pilot study (N = 23), the negatively phrased items for the dependent variable, textbook alignment preferences were

recoded. Thus, the mean or summated score per participant represented preference for *Standards*-based textbooks.

The internal consistency of all 24 items was Cronbach's alpha coefficient = 0.79. Pallant (2001) recommends the overall Cronbach's alpha coefficient to be above 0.70. Although, Cronbach's alpha coefficient was above 0.70, five of the items were reevaluated due to negative and low correlations with the total score for alignment preferences with *Standards*-based textbooks. The re-evaluation determined that one item was to be reworded and the other four slightly altered (e.g. an "always" or "very" was included).

After additional data were collected for the second pilot study (N = 16), another reliability analysis for the dependent variable was conducted. Cronbach's alpha coefficient = 0.82 for this revised variable. Thus, the internal consistency of this variable appeared acceptable.

Reliability analysis was also conducted for the some of the other independent variables. These included mathematics beliefs, emphasis of professional development, and teacher attention to the NCTM *Standards*.

Zollman and Mason (1992) conducted a reliability analysis for their mathematics beliefs instrument. They found Cronbach's alpha coefficient = 0.65. Wilkins and Brand (2004) utilized Zollman and Mason's beliefs instrument for their study and found Cronbach's alpha coefficient = 0.66. Additionally, the second pilot study's reliability analysis of these items found Cronbach's alpha coefficient = 0.64. Although Cronbach's alpha coefficient was below 0.70 for this variable, the instrument's content validity was desirable and it's items directly related to the NCTM *Standards* (Wilkins & Brand, 2004; Zollman & Mason, 1992). Thus, it was used for the study.

The researchers that created the five items for the variable emphasis of professional development did not conduct a reliability analysis (Weiss et al., 2001). However, in the second pilot study the measure of reliability based on internal consistency was found to be adequate (Cronbach's alpha coefficient = 0.76).

Weiss et al. conducted a reliability analysis for the variable teacher attention to the NCTM *Standards*. The research group performed a factor analysis of their survey items and found that these four items had a strong relationship and the reliability was found to be adequate (Cronbach's alpha coefficient = 0.81). The second pilot data did not yield an adequate Cronbach's alpha coefficient (-0.84). However, the individual items appear quite reasonable, the variable correlated reasonably well with the dependent variable (r = 0.43), and Weiss et al. (2001) found Cronbach's alpha coefficient = 0.81. Thus, the poor reliability may have been a chance event (N = 16 for second pilot) and variable was retained for use in the study.

The second pilot study generated correlations that are listed in Table 1. A high correlation existed between textbook alignment preferences and mathematics beliefs (.72).

Table 1

Predictor Variable	Textbook Alignment Preferences
Years of Teaching Experience	-0.25
Teacher Attention to the NCTM Standards	0.43
Emphasis of Professional Development	0.63
Hours of Professional Development	0.61
Mathematics Beliefs	0.72

Correlations of Textbook Alignment Preferences and Predictor Variables (N=16)

Operational Definition of the Variables

The variables used in this study and their operational definitions are shown below.

Textbook Alignment Preferences: A teacher's textbook alignment preferences was measured by the composite mean score on a 24-item, five-point Likert scale, researcher created questionnaire. This variable measured the degree of agreement (0 =strongly disagree, 1 =disagree, 2 =neutral, 3 =agree, 4 =strongly agree) with characteristics of K-6 *Standards*-based textbooks. High mean scores (≥ 3.00) indicated that teachers' agreed with characteristics of *Standards*-based textbooks; conversely, low mean scores (< 2.00) indicated that teachers' disagreed with *Standards*-based textbooks (traditional mathematics textbooks).

Mathematics Beliefs: A teacher's mathematics belief was measured by the composite mean score on a 16-item, four-point Likert scale questionnaire (Zollman & Mason, 1992). This variable was used to indicate a teacher's degree of agreement (0 =

strongly disagree, 1 = disagree, 2 = agree, 3 = strongly agree) with statements that are consistent with the mathematics teaching and learning as espoused by the NCTM *Standards*. High mean scores (\geq 2.00) indicated that teachers' mathematics beliefs agreed with the teaching and learning espoused by the *Standards*; conversely, low mean scores indicated that teachers' mathematics beliefs disagreed (< 2.00) with the teaching and learning and learning espoused by the *Standards*.

Emphasis of Professional Development: A teacher's emphasis of professional development was measured by the composite mean score on a five-item, five-point Likert scale questionnaire (Weiss et al., 2001). This variable was used to indicate the extent a teacher's training (0 = not at all, 1 = slightly, 2 = somewhat, 3 = a good deal, 4 = to a great extent) emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, and assessment for mathematics over the past five years. For example, a mean score of 2.00 indicated that a teachers' professional development had somewhat emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, and assessment for mathematics over the past five years.

Hours of Professional Development: A teacher's hours of professional development was measured by the composite mean score on a four-item, five-point Likert scale questionnaire. This variable was used to indicate how much time (0 = none, 1 = less than 6 hours, 2 = 6-15 hours, 3 = 16-35 hours, 4 = more than 35 hours) a teacher spent in training that emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, and assessment for mathematics over the past five years. For example, a mean score of 2.00 indicated that a teacher had spent 6-15

hours in professional development training that emphasized deepening mathematics content knowledge, student thinking, teaching strategies, technology, assessment for mathematics over the past five years.

Years of Teaching Experience: Years of teaching experience was measured by a person's self-reported number of prior years of teaching experience.

Teacher Attention to the NCTM Standards: Teacher attention to the NCTM *Standards* was measured by the composite mean score on a four-item, four-point Likert scale questionnaire (Weiss et al., 2001). This variable was used to indicate a teacher's level of attention (0 = strongly disagree, 1 = disagree, 2 = agree, 3 = strongly agree) with the work NCTM has set forth in setting standards for mathematics curriculum, instruction, and assessment. High mean scores (\geq 2.00) for this variable indicated that teachers' had a high level of attention to the work NCTM has set forth in setting standards for mathematics et al., 2001). Conversely, low mean scores (\leq 2.00) for this variable indicated that teachers' had a low level of attention to the work NCTM has set forth in setting standards for mathematics curriculum, instruction, and assessment.

Data Collection Procedures

This section includes information regarding recruitment of the participants and dissemination of the survey. Most of the data were collected by the means of an electronic survey and few via paper survey. The electronic survey method was selected because of its effectiveness in collecting the kind and amount of data to be analyzed in this study.

In order to distribute the survey to the participants for the study, first a simple random sample of 50 districts was selected from Ohio's 612 districts. The recruitment procedure (See Appendix B for recruitment protocol) began by contacting the superintendent, via phone (See Appendix G for phone script), of the first chosen district. Once permission had been granted, then a K-6 principal from the district was contacted via phone (See Appendix G for phone script). The principal and researcher discussed the permission granted by the superintendent, details of the study, and ultimately if he/she would allow the research to be conducted in the school.

Once consent from the principal was granted, then in order to achieve the necessary return rate, teachers were emailed or mailed via post three different letters (contacts). These three contacts consisted of an initial contact, a thank you contact, and a final contact (Appendix H). The contacts constitute a modified version of Dillman's (2000) tailored design method. The emailed contacts included a link to the survey, which was created using the online survey software, SurveyMonkey.com, and the post mailing included a copy of the paper survey (SurveyMonkey, 2006).

The principal decided the individual who would distribute the contacts; the principal, a contact person within the school, or the researcher. If the principal chose to have the researcher distribute the contacts via email, then the teachers' email addresses were ascertained from the principal or a contact person in the school. If the principal or a contact person in the school chose to distribute the contacts via email, then the researcher emailed the contacts at the appropriate times.

The first letter distributed was an initial contact. This contact informed the teachers that the superintendent and principal have given their consent for the distribution of the survey. It also stated the study's purpose, that their consent to participate was their completion of the survey, and it provided the web link to the survey or included the paper copy of the survey. About two weeks later, a thank you email was distributed that expressed appreciation for those who responded and also indicated that if the survey had not been completed it is hoped that it would be done soon. Approximately three weeks after the initial contact, participants received a final contact. It explained that the study was drawing to a close and if they still wanted to participate then please do so within the next week. Both the thank you and final email contact included the web link to the survey or a paper copy of the survey.

A database was created to track the contacts sent to the teachers. It included district name, superintendent name, school name, principal name, mailing address, school phone number, number of teachers that were sent the survey, and type of contact and the date it was sent. Once 500 surveys were distributed, then the data collection process was completed. This same database was used to award the gift certificates to *Staples*. It was awarded to the schools for each K-6 teacher that completed the survey (\$3 per teacher). The award was distributed within four to five weeks after the school had completed the data collection process.

Data Analysis Procedures

The research questions addressed in this study are the following:
- What are the textbook alignment preferences, mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* as reported by K-6 teachers?
- For K-6 textbooks, how well do mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* predict textbook alignment preferences?

The first research question was answered using descriptive statistics. Specifically, the mean and standard deviation for textbook alignment preferences, mathematics beliefs, emphasis of professional development, hours of professional development, teacher attention to the NCTM *Standards*, and prior number of years of teaching experience are reported. Additionally, pertinent frequencies per item for the dependent and independent variables are reported. Next, after computing summated scores for textbook alignment preferences, mathematics beliefs, emphasis of professional development, and teacher attention to the NCTM *Standards*, the mean, standard deviation, possible and observed range, minimum, maximum, and percentiles were reported. Histograms of the summated scores for the appropriate variables were also included to evaluate the spread of the participants' summated scores.

The second research question was addressed using multiple regression methods. The entire set of predictors was entered simultaneously (the SPSS default procedure) since this study was not testing theory that would warrant an ordered entry. First, assumptions for this type of analysis were evaluated. These include: sample size, multicollinearity, singularity, outliers, and normality, linearity, homoscedasticity of residuals (Tabachnick and Fidell, 2001; Pallant, 2001). Second, an evaluation of the prediction equation was conducted. The evaluation of the prediction equation utilized an alpha level of .05. Multiple *R*, *F* statistic, and *p*-value of the model were reported and post hoc analyses were conducted (Tabachnick and Fidell, 2001; Pallant, 2001). Lastly, relevant solicited comments were included in the discussion of results.

The procedures described in this chapter comprise the research design that was used for this study. Descriptive statistics and multiple regression methods were used to investigate the relationship between the variables.

CHAPTER 4: RESULTS

The results of this study are presented in this chapter and organized into four main sections: data collection and preliminary analysis, first research question, second research question, and additional analyses. The two research questions are repeated here as a reference for the reader.

- What are the K-6 textbook alignment preferences, mathematics beliefs, emphasis
 of professional development, hours of professional development, prior number of
 years of teaching experience, and teacher attention to the *Standards* as reported by
 K-6 teachers?
- 2. For K-6 textbooks, how well do mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the *Standards*, predict textbook alignment preferences?

H_o: $R^2 = 0$

H_a: $R^2 \neq 0$

Data Collection and Preliminary Analysis

For the purposes of this study, cluster sampling was utilized to obtain the 500 K-6 teachers needed for the analysis. Initially, a simple random sample of 50 districts from Ohio's 612 school districts was ascertained. During the first three weeks of data collection, all superintendents from the 50 school districts were contacted via phone to obtain permission to conduct this research. By the end of the third week, 19 district superintendents had agreed to participate, 11 had declined, and 20 had not responded.

Next, the K-6 principals from the 19 districts whose superintendents agreed to participate were contacted to obtain permission to conduct this research in their school. At this point, permission that was granted from the principals equated to 448 K-6 teachers out of the 500 needed for the analysis.

To achieve the 500 K-6 teachers needed for the analysis a second contact was made to those districts that had not responded. Additionally, a second simple random sample of 50 districts was conducted to ensure the 500 K-6 teachers needed for analysis. The number of participants needed had been met at the 19th randomly chosen district from the second simple random sample. Thus, contact to the second set of district superintendents stopped.

Among the 69 districts contacted, 27 of the district superintendents agreed to participate. However, only 22 out of the 27 districts had K-6 principals agree to allow research to be conducted in their school. The 22 districts yielded 48 schools that participated in the study and ultimately 572 K-6 teachers were contacted. The shaded areas in Figure 1 represent the districts that participated in this study. From the 572 K-6 teachers that were contacted, 273 returns provided data for analysis. This yielded a 48% response rate.



Figure 1. Districts that participated in study.

During the course of the data collection process, the 572 K-6 teachers were sent three contacts that asked them to participate in the study: an initial, thank you, and final contact (Appendix H). The 48 K-6 school principals decided the manner to which to disseminate the contacts. Table 2 describes the decision each principal made with regards to the dissemination of the three contacts.

Disseminated Contacts	Number of Schools
Principal emailed contacts	31
Contact person in school emailed contacts	2
Researcher emailed contacts	9
Contacts sent via U.S. mail to principal for dissemination	6

Dissemination of Contacts to K-6 Teachers

Additionally, the data collection process (N = 273) yielded 206 responses after the initial contact, 43 responses after the thank you contact, and 24 responses after the final contact.

Gift certificates to *Staples* were issued (\$3.00 per teacher) to schools that responded to the survey. Also, district and school data were analyzed and mailed to the appropriate individual.

Missing Data and Data Entry Error Concerns

Before analysis began, the negatively phrased items for the variables textbook alignment preferences and mathematics beliefs were recoded. Next, all Likert scale items from the survey were recoded so that the lowest response option was set to zero and the others were adjusted accordingly. For instance, a variable with a scale ranging from one to four was recoded to have a scale of zero to three. By doing this, a participant of the study who answered the lowest point on every item in a variable received a zero rather than some positive number. The data were checked and corrected for errors by analyzing the frequencies for each item from the survey that constituted the variables of interest: textbook alignment preferences, mathematics beliefs, prior number of years of teaching experience, teacher attention to the NCTM *Standards*, emphasis of professional development, and hours of professional development. Specifically, the minimum, maximum, extreme values, and mean were checked to assure that the scores were within the appropriate range.

Missing value concerns were initially assessed by analyzing the case summaries of the variables' mean scores. First, the case processing summary showed that all participants, N = 273, responded to the question regarding the prior number of years of teaching experience. Next, to ensure that ample data were available per participant to compute the mean scores for most of the variables, an arbitrary inclusion rule was established. This rule was needed because five out of the six variables are scales. For example, if SPSS computes the mean score for mathematics beliefs, a 16-item scale, and a participant responded to two items, then the validity of this case for this variable is weak. Thus, a participant's responses for a variable was included if he/she responded to 50% or more of the items.

The Table 3 summarizes the missing data for this study. It illustrates that 26 to 28 participants did not respond to any of the items for five out of the six variables. Table 3 also illustrates that the remaining participants had a few items missing and therefore met the inclusion rule.

Variable	Total No. Participants w/o Data for Variable	Total No. Participants w/ Missing Data	Ratio of Fewest Item Responses to Total Items	Ν
Textbook Alignment Preferences	28	4	16:24	245
Mathematics Beliefs	27	9	14:16	246
Emphasis of Professional Development	28	0	5:5	245
Hours of Professional Development	28	0	4:4	245
Prior Years of Teaching Experience	0	0	1:1	273
Teacher Attention to the NCTM <i>Standards</i>	26	2	3:4	247

Missing Data Summary

These missing values effect both research questions. Thus, the number of participants for research question one utilized the total N since descriptive statistics were used to analyze each variable. For the analysis of research question two, it was dependent upon regression methods. Therefore, inclusion was listwise and the number of participants for this analysis was 244.

Reliability Analyses

Reliability analyses were conducted for the variables in this study that included Likert scales. Table 4 summarizes the reliability scores.

Reliability Analyses

Variables	Cronbach's Alpha Coefficient
Textbook Alignment Preferences	0.81
Mathematics Beliefs	0.62
Emphasis of Professional Development	0.90
Teacher Attention to the NCTM Standards	0.89

To begin, the reliability score for textbook alignment preferences exceeded Pallant's (2001) recommendation of 0.70. Additionally, Cronbach's alpha coefficient for this variable is consistent with the second pilot study (0.82).

Next, mathematics beliefs' Cronbach's alpha coefficient did not exceed Pallant's (2001) recommendation (0.70 or above) but it is consistent with the second pilot study's reliability score (.64). An inspection of the items for this study found one item (Mathematics should be thought of as a collection of concepts, skills, and algorithms) to have a negative correlation. Wilkins and Brand (2004) conducted a principal components analysis for the same items that composed this variable. They found the same item "did not hang together with the other items" (p. 228). Another study found this item to function inconsistently with the other items (Hart, 2002). However, Wilkins and Brand choose not to delete the item since it "did not substantially change the results of any subsequent analyses" (p. 228). These researchers also wanted to remain consistent with

other researchers (Zollman & Mason, 1992; Hart, 2002) that had used the variable. Similarly, this study has chosen to remain consistent with other researchers due to the content validity of the variable and its direct relation to the NCTM *Standards*.

For the variable emphasis of professional development, Cronbach's alpha coefficient exceeded Pallant's (2001) recommendation of 0.70. Additionally, this study's reliability score (0.90) exceeded the second pilot study Cronbach's alpha coefficient (0.76).

Lastly, the second pilot study did not yield an adequate reliability score for teacher attention to the NCTM *Standards* (-0.84). This variable was kept since Weiss et al. (2001) found Cronbach's alpha coefficient = 0.81 and the second pilot study's poor reliability may have been a chance event (small sample; N = 16). The Cronbach's alpha coefficient for this study was 0.89. This adds further evidence that the second pilot study's reliability score may have been a chance event.

Teacher Background Information

The first portion of the survey asked the participants to provide background information. This background information included questions regarding grade level assigned to teach, gender, and degrees earned. Additionally, the name of the district and school was ascertained from this portion of the survey for distribution of the gift certificates to *Staples*. There were 273 participants that provided this information and this section contains a discussion of these items.

There were 17 male (6.20%) and 256 female (93.80%) participants for this study. Additionally, 86 had their bachelors degree (31.50%), 141 participants had their masters degree (51.60%), and 46 had completed a masters degree plus 30 hours (16.80%). The participants for this study were asked to report the grade level they were assigned to teach. There were 11 participants (4%) that indicated they teach more than one grade level while one teacher reported teaching grades K-6. Table 5 shows the number of teachers per grade level that participated in the study.

Table 5

		Grade						
Responses	K	1	2	3	4	5	6	
No. of Responses	48	46	50	55	45	31	25	
Percentage of Response	17.60	16.80	18.30	20.10	16.50	11.40	9.20	

Percentage of Grade Levels Taught by K-6 Teachers

Results Relating to the First Research Question

The main goal of this section is to describe the participants' prior number of years of teaching experience, emphasis of professional development, hours of professional development, teacher attention to the NCTM *Standards*, mathematics beliefs, and textbook alignment preferences. Specifically, the mean and standard deviation for the variables, summated scores for relevant variables, and any pertinent frequencies per item were found and reported.

Descriptive Statistics for Variables

To begin, Table 6 reports the mean, standard deviation, minimum, maximum, and number of participants for each variable of interest in this study. As a reminder to the reader, the mean scores in this table were found by initially reversing the negative items (refer to section on selection/development of instrument in chapter 3) to coincide with positive items for textbook alignment preferences and mathematics beliefs. The other variables did not have negative items. Next, the average score for each participant was calculated. Lastly, the mean of the participants' averages was computed for the entire sample.

	Mean(SD)	Median	Possible Range	Observed Range	Ν
Textbook Alignment Preferences	2.34(.38)	2.33	[0, 4]	[1.25, 3.25]	245
Mathematic Beliefs	1.80(.23)	1.75	[0, 3]	[1.06, 2.56]	246
Emphasis of Professional Development	1.99(.94)	2.00	[0, 4]	[0.00, 4.00]	245
Hours of Professional Development	1.47(.95)	1.25	[0, 4]	[0.00, 4.00]	245
Prior Years of Teaching Experience	15.09(9.87)	14.00	n/a	[0.00, 37.00]	273
Teacher Attention to the NCTM <i>Standards</i>	1.63(.66)	1.75	[0, 3]	[0.00, 3.00]	247

Descriptive Statistics for Variables

The meanings of the Likert scales for all appropriate variables are repeated here for the reader. For textbook alignment preferences, 0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, and 4 = strongly agree. For mathematics beliefs, 0 = stronglydisagree, 1 = disagree, 2 = agree, and 3 = strongly agree. For emphasis of professional development, 0 = not at all, 1 = slightly, 2 = somewhat, 3 = a good deal, and 4 = to agreat extent. For hours of professional development, 0 = none, 1 = less than 6 hours, 2 = 6-15 hours, 3 = 16-35 hours, and 4 = more than 35 hours. For teacher attention to the NCTM *Standards*, 0 = strongly disagree, 1 = disagree, 2 = agree, and 3 = strongly agree. Upon further inspection of the data in table 6, the researcher found the frequency of participants mean scores above 2.00 for textbook alignment preferences. The data revealed 84.10% of the participants had mean scores of 2.00 or higher (neutral, agree, or strongly agree).

Summated Scores

Table 7 gives the mean, standard deviation, possible and observed range, and percentiles for the summated scores as they relate to the appropriate variables. The mean summated score was found by initially reversing the negatively phrased items (only for textbook alignment preferences and mathematics beliefs). Next, the sum of the responses for the items that comprise that variable was computed. Finally, the mean of the summated scores for the sample was calculated. See Appendix I for the histograms of the summated scores for each variable.

	Mean (SD)	Possible Scores	Observed Scores	Percentiles (25 th ,50 th ,75 th)	Ν
Textbook Alignment Preferences	56.11 (9.19)	[0, 96]	[30, 78]	(50, 56, 63)	245
Mathematics Beliefs	28.71 (3.74)	[0, 48]	[17, 41]	(26, 28, 31)	246
Emphasis of Professional Development	9.94 (4.69)	[0, 20]	[0, 16]	(7, 10, 13)	245
Hours of Professional Development	5.89 (3.78)	[0, 16]	[0, 16]	(4, 5, 8)	245
Teacher Attention to the NCTM <i>Standards</i>	6.51 (2.63)	[0, 12]	[0, 12]	(5, 7, 8)	246

Descriptive Statistics for Summated Scores

Pertinent Frequencies

The responses to the items from the survey that constitute the variables for this study were reviewed for pertinent frequencies. For each of the items from the variables, the mean, standard deviation, total number of participants, and percentage per item were recorded in Appendix J.

Recall that the participants of this study responded to 24 items that constituted the variable textbook alignment preferences. They were asked to state their degree of agreement with the characteristics of K-6 *Standards*-based and traditional mathematics curriculum materials. After the items with negative valence (traditional textbook

characteristics) were reversed to coincide with the positive valence items (*Standards*based textbook characteristics), the percentage of agreement (agree to strongly agree), neutral, and disagreement (strongly disagree to disagree) per item were calculated. From these results, the items that constitute textbook alignment preferences were ordered from the highest to the least percentage in regards to agreement with *Standards*-based textbook characteristics. The five highest and the five lowest agreement percentage items are summarized in the Table 8. The decision to report the highest and lowest percentage items was arbitrary.

Agreement with Items from Textbook Alignment Preference

Percentage	Curriculum Materials Characteristic
91.00	The best curriculum materials develop mathematical topics by fostering mathematical reasoning and communication among students. (SB)
87.80	The most useful assessment materials emphasize varied means of evaluation (e.g., observations, oral work, written work, student demonstrations of presentations either individually or in small groups). (SB)
86.10	Most lessons in curriculum materials should emphasize student-directed, whole-class, small-class, and individual-class instruction. (SB)
84.00	Curriculum materials that are most successful have a flexible organizational scheme with multiple points of entry. (SB)
83.30	Curriculum materials should largely focus on investigating mathematical topics and ways of thinking about solving problems.(SB)
26.60	Curriculum materials should primarily focus on teaching students to learn steps/rules for solving mathematical problems and basic facts.(TR)
25.00	Better curriculum materials should have attractive and motivating units and/or chapters titles that need not identify the mathematical content (e.g., The Amazing Race). (SB)
24.50	The best curriculum materials always develop mathematical topics in very small pieces. (TR)
23.80	Curriculum materials should largely focus on repetition and review of mathematical topics.(TR)
18.00	Better curriculum materials have units and/or chapters named by mathematical topic. (TR)

Note. SB = Standards-based textbook; TR = Traditional textbook.

It was noted that the five highest percentages were all characteristics of *Standards*-based curriculum materials. Upon further inspection of these characteristics, nine out of the twelve items were negatively skewed. This is an indication of agreement with the *Standards*-based curriculum materials. Also, the low agreement percentage items consist of traditional textbook characteristics with the exception of one (Better curriculum materials should have attractive and motivating units and/or chapters titles that need not identify the mathematical content (e.g., The Amazing Race)).

Next, participants of this study responded to 16 items that constituted the variable mathematics beliefs. They were asked to state their degree of agreement with items that measure the consistency of a person's beliefs about mathematics teaching and learning with the *Standards*. Initially, the four highest and the four lowest percentage items that represent agreement (agree to strongly agree) with the mathematics teaching and learning of the *Standards* were found. These percentages are summarized in Table 9.

Agreement with Items from Mathematics Beliefs

Percentage	e Mathematics Beliefs
99.60	Mathematics can be thought of as a language that must be meaningful if students are to communicate and apply mathematics productively.(Aligned with <i>Standards</i>)
99.20	The study of mathematics should include opportunities of using mathematics in other curriculum areas. (Aligned with <i>Standards</i>)
99.20	Learning mathematics must be an active process. (Aligned with Standards)
98.00	Students should share their problem solving thinking and approaches with other students. (Aligned with <i>Standards</i>)
38.30	Appropriate calculators should be available to all students at all times (Aligned with <i>Standards</i>)
32.90	Learning mathematics is a process in which students absorb information, storing it easily in retrievable fragments as a result of repeated practice and reinforcement
6.90	In K-4 mathematics, increased emphasis should be given to use of clue words to determine which operations to use in problem solving
5.70	Mathematics should be thought of as a collection of concepts, skills, and algorithms

It was noted that the highest percentage items that were aligned with the teaching and learning espoused by the *Standards* were above 90%. Thus, an additional analysis was conducted to further investigate the distribution of participants' responses per item, namely examining the percentage of agreement per item. This additional analysis found that nine items had high agreement for the participants (78% or more). Of these nine items, six items were aligned with the teaching and learning espoused by the *Standards*. Overall, 51.80% of the participants agreed with the majority of the items from this variable (11 out of 16 items). Lastly, all of the lowest agreement percentage items were not aligned with the Standards with the exception of one (Appropriate calculators should be available to all students at all times).

Another variable of interest in this study, emphasis of professional development, consisted of five items. The sample of K-6 teachers were asked to consider all of the professional development they had participated in during the last five years and indicate how much emphasis was placed for the five items from this variable. There were 40.4% of the participants that reported their professional development emphasized understanding student thinking in mathematics a good deal to a great extent. Also, 23.30% of the participants reported that their professional development emphasized learning how to use technology in mathematics instruction a good deal to a great extent.

The next variable analyzed for pertinent frequencies, hours of professional development, consisted of four items. Participants were asked to indicate the total amount of time over the past five years they had spent on professional development that emphasized the four items. There were 14.70% to 15.9% of the participants that had 16 or more hours of professional development for all mathematics topics from this variable.

The last variable analyzed for pertinent frequencies was teacher attention to the NCTM *Standards*. This variable consisted of four items. Participants of this study were asked to state their degree of agreement with the work that NCTM has done in setting standards for school mathematics. For all four items, 50% or more of the participants agree to strongly agree with each item. Further, 73.50% of the participants reported that teachers in their school had implemented the *Standards* in their teaching and 60.20%

reported a school-wide effort was in place to make changes inspired by the NCTM *Standards*.

Results Relating to the Second Research Question

The main goal of this section is to report the results of how well mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* predicted textbook alignment preferences. Specifically, standard multiple regression was used for this analysis. This section includes a brief description of standard multiple regression, analysis of the assumptions for this method, evaluation of the model, and post hoc evaluations.

Description of Standard Multiple Regression

Multiple regression analyses are a set of statistical techniques that allows researchers to assess the relationship between one dependent variable and several independent variables. Tabachnick and Fidell (2001) stated:

Multiple regression is an extension of bivariate regression in which several independent variables instead of just one are combined to predict a value on a dependent variable for each subject. The result of regression is an equation that represents the best prediction of a dependent variable from several continuous (or dichotonmous) independent variables. (p. 111)

One of the major types of analytic strategies in multiple regression is standard multiple regression. For this model, all of the independent variables are entered into the regression equation simultaneously (the SPSS default procedure). Each independent variable is assessed as if it had entered the regression model after all of the other independent variables had entered (Tabachnick & Fidell, 2001). Further, each independent variable is assessed "in terms of what it adds to the prediction of the dependent variable that is different from the predictability afforded by all the other independent variables" (p. 131). This study utilized this major analytic strategy in multiple regression.

For this research, the dependent variable was textbook alignment preferences and the independent variables are mathematics beliefs, emphasis of professional development, hours of professional development, teacher attentions to the NCTM *Standards*, and years of teaching experience. The entire set of predictors was entered simultaneously (the SPSS default procedure) since this study was not testing theory that would warrant an ordered entry.

Regression Assumptions

Sample Size

Sample size was determined a priori using the *Sample Power* software (Borenstein et al., 2000). It was determined with five predictors a minimum sample size of 104 was needed based upon Cohen's (1987) estimate of R^2 for a medium effect size $(R^2 = 0.13)$ and alpha = 0.05. The issue with sample size for multiple regression is generalizability. In order for a regression equation to be "reliable", Stevens (1999) recommends 15 participants per predictor. In the current study, 244 participants were included for this analysis, which yielded approximately 48 participants per predictor. Therefore, this assumption has been met.

Multicollinearity and Singularity

All of the variables show some relationship with the dependent variable (Table 10). All variables are slightly correlated with textbook alignment preferences except mathematics beliefs. This variable has a substantial correlation (r = 0.67).

Table 10

Correlations of Textbook Alignment Preferences and Independent Variables (N = 244)

	Textbook Alignment Preferences
Years of Teaching Experience	-0.21**
Attention to the NCTM Standards	0.16*
Emphasis of Professional Development	0.29**
Hours of Professional Development	0.27**
Math Beliefs	0.67**

* *p* < 0.05. ** *p* < 0.01

The correlations among the independent variables are presented in Table 11.

	Years of Teaching Experience	Emphasis of Professional Development	Hours of Professional Development	Teacher Attention to NCTM Standards	Tolerance Values
Emphasis of Professional Development	-0.02				0.49
Hours of Professional Development	-0.06	0.67*			0.54
Teacher Attention to NCTM Standards	0.07	0.43*	0.31*		0.80
Mathematics Beliefs * $p < 0.01$	-0.06	0.24*	0.20*	0.20*	0.92

Correlations of Independent Variables (N=244)

Tabachnick and Fidell (2001) stated that multicollinearity exists when bivariate correlations are 0.90 or above. The authors also warn against including two variables with bivariate correlations of 0.70 or above. All bivariate correlations are slight to moderate with the exception of emphasis of professional development and hours of professional development (r = 0.67). The tolerance values are 0.49 and 0.54 for emphasis of professional development, respectively. Pallant (2001) stated, "if this value is very low (near zero), then this indicates that the multiple correlation with the other variable is high, suggesting the possibility of multicollinearity" (p. 143). Since the bivariate correlations are not .9 or above and the tolerance values are

not near zero for either variable, then the multicollinearity assumption does not appear to be violated.

Tabachnick and Fidell (2001) stated, "screening for singularity often takes the form of running your main analysis to see if the computer balks" (p. 84). If the variables are perfectly correlated with one another, then singularity exists and the analysis is aborted. These authors recommend considering if one of the variables was created from others. None of the variables were created from one another and the analysis did not abort. Thus, the singularity assumption does not appear to be violated.

Outliers

The presence of outliers was assessed inspecting the residuals scatterplot and Mahalanobis distance. Tabachnik and Fidell (2001) defined an outlier as cases that have a standardized residual of more than 3.30 or less than –3.30. An inspection of the residuals scatterplot (Figure 2) found no residuals that met these criteria. Mahalanobis distances indicate the "distance of each case from the centroid of the remaining cases where the centroid is the point created at the intersection of the means of all the variables" (p. 68). To identify the potential outliers, a critical chi-square value of 20.52 was determined using Tabachnick and Fidell's guidelines (as cited in Pallant, 2001). Since none of the cases had a Mahalanobis distance that exceeded the critical value, then it was determined that none of the cases were outliers. Thus, this assumption has been met.



Figure 2. Residual Scatterplot.

Normality, Linearity, Homescedasticity, and Independence of Errors

The normality, linearity, homoscedasticity, and independence of errors assumptions were evaluated using the residual scatterplot (Figure 2). Tabachnik and Fidell (2001) stated, for these assumptions to be met the residuals scatterplot is nearly rectangularly distributed with a concentration of scores along the center. Upon examination of the scatterplot, the points appear to have this formation. Therefore, these assumptions appear to be met.

Evaluating the Model

In this study standard multiple regression was used. The overall inferential test in standard multiple regression is whether the sample of scores is drawn from a population where multiple R (R^2) is zero (Tabachnick & Fidell, 2001).

For this study, $R^2 = 0.49$. This means the model, expressed as a percentage, explains 49% of the variance in textbook alignment preferences. Also, "when a small sample is involved, the R² value in the sample tends to be a rather optimistic overestimation of the true value in the population" (Pallant, 2001, p. 145). Thus, the statistic Adjusted R^2 "corrects this value to provide a better estimate of the true population value" (Pallant, 2001, p. 145). The Adjusted $R^2 = 0.48$ and N = 244, which indicates R^2 is not an overestimation. Finally, R^2 was significantly different from zero, F(5, 238) = 45.43, p < 0.001.

Evaluating the Independent Variables

With a significant model, post hoc evaluations were conducted to determine the variables that contributed significantly. There were two variables that made a statistically significant unique contribution to the model. In order of importance, they are: math beliefs ($\beta = 0.63$, p < 0.001) and years of teaching experience ($\beta = -0.17$, p < 0.001). The variables emphasis of professional development (p = 0.68), hours of professional development (p = 0.07), and teacher attention to the NCTM *Standards* (p = 0.96) did not make a unique contribution. Table 12 displays the unstandardized regression coefficients (B), standard error of the estimate (SEB), the standardized regression coefficients (β), *t*-values (*t*), significance values (*p*), and semipartial correlations (sr_1^2) for the independent variables in this study and the constant.

Summary of Standard Regression Analysis for Variables Predicting Textbook Alignment Preferences

Independent Variable	В	SEB	β	t	р	sr _i ²
Constant	0.51	0.14		3.51	0.00	
Math Beliefs (MB)	1.03	0.08	0.62	12.97	0.00	0.36
Prior Years of Teaching Experience (YTE)	-0.01	0.00	-0.17	-3.67	0.00	-0.03
Hours of Professional Development (HPD)	0.05	0.03	0.11	1.79	0.07	0.00
Emphasis of Professional Development (EPD)	0.01	0.03	0.03	0.41	0.68	0.00
Teacher Attention to NCTM Standards (TAS)	0.00	0.03	0.00	-0.00	0.96	0.00

The prediction equation for this analysis is: TAP = (1.031)MB + (-0.007)YTE + (0.046)HPD + (0.011)EPD + (-0.001)TAS + 0.51. Table 12 includes the meanings of abbreviations.

Additional Analyses

The 24 items of the textbook alignment preferences variable were subjected to factor analysis using the statistics software SPSS. Tabachnick and Fidell (2001) described factor analysis as a

statistical technique applied to a single set of variables when the researcher is interested in discovering which variables in the set form coherent subsets that are relatively independent of one another. Variables that are correlated with one another but largely independent to the other subsets of variables are combined into factors. Factors are thought to reflect underlying processes that have created the correlations among variables. (p. 582)

With this understanding, the goal for this analysis was to summarize patterns of correlations among data for the variable textbook alignment preferences. The analysis includes a discussion of the assumptions, factor extraction and factor rotation. The interpretation of this factor analysis is discussed in Chapter 5.

Factor Analysis Assumptions

Missing Values and Sample Size

The data set for the variable textbook alignment preferences were assessed for missing values due to the sensitivity of factor analysis procedures. There were six cases that had missing values for this variable. These cases were deleted based on the recommendation of Tabachnick and Fidell (2001) where N = 239.

Comrey and Lee (as cited in Tabachnick & Fidell, 2001) stated that a sample size of 200 is fair and 300 is good. Nunnally (as cited in Pallant, 2001) recommended "a 10 to 1 ratio, that is 10 cases for each item is adequate in most cases" (p. 153). For this study, N = 239 and the number of items are 24 for the variable textbook alignment preferences. This sample size is between Comrey and Lee's fair and good recommendation and meets the 10 to 1 ratio (9.95 to 1) recommended by Nunnally. Thus, the sample size is adequate for this analysis.

Outliers

Outlying cases have more influence on the factor solution than other cases. Thus, the items textbook alignment preferences were assessed for outliers. This assessment was conducted using Mahalanobis distance. Refer to the Assumptions section for Results for Research Question Two as it provides an explanation of Mahalanobis distance. Using a criterion of $\alpha = 0.001$ with 24 df, $\chi^2 = 51.78$. Three cases were identified with Mahalanobis distance greater than the critical χ^2 value (51.25, 68.15, 96.61). These three cases were deleted from the data set for a final N = 236.

Factorability of R

The factorability of *R* included an inspection of the correlation matrix for values in excess of 0.30, Kaiser-Meyer-Oklin value, and Barlett's Test of Sphericity. The correlation matrix revealed the presence of many coefficients of 0.30 and above. The Kaiser-Meyer-Oklin value was 0.80, exceeding the recommended value of 0.60 and the Barlett's Test of Sphericity reached the statistical significance (p < 0.001). These items support the factorability of *R*.

Normality, Multicollinearity, and Singularity

For the normality assumption, Tabachnick and Fidell (2001) stated that if factor analysis is used descriptively as a convenient way to summarize the relationships in a large set of observed variables (N = 236), then "assumptions regarding the distributions of variables are not in force" (p. 588). Again, the goal of this analysis is to summarize patterns of correlations among data for the textbook alignment preferences. Thus, the normality assumption is not in force. These same authors also stated for the multicollinearity and singularity assumption there "is not a problem because there is no need to invert a matrix" (p. 589).

Linearity

Since factor analysis is based on correlation, it is assumed that there is a linear relationship between the variables. Tabachnick and Fidell (2001) recommended assessing this linear relationship for the items of interest through an inspection of scatterplots. With 24 items, however, an examination of all pairwise scatterplots (about 275) is impractical. Tabachnick and Fidell suggested inspecting the scatterplots of variable pairs where the skewness is likely to depart from linearity. Therefore, a spot check on a few plots (6 pairs) was conducted. The scatterplots for these pairs of items from textbook alignment preferences did not indicate a departure from linearity. Thus, the linearity assumption does not appear to be violated.

Factor Extraction & Rotation

Parallel analysis was employed as the technique for determining the number of factors (components) to retain. This analysis compared the actual eigenvalues that were produced from the software SPSS and eigenvalues from independent random data. The simulated eigenvalues were based on a sample size of 236 with 24 variables (24 items from textbook alignment preferences) and were produced using Kaufman and Dunlap's (2000) parallel analysis software. Table 13 depicts the actual and simulated eigenvalues.

Actual Eigenvalues	Simulated Eigenvalues	
4.95	1.63	
2.50	1.53	
1.65	1.45	
1.53	1.38	
1.23	1.32	

Actual and Simulated Eigenvalues

After the actual and simulated eigenvalues were compared, the examination deemed four factors to be retained. These four eigenvalues explained 20.64%, 10.40%, 6.89%, and 6.37% of the variance for a total variance of 44.30%. Refer to Appendix K for the component matrix. Additionally, the code for each item can be found in Appendix D.

Once the number of factors was obtained, the data for the variable textbook alignment preferences was subjected to Varimax rotation, an orthogonal approach. This approach assumes the factors are not related. The rotated solution (Table 14) revealed that three of the four factors had some excellent (loadings > 0.71) to good (loadings between 0.61 and 0.70) loadings, which is according to Comrey and Lee's criteria (as cited in Tabachnick & Fidell, 2001). Additionally, most variables loaded on one factor where one variable did not load on any of the four factors (SB Org 2). The one item that did not load onto one of the factors was due to the loading criteria (Loading > 0.30) Again, the code for each item is located in Appendix D.

Item	Factor 1	l	Factor 2	Factor 3	3 Factor 4
SD Instr 2	0.74				
SD IIISU \angle SD St Wilz 2	0.74				
SD SI WK 2	0.03				
SD Assess	0.62				
SB Instr 3	0.62				
SB Cont 2	0.59				
SB St WK I	0.60				
SB Instr I	0.53				
SB Cont 3	0.49				
SB Org 1	0.43				
TR Instr 2			0.70		
TR Cont 3			0.69		
TR Cont 2			0.69		
TR Assess			0.69		
TR St Wk 2			0.67		
TR Instr 1			0.48		
TR St Wk 1			0.34		
TR Instr 3			0.32		
TR Org 2				0.7	73
TR Org 1				0 7	72
TR Cont1				0 6	52
SB Cont1				0.4	59
SB Tech				0.0	0 79
TR Tech					0.79
SB Org 2^a					0.77
SD OIg 2					
Percent of Variance Explained	14.15 13	5.81 9.14	7.20		

Varimax Rotation of 4 Factor Solution

^aSB Org 2 did not have a loading for a 4 factor solution

Summary

The summary of this chapter serves as a bridge between the results reported in this chapter and the discussion of the results in the subsequent chapter.

The descriptive analysis for the first research question found several results for the K-6 teachers who participated in this study. To begin, the number of prior years of teaching experience for this sample was about 15 years with a range of 0 to 37. Next, the pertinent frequencies analysis found that the majority of participants did not disagree with 22 out of the 24 characteristics for *Standards*-based textbooks. This same analysis found a majority of participants agreed with 11 out of 16 items from mathematics beliefs. Lastly, 73.50% of the participants for this study reported that teachers in their school had implemented the *Standards* in their teaching.

The second research question utilized standard multiple regression. This analysis was performed between K-6 teachers textbook alignment preferences as the dependent variable and mathematics beliefs, hours of professional development, emphasis of professional development, teacher attention to the NCTM *Standards*, and prior years of teaching experience as the independent variables. The analysis indicated that the overall model was statistically significant ($\alpha = 0.05$). Additionally, the independent variables mathematic beliefs and prior years of teaching experience were statistically significant predictors ($\alpha = 0.05$).

Lastly, an additional analysis was conducted on the researcher created variable textbook alignment preferences. Parallel analysis was utilized and it found a four-factor solution for the scale textbook alignment preferences. All items from this scale with the exception of one (SB Org 2) loaded on one of the four factors.

CHAPTER 5: SUMMARY AND CONCLUSIONS

National attention has been brought to the *Standards* through various forms of media. In the midst of this national attention are colliding views on the textbooks teachers' use and students learn from. Most mathematics textbooks looked alike until the NSF funded major initiatives to create textbooks based on the *Standards*. Weiss et al. (2001) reported that in 2000, one NSF funded textbook, *Everyday Math*, was among the many choices of mathematics textbooks. Specifically, the report noted that this textbook was used in approximately 7% of K-4 and 4% of 5-8 classrooms. A different national study that may be biased towards the *Standards* due to sampling, found that approximately 50% of its respondents were using or considering *Everyday Mathematics* or *Investigations in Number, Data, and Space* (St. John et al., 2004). This same national study found that about 20% of its respondents were using or considering *Math*

In 2007, John S. Bradley's reported that the market share for NSF funded elementary and middle school mathematics textbooks were between 20% and 25%. This finding is consistent with this study since 21.10% of Ohio' K-6 teachers reported using NSF funded textbooks. The rise in use of textbooks that espouse the vision of the *Standards* is promising. However, 21.10% is still a relatively low percentage of usage. Research has shown that teachers make mathematics textbook choices based on factors other than learning, teaching, or the *Standards* and are ill-equipped to judge how well a particular textbook aligns with the *Standards* (Bush, Kulm, & Surati, 2000). Due to this understanding of mathematics textbook choices, it is not surprising that the percentage of NSF funded textbook use is not higher. If a teacher is allowed to choose a mathematics textbook, then textbook choice is matter of preference. Additionally, with the differences between NSF and non-NSF funded mathematics textbooks, then preferences may lean towards one type of textbook. Thus, this research investigated teachers' preferences of characteristics regarding *Standards*based textbook and specific factors that influenced their preferences. Specifically, this research addressed the following questions:

- What are the K-6 textbook alignment preferences, mathematics beliefs, emphasis
 of professional development, hours of professional development, prior number of
 years of teaching experience, and teacher attention to the *Standards* as reported by
 K-6 teachers?
- 2. For K-6 textbooks, how well do mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the *Standards*, predict textbook alignment preferences?

H_o: $R^2 = 0$

H_a: $R^2 \neq 0$

The remainder of this chapter offers a general discussion of the findings of the study and the relationships with other research among the literature. This chapter consists of four sections: methodology and data collection, findings, limitations of the study, and recommendations for further research.

Methodology and Data Collection

To address the research questions, one instrument, a combination of researcher created and previously used variables, was used in collecting the data. This instrument
was a 60-item survey that consisted of teacher background and textbook use information, textbook characteristics, mathematics beliefs, hours and emphasis of professional development for mathematics, and teacher attention to the NCTM *Standards*. This survey collected data in the spring of 2007 where the sample consisted of 273, K-6 teachers throughout the state of Ohio.

This sample is rather large in comparison to the number of participants needed for analysis (recall N = 104). The a priori response rate was established as 20% due to declining rates. However, this study yielded a 48% response rate.

The high response rate may be a chance event. On the other hand, the reason may be the personal contact via phone, the flexibility of when a superintendent/K-6 principal could discuss the possibility of research being conducted in district/school, and the persistence of the researcher to ensure contact. The persistence consisted of at most two phone contacts to the superintendents/K-6 principals. If a superintendent/K-6 principal did not return the initial call, then a subsequent called was made. The persistence also included the three contacts to the K-6 teachers (modified version of Dillman's (2000) tailored designed method). Even though the high response rate may be a chance event, it is believed the rate was achieved primarily through the personal contact via phone.

Findings

Discussion of Research Question One

This section discusses the textbook alignment preferences, mathematics beliefs, emphasis and hours of professional development, prior number of years of teaching experience, and teacher attention to the NCTM *Standards* for the study's K-6 teachers. This discussion consists of an interpretation of the mean, standard deviation, and pertinent frequencies for the appropriate variables. As would be expected the mean and standard deviation values for the summated scores did not reveal any new information. Specifically, the mean and standard deviation for the summated scores followed a similar pattern as that of the mean for each variable. However, examinations of the percentiles for the summated scores yielded interesting results and are discussed within this section. *Textbook Alignment Preferences*

To begin, the mean for textbook alignment preferences, 2.34, indicated that on average the participants of this study were slightly above neutral for characteristics of K-6 *Standards*-based textbooks (0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, 4 = strongly agree). The standard deviation, 0.38, for this variable indicated that there was very little variance. Additionally, 84.10% of the participants had a mean score of 2 or higher for this variable. Thus, this indicated that on average the vast majority of K-6 teachers did not disagree with the characteristics of *Standards*-based K-6 textbooks (i.e. K-6 teachers were neutral or "agreed" with the characteristics of *Standards*-based K-6 textbooks).

When summated scores for textbook alignment preferences were evaluated in terms of percentiles, the 75^{th} percentile (summated score = 63) indicated that less than 25% of K-6 teachers agreed with characteristics of K-6 *Standards*-based textbooks (Agreement = 72 or higher). A histogram of summated scores are located in Appendix I. Thus, while most participants did not disagree with K-6 *Standards*-based textbook characteristics, there were less than one-fourth of these teachers that strictly agreed.

The dominant position among the participants, did not disagree with the characteristics of *Standards*-based textbooks, was also evident when items were

evaluated in isolation from one another. Only two characteristics among the twenty-four have a minority of K-6 teachers that did not disagree. It was also found that participant agreement was higher with *Standards*-based textbook characteristics than traditional. Specifically, nine items from this variable had 62.30% or more participants that agreed with K-6 *Standards*-based textbook characteristics. All of the low agreement percentage items were traditional textbook characteristics with the exception of one. Specifically, 25% of the K-6 teachers agreed with the following *Standards*-based textbook characteristic (33.20% neutral and 41.80% disagreed):

Item: Better curriculum materials should have attractive and motivating units and/or chapters titles that need not identify the mathematical content (e.g., The Amazing Race). Due to the *Standards*-based textbook characteristic having a low percentage of agreement among the K-6 teachers, further discussion of this item is needed.

First, the traditional textbook characteristic counterpart for this item (listed below)

had 41.2% agreement, 40.80% neutral, and 18.00% disagreement.

Item: Better curriculum materials have units and/or chapters named by mathematical topic.

When participants' responses for the traditional item were recoded to analyze degree of agreement with *Standards*-based textbook characteristics, the percentages were found to be similar to that of the *Standards*-based characteristic; namely, a low percentage of agreement. These percentages suggest that only a small percentage of participants in this study prefer attractive and motivating names of units/chapter titles of K-6 textbooks and not necessarily identified by math content. As further support, it was found that 63.5% of this study's participants were neutral or disagreed with both items. Gerald Kulm (1999) stated:

The familiar chapter and lesson titles in the table of contents have a different look in many new materials, sometimes making it more difficult to determine what content is addressed in each module or unit. Without a simple one-for-one topic match, it can be difficult to compare how the mathematics content in the new material corresponds with a district curriculum guide or framework. (p. 541)

Recall Bush, Kulm, and Surati's (2000) statement regarding that research shows teachers often make mathematics textbook choices based on familiarity or an attractive array of support materials. Thus, with the choice of familiarity versus difficulty, the low percentage of agreement with this *Standards*-based textbook characteristic for the K-6 teachers is expected.

Mathematics Beliefs

While the mean for textbook alignment preferences indicated the participants were slightly above neutral, the interpretation for the mathematics beliefs mean (1.80) differed slightly. The mean indicated that on average the participants' mathematics beliefs about the teaching and learning of mathematics are close to agreement of those espoused by the *Standards* (2 or higher indicated agreement). The standard deviation for this variable, 0.23, indicated that there was very little variance.

Also, the spread of the summated scores for mathematics beliefs found that the 75^{th} percentile was 31. This score indicated that approximately 25% of the K-6 teachers agreed with the teaching and learning as set forth by the *Standards* (Agreement = 32).). A histogram of summated scores are located in Appendix I.

To compare the K-6 teachers' mathematics beliefs to previous research, the mean summated score (44.70), where items were recoded on a scale of 1 to 4 (1 = strongly

disagree, 2 = disagree, 3 = agree, 4 = strongly agree), was calculated. The original coding was 0-3. A score of 48.00 or higher indicated agreement with the teaching and learning espoused by the *Standards*. Hart (2002) found teachers to have a mean summated score of 36.00 before training with regards to the *Standards* and 41.93 after training. A different researcher, Furner (1996), found teachers with less than five years of teaching experience had a mean summated score of 45.13 and 43.07 with more than five years. Furner proposed the higher mean summated score of the teachers with less than five years of teaching experience may be attributed to exposure to the *Standards* during pre-service training. Therefore, taking all mean scores for mathematics beliefs into consideration, there is little difference between the mean summated scores of the participants for this research and previous studies where the participants were exposed to explicit training for the *Standards*.

For this study, a different analysis of the variable mathematics beliefs was conducted. It evaluated each item that constituted this variable. The analysis found that a little more than half, 51.80% or more, of the participants agreed with almost three fourths of the items from this variable (11 out of the 16). Further, 78% or more of the participants agreed with nine of these items. Additionally, the K-6 teachers from this study had a low agreement percentage, 38.30%, for one mathematics beliefs item that was aligned with the *Standards*. It was the following: Appropriate calculators should be available to all students at all times.

The low agreement percentage may be due to the item portion "at all times". Van de Walle (2004) confirmed that this mathematics belief may seem radical. In his book, *Elementary and Middle School Mathematics*, he addressed several myths and fears

regarding using calculators that may be a heart of the low agreement percentage. These myths and fears included: If kids use calculators, they won't learn the basics; Calculators make students lazy; Students should learn the "real way" before using calculators; Students will become overly dependent on calculators. Thus, since a majority of teachers do not have this belief, then it is possible that they have one or more of these fears or believe one or more of the above named myths.

Alternatively, the mathematics beliefs instrument used in this study was created by Zollman and Mason (1992) and based from the 1989 version of the *Standards*. This item agrees with the 1989 version but not the recent version of the *Standards* published in 2000. Thus, the K-6 teachers' disagreement with this item may actually reflect the change in the version of the *Standards*.

Emphasis of Professional Development

Another variable evaluated in this study, emphasis of professional development, had a mean of 1.99 (0 = not at all, 1 = slightly, 2 = somewhat, 3 = a good deal, 4 = to a great extent). This indicated that on average the participants' professional development over the past five years somewhat emphasized the following professional development topics: deepening mathematics content knowledge, understanding student thinking, learning how to use inquiry/investigation-oriented teaching strategies, learning how to use technology in mathematics instruction, and learning how to assess student learning in mathematics. The standard deviation of 0.94 indicates a good deal of variance in responses for this variable. Additionally, participants' spread of summated scores, were calculated to further describe emphasis of professional development. The 75th percentile, summated score = 13, indicated that a little less than 25% of the participants' reported having a good deal or more of mathematics training over the past five years emphasize the topics from emphasis of professional development. (A good deal to a great extent = 15 or higher).). A histogram of summated scores are located in Appendix I.

An alternative analysis, frequency of each item from the variable emphasis of professional development, was conducted to discern what mathematics professional development training was emphasized a good deal or more over the past five years. The data made it clear that understanding student thinking in mathematics had been the priority for this study's participants (40.4%). Weiss et al. (2001) found a similar result for K-8 teachers in a nationwide study (32-34% of K-8 teachers). "In mathematics, understanding student thinking has received special attention, especially in grades K-8 where it appears among the most emphasized topic" (p. 42). Additionally for the nationwide study, learning how to use inquiry/investigation-oriented teaching strategies ranked in the top two for every grade. When the participants of this research were separated by grade, a similar result was found.

Hours of Professional Development

An additional variable, hours of professional development, had a mean of 1.47 (0 = none, 1 = less than 6 hours, 2 = 6-15 hours, 3 = 16-35 hours, 4 = more than 35 hours). The mean represented that on average the participants' spent one to 15 hours for the topics from emphasis of professional development. The standard deviation of 0.95 indicated a good deal of variance in responses. Along with the mean, the summated scores for hours of professional development were analyzed. The 75th percentile, summated score = 8, revealed that 25% of the participants' reported having six or more hours of professional development training over the past five years that emphasized the

topics from emphasis of professional development.). A histogram of summated scores are located in Appendix I. Further, 10.10% of the K-6 teachers reported having 16 or more hours.

Additionally, the items that constitute hours of professional development were investigated for pertinent frequencies. To begin, this study found 55.90% to 59.80% of its K-6 teachers spent none to less than six hours in mathematics professional development over the past five years in each of the topics from emphasis of professional development. Further, 14.70% to 15.90% of K-6 teachers reported 16 or more hours spent in these same topics. While this study collected data on time spent in specific mathematics areas, a national study found that K-8 teachers had more hours spent on in-service education for mathematics in a three year time span (32% of K-4, 42% of 5-8) (Weiss et al., 2001). Overall, it is clear that over the past five years the majority of the K-6 teachers have had very little time spent deepening their math content knowledge, understanding student thinking, and learning how to assess, use technology, and use inquiry/investigation-oriented teaching strategies.

Years of Teaching Experience

Another variable, prior years of teaching experience, had a mean of 15.09. This indicated that the K-6 teachers for this study had on average 15 years of teaching experience prior to his/her current year of teaching. The kindergarten teachers from this study had the lowest average of prior years of teaching experience (11.49) while the fifth grade teachers had the highest (19.08).

Teacher Attention to the NCTM Standards

The last variable to be discussed for research question one is teacher attention to the NCTM *Standards*. The mean, 1.63, indicated on average the participants' of this study had a moderate level of attention to the work that NCTM has done in setting standards for mathematics curriculum, instruction, and assessment (0 = strongly disagree, 1 = disagree, 2 = agree, 3 = strongly agree). The standard deviation, .66, revealed some variance in responses. Also, the spread of the summated scores for this variable were calculated. The 75th percentile, summated score = 8, revealed that 25% of the K-6 teachers have a high level of attention to the work that NCTM has done in setting standards for mathematics curriculum, instruction, and assessment.). A histogram of summated scores are located in Appendix I.

To compare the variable teacher attention to the *Standards* to previous research, the mean summated score (54.30) was calculated on a 100-point scale. As with the mean, this score indicated that on average there has been a moderate level of attention to the NCTM *Standards*. A national study found the mean summated score for this variable, 52, to be slightly lower than this study (Weiss et al., 2001). Thus, the level of attention to the NCTM *Standards* has been relatively consistent at these two points.

Further, the items that comprise teacher attention to the NCTM *Standards* were investigated for pertinent frequencies. It was found that 73.50% of the K-6 teachers reported that teachers in their school have implemented the NCTM *Standards* in their teaching. Only 58% of the teachers from the national study reported the same (Weiss et al., 2001). The difference may be due to a seven-year span of time between this research and the national study. This research also found that 60.20% of K-6 teachers reported a

school-wide effort to make changes inspired by the NCTM *Standards*. In Weiss et al.'s (2001) national study, it found that 55% of the K-8 teachers reported the same effort. Lastly, the K-6 teachers were divided almost equally for the remaining two items (I am prepared to explain the NCTM *Standards* to my colleagues and the NCTM *Standards* have been thoroughly discussed by teachers in this school).

Summary of Research Question One

In conclusion, the first research question used descriptive methods to attempt to explain textbook alignment preferences, mathematics beliefs, emphasis of professional development, hours of professional development, prior number of years of teaching experience, and teacher attention to the *Standards* as reported by K-6 teachers.

The textbook alignment preferences indicated that the K-6 teachers did not disagree with the characteristics of *Standards*-based textbooks. Furthermore, this was apparent when 22 out of the 24 textbook characteristics had a majority of participants that did not disagree. However, less than one-fourth of the participants agreed with *Standards*-based textbook characteristics overall. The following comments represent views on the textbook teachers are using in their classroom.

"I am using the Investigations as my entire math curriculum this year and absolutely think it is the way to teach math. It is so totally student centered. My K kids think they play during math. They are so good at sharing strategies and accepting others opinions of their ideas".

"This math program is wonderful for real life math, hands on math, problem solving, and cross-curricular applications. What it lacks in is basic math skills such as addition/multiplication facts, multi-digit addition and subtraction with regrouping, and place value. It touches on each of these concepts, but just briefly and the students just don't get it with a brief attention to these concepts. There is no mastery built in for these concepts and I think (not all third grade concepts) there needs to be some mastery".

The first comment illustrated a teacher who is among the one-fourth who strictly agreed with *Standards*-based textbook characteristics overall. This teacher is "sold out" for the *Standards*-based textbook. The second comment illustrated a teacher who is among those who did not disagree with *Standards*-based textbook characteristics. She found fault with the perceived need to "practice the basic math skills".

Additionally, the participants' beliefs about the teaching and learning of mathematics were close to agreement with those espoused by the NCTM *Standards* and about 25% strictly agreed. Further, 11 out of the 16 mathematics beliefs had a majority of participants that agreed with the teaching and learning espoused by the *Standards*. Among the 25% who agreed, only 5% agreed with the characteristics of *Standards*-based textbooks and about 22% did not disagree. The following teacher is among this 5%.

"I felt that our mathematics textbook adoption should have been researched, based upon NCTM standards as well as best-practices. I do not use our text very much, but much prefer Investigations, which is research-based, and does not isolate mathematical concepts. I feel very strongly that children need to be mathematically literate, and our current text does not coincide with my beliefs".

Research has found that teachers often make textbook choices based on familiarity and a vast array of support materials (Kalder, 2001; Bush, Kulm, & Surati, 2000). Additionally, factors such as student appeal, affordability, state standards, district or state standardized tests have been shown to influence the selection of mathematics textbooks (St. John et al., 2004; Schwab, 2002). However, this teacher's comment illustrates a desire for a textbook adoption that is based on research and the NCTM Standards. Further, the comment demonstrates how one's beliefs for how to teach and how students learn may not coincide with the characteristics of the adopted text. ChavezLopez (2003) found the same result for a teacher who had more traditional mathematics beliefs and was using a *Standards*-based text.

Since the item analysis indicated agreement with the *Standards* for most items from mathematics beliefs and textbook alignment preferences, it is not surprising that 73% of the participants reported teachers in their school had implemented the *Standards* in their teaching. Overall, teacher attention to the NCTM *Standards* for this research indicated a moderate level of attention to the work that NCTM has done in setting standards for school mathematics.

Awareness of the *Standards* has been cultivated through the media, colleges and universities, state curriculums and mathematics textbooks that embody the vision of the *Standards*. However, about half of this study's participants reported being able to explain the *Standards*. Similarly, about half of the participants reported that the *Standards* had been thoroughly discussed by teachers in their school. Thus, while the vast majority of this study's K-6 teachers reported implementation of the *Standards* in his/her school, work still needs to be done to develop teachers' understanding of the *Standards* and cultivate discussions of these documents.

Unfortunately, participation in professional development experience was found to be generally low for mathematics in a national study conducted a few years ago (Weiss et al., 2001). A similar result was found for this research. Still, professional development is one means that mathematics educators have utilized to assist teachers in developing his/her understanding of the teaching and learning espoused by the *Standards*. While professional development may have been measured in a limited sense, for example specific mathematics topics, these participants may have developed their understanding of the *Standards* by another means. They may have developed this understanding from courses in college and/or their K-12 experience. This is plausible since the *Standards* have been in circulation for 20 years.

Discussion of Research Question Two

This section discusses how well mathematics beliefs, emphasis and hours of professional development, prior number of years of teaching experience, and teacher attention to the *Standards* (independent variables), predicted textbook alignment preferences (dependent variable). While the results of this research question yielded interesting findings and implications for mathematics education, it does not have a firm footing in the literature. Still, two qualitative studies from the literature were utilized to add to the discussion of the results.

To begin, the reader is reminded the entire set of predictors was entered simultaneously since this study was not testing theory that would warrant an ordered entry. Thus, standard multiple regression was utilized. The statistical significance of the overall model implied that a relationship does exist between textbook alignment preferences and the independent variables. In fact, multiple R ($R^2 = 0.49$) yielded quite a respectable result for the how much variance in textbook alignment preferences was explained by the model. The researcher was not surprised by these findings because of experience with teachers and their interaction with mathematics textbooks. Further, the null hypothesis for this research question was rejected because the sample of data was not drawn from a population in which multiple R was zero.

With a significant model, post hoc evaluations were conducted to assess which independent variables contributed to the prediction of textbook alignment preferences.

This research found that mathematics beliefs was a significant predictor. In fact, the squared semipartial correlation for this variable indicated that mathematics beliefs uniquely contributed almost all of the variance to R^2 (0.41 out of 0.49). Other researchers found that six out seven middle school teachers' mathematics beliefs agreed with the textbook he or she was using (Kauffman, 2002; Chavez-Lopez, 2003). Additionally, Chavez-Lopez (2003) found that a middle school teacher's mathematics beliefs shaped the preference for the *Standards*-based textbook that was in use.

Furthermore, the researcher anticipated that mathematics beliefs would be a significant predictor of K-6 teachers' preferences for *Standards*-based textbooks. This is because the researcher believed it is reasonable to assume that one's beliefs about how to teach mathematics and how students learn would reflect the characteristics that a teacher would prefer in a textbook.

The other significant predictor's, prior number of years of teaching experience, squared semipartial correlation uniquely represented 6% of the variance for R^2 . This information coupled with the squared semipartial correlation of mathematics beliefs indicated that 46.50% of the variance for these predictors was uniquely attributed to R^2 (49.20%). Additionally, the unstandardized regression coefficient (-0.01) for prior number of years of teaching experience was negative. The negative coefficient for this variable indicated that an inverse relationship exists between the K-6 teachers prior number of years of teaching experience and degree of agreement with the *Standards*-based textbook characteristics (dependent variable). Given the way the dependent variable was defined, this indicates that teachers with fewer years of teaching experience

is directly associated with textbook alignment preferences scores that indicate a higher degree of agreement with *Standards*-based textbook characteristics.

Lastly, the other independent variables, hours and emphasis of professional development and teacher attention to the *Standards*, jointly contributed 2.70% of the variance to R^2 . It was unexpected that hours and emphasis of professional development would not be significant predictors of textbook alignment preferences. Among the literature, teachers reported that professional development activities have somewhat or strongly influenced their vision of good curricula or its selection and purchase (St. John et al., 2004; Appalachian Rural, 2000). Even so, judgments about the relative importance of independent variables for this study are difficult because they are correlated (-.02 to .67).

Within the context of the dependent variable as the degree of agreement with *Standards*-based textbook characteristics and within the limitations of the independent variables, it is reasonable to assert that mathematics beliefs, emphasis and hours of professional development, prior number of years of teaching experience, and teacher attention to the *Standards* are important influences on the selection of mathematics curriculum materials. Selection of a mathematics textbook – textbook adoption – is vital period for school districts because mathematics textbooks have the potential to promote good instructional methods and a well-articulated, coherent, and comprehensive mathematics curriculum (Reys & Bay-Williams, 2003).

Before the adoption of a textbook, an important consideration for school districts would be teachers' beliefs about how to teach mathematics and how students learn. Battista (1994) stated "all our efforts to make the mathematics curriculum consistent with the NCTM *Standards* will fail if teachers' beliefs about mathematics do not become aligned with those of the reform movement" (p. 468). Because this study found that teachers' beliefs were a significant predictor of textbook alignment preferences, then educating and challenging teachers' beliefs would be vital first step before textbook adoption.

Also, this study found that prior years of teaching experience had an indirect relationship with textbook alignment preferences. Again, those teachers with fewer years of teaching experience had higher agreement with *Standards*-based textbook characteristics. Thus, this finding has implications for preservice education and professional development training of teachers new to the field. Namely, educate teachers in regards to the vision of the *Standards* while they are in preservice education programs and/or young in their career.

In conclusion, this research found a statistically significant model, which predicted K-6 teachers' textbook alignment preferences from their mathematics beliefs, emphasis and hours of professional development, prior number of years of teaching experience, and teacher attention to the *Standards*. Further, mathematics beliefs and prior years of teaching experience contributed significantly to the model.

Additional Results

A factor analysis was conducted for the 24 *Standards*-based and traditional textbook characteristics that constitute the variable textbook alignment preferences to add further evidence of this scales' construct validity. Recall that the items from this scale were created based on differences between *Standards*-based and traditional mathematics textbooks. These differences were supported by the literature and categorized in the

following areas: instruction, content, student work, organization, assessment, and technology. The analytic technique, parallel analysis, found a four-factor solution for these items. When examined conceptually in the context of the characteristics of traditional and *Standards*-based textbooks, the four factors made sense and reasonable evidence exists that supports the validity of the four factor structure. Additionally, one item did not load on one of the four factors due to the loading criterion of 0.30. A discussion of the four factors, the item that did not load, and a subsequent factor analysis is discussed below.

To begin, the first factor loaded nine items, which were easily identified as characteristics that represent the content, instruction, student work, assessment, and organization of *Standards*-based textbooks. The second factor loaded eight items, which were also easily identified as characteristics that represent content, instruction, student work, and assessment of traditional textbooks. Unfortunately, items that depicted traditional textbook organization did not load on factor two.

The third factor was initially not as easy to conceptualize as the first two. The third factor seemed like an unusual mix of four items, organization and content for both traditional and *Standards*-based textbook characteristics. However, after reflection of the wording for these characteristics it was decided that they represent structure of mathematical topics among mathematics textbooks. Specifically, these factors represent both *Standards*-based and traditional textbook characteristics through lessons (teach single topic or integrate different topics) and organization of chapters/units (chapters/unit named by topic and definite starting and ending point for topics). The fourth factor

loaded two items, which were easily conceptualized as technology characteristics for *Standards*-based and traditional textbooks.

The single item that did not load any of the four factors logically fits with the first factor. This item described how *Standards*-based textbooks have a flexible organizational scheme with multiple points of entry. The vast majority of participants, 84.00%, agreed with this *Standards*-based textbook characteristic. Recall, there were quite a number of *Standards*-based characteristics that had a majority percentage of agreement (9 out of 12). Seven out of the nine characteristics loaded on factor one. Thus, this item caused suspicion about its usefulness as a textbook characteristic.

Considering the textbook characteristics were created to represent the differences between traditional and *Standards*-based textbooks, a two-factor solution was explored as a possible option for interpretation of these items. Most of the traditional textbook characteristics (10 out of 12) loaded on component one and similar result was found for *Standards*-based textbook characteristics (10 out of 12 loaded on component 2). Thus, these factors were easily conceptualized as traditional textbook characteristics and *Standards*-based textbook characteristics. Three items did not meet the loading criteria of 0.30 and one *Standards*-based characteristic loaded with the traditional textbook characteristics. All in all, the analysis of the four and two factor solution indicated that there is evidence of construct validity for this scale.

Limitations of the Study

This study was conducted in the state of Ohio. How the results would generalize to the nation cannot be determined from this research. Additionally, how these results would generalize to textbook adoption states cannot be determined from this research. Also, this study utilized teacher reported data. The information that was reported by the K-6 teachers may not accurately represent all of the data. For instance, teachers were asked to state their degree of agreement in regards to a school-wide effort to make changes inspired by the NCTM *Standards*. Some teachers may have disagreed with this statement when in reality an effort is and has been made.

The second research question was based upon regression methods. Due to this analytical technique, a cause and effect relationship among textbook alignment preferences and its predictors cannot be determined.

The variable textbook alignment preferences may be missing characteristics that represent *Standards*-based and traditional textbooks. One such "hallmark" characteristic for traditional textbooks, which was not included in this variable, was examples that explain how to solve a problem. These examples are typically within each section of a chapter or unit. The examples teach students how to solve problems in an algorithmic manner and do not allow the opportunity for problem-solving especially in a real-world situation (what you do when you don't know what to do).

Other factors more than likely influence teachers' textbook alignment preferences. For example, an influential individual in a teacher's career or a professional organization may have impacted these preferences. Thus, this research may be limited due to other influences that were not investigated.

Professional development and training have been shown to impact teachers' preferences for curriculum materials (Almekbel, 2000; St. John et al., 2004). It is possible the emphasis of professional development variable did not capture this important influence.

Recommendations for Further Research

A recommendation for further research is to investigate the effect No Child Left Behind (NCLB) has on teachers' preferences for *Standards*-based textbooks, and their beliefs about how to teach mathematics and how students learn mathematics. To what extent has NCLB effected mathematics textbook adoption or implementation of *Standards*-based mathematics textbooks?

One of the goals of this research was to investigate quantitatively teachers' preferences for *Standards*-based textbooks and determine what predicts these preferences. It was found that mathematics beliefs and years of teaching experience significantly contributed to textbook alignment preferences for K-6 teachers. Further research is needed to investigate if this relationship exists for 6-8 and 9-12 mathematics teachers. Also, the replication for K-6 teachers in other states and throughout the nation would benefit the generalizability of this study.

Textbooks often determine what and how teachers will teach and how students will learn (Reys, Reys, & Chavez-Lopez, 2004). Thus, an investigation supporting these quantitative findings in a deeper way (qualitatively) would assist in further understanding the impact of mathematics beliefs and preferences for textbooks.

Further work is needed in regards to the variable textbook alignment preferences. Mathematics educators have published work that discussed the differences between *Standards*-based and traditional textbooks (Kulm, 1999; Goldsmith, Mark, & Kantrov, 2000). While the items that constitute this variable were created based upon this literature and characteristics of these textbooks, further work is needed in regards to the item that did not load into the four factor solution; i.e. possibly revise these items. Additionally, the factor analysis for the textbook alignment preferences variable also reported a two factor solution. It is the researcher's recommendation that a twofactor solution be investigated utilizing confirmatory factor analysis.

The implications for textbook selection in regards to this research are vast. Chavez-Lopez (2003) reported that two of three individuals from his case studies mathematics beliefs agreed with the textbook he or she was using and these same individuals were part of the adoption committee for these texts. Kauffman (2002) found that three out of the four subjects that participated in his research had mathematics beliefs that agreed with the textbook he or she was using. The Appalachian Rural Systemic Initiative (2000) ultimately led to many schools selecting and purchasing resources consistent with national and state standards. As this previous research demonstrated, a teacher's mathematics beliefs can greatly affect his or her selection and preference in a textbook. The two comments below illustrate this point and also the disappointment with curriculum materials that are currently available.

" was opposed to adopting Harcourt Math in 2002. I found it to be too much 'drill, skill, kill'. I use the book sparingly, and supplement with Marilyn Burns and Investigations"

Both of these teachers' textbook alignment preferences and mathematics beliefs

agree with the Standards. Also, both teachers have more than 20 years of teaching

experience. Their comments illustrate how mathematics beliefs can impact an

individual's preference and selection of a textbook. Thus, further research is needed to

[&]quot;We have chosen to gather or make our own math materials because we feel the "textbook" approach to curriculum at the kindergarten level is not the best way to meet the NCTM Standards. We are looking for a math curriculum that provides an organized, "hands on ", child-centered, developmentally appropriate (real life experience) means of integrating the NCTM standards into the everyday lives of our kindergarteners. We are having a very hard time".

bridge teachers' mathematics beliefs and the actual textbook choice they made. Other potential recommendations for research are the following: To what extent does mathematics beliefs influence a teacher's preference for a textbook? How has teacher's mathematics beliefs impacted the textbook adoption process?

REFERENCES

- Almekbel, A. S. (2000). The impact of a teacher enhancement program on 7th through 12th grade mathematics instruction with regard to curriculum, technology, and asessment. *Dissertations Abstracts International*, 64(07), 2415A. (UMI No. 9980394)
- American Association for the Advancement of Science. (2000). *Middle grades mathematics textbooks: A benchmarks-based evaluation*. Washington, DC: Author.
- Appalachian Rural Systemic Initiative. (2000). Appalachian Rural Systemic Initiative (ARSI): Phase 1, year 5 annual report, 2002. Lexington, KY: National Science Fundation. (ERIC Reproduction Service No. 467505)
- Apthorp, H. S., Dean, C. B., Florian, J. E., Lauer, P. A., Reichardt, R., & Snow-Renner,
 R. (2001). *Standards in classroom practice: Research synthesis*. Aurora, CO:
 Mid-continent Research of Education and Learning. (ERIC Document
 Reproduction Service No. 460110)
- ARC Center. (2002). Use of everyday mathematics, nvestigations in number, data and space, and math trailblazers by elementary schools in the U.S. Retrieved August 12, 2005, from, http://www.comap.com/elementary/projects/arc/graph.htm
- ARC Center. (2003). *Curriculum Summaries*. Retrieved October 26, 2006, from, <u>http://www.comap.com/elementary/projects/arc/curricul.htm</u>
- Banilower, E. R., Boyd, S. E., Pasley, J. D., & Weiss, I. R. (2005). Lessons from a decade of mathematics and science reform: A capstone report for the Local Systemic Change through teacher enhancement initiative. Chapel Hill, NC:

Horizon Research, Inc. Retrieved November 2, 2006, from http://www.horizonresearch.com/reports/

- Battista, M. T. (1994). Teacher beliefs and the reform movement in mathematics education. *Phi Delta Kappan*, 75(6), 462-470.
- Becker, J., & Jacob, B. (2000). The politics of California school mathematics: The antireform of 1997-99. *Phi Delta Kappan*, *81*(7), 529-537.
- Bishop, W. (1997). An evaluation of selected mathematics textbooks. Retrieved June 26, 2006, from, http://mathematicallycorrect.com/bishop4.htm
- Borenstein, M., Rothstein, H., Cohen, J., Schoenfeld, D., & Berlin, J. (2000). Sample Power (Version 2) [Computer Software]. Chicago, IL: SPSS.
- Bush, W. S., Kulm, G., & Surati, D. (2000). Getting together over a good book. *Journal* of *Staff Development*, 21(2), 34-38.
- Bradley, J. S. (2007). Foreword. In C. R. Hirsch (Ed.), Perspectives on the Design and Development of School Mathematics Curricula (pp. ix-xii). Reston, VA: NCTM.
- California Mathematics Project. (2005). *Frameworks: Criteria for evaluating mathematics instructional resources*. Retrieved October 26, 2006, from, http://csmp.ucop.edu/cmp/standards/evaluation2.html
- Carpenter, C. (1963). *History of American Schoolbooks*. Philadelphia, PN: University of Pennsylvania Press.
- Carpenter, T. P., Fennema, E., Peterson, P. L., Chiang, C., & Loef, M. (1989). Using knowledge of children's mathematics thinking in classroom teaching: An experimental study. *American Educational Research Journal*, 26(4), 499-531.

- Chavez-Lopez, O. (2003). From the textbook to the enacted curriculum: Textbook use in the middle school mathematics classroom. *Dissertations Abstracts International*, 64(07), 2415A. (UMI No. 3099613)
- Choy, S. P., Chen, X., & Ross, M. (1998). Toward better teaching: Professional development in 1993-94 (Report No. NCES 98-230). Washington, DC: National Center for Education Statistics.
- Cobb, P., Wood, T., Yackel, E., & McNeal, B. (1992). Characteristics of classroom mathematics traditions: An international analysis. *American Educational Research Journal*, 29, 573-604.
- Cohen, D. K., & Hill, H. C. (1998). State policy and classroom performance: Mathematics reform in California. CPRE policy briefs. Philadelphia: PA:
 Consortium for Policy Research in Education. (ERIC Document Reproduction Service No. 418842)
- Cohen, J. (1987). *Statistical analysis for the behavioral science* (Rev. ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Cooney, T. J. (2001). Considering the paradoxes, perils, and purposes of conceptualizing teacher development. In F. L. Lin & T. J. Cooney (Eds.), *Making Sense of Mathematics Teacher Education* (pp. 9-31). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Cooney, T. J., & Shealy, B. E. (1997). On understanding the structure of teacher's beliefs and their relationships to change. In E. Fenemma & B. S. Nelson (Eds.), *Mathematics teachers in transition* (pp. 87-109). Mahwah, NJ: Lawrence Erlbaum Associates.

- Dillman, D. A. (2000). *Mail and internet surveys: The tailored design method* (2nd ed.). New York: John Wiley and Sons, Inc.
- Ellis, M. W., & Berry, R. Q. (2005). The paradigm shift in mathematics education:Explanations and implications of reforming conceptions of teaching and learning.*The Mathematics Educator*, 15(1), 7-17.
- Fey, J. (1999, May). Standards under fire: Issues and options in the math wars. Paper presented at the meeting of the Show-Me Project Curriculum Showcase.Retrieved June 26, 2006 from,

http://showmecenter.missouri.edu/showme/perspectives/keynote1.html

- Furner, J. M. (1996). Mathematics teachers' beliefs about using the National Council of Teachers of Mathematics standards and the relationship of these beliefs to students' anxiety toward mathematics. Port St. Lucie, FL: Florida Atlantic University. (ERIC Document Reproduction Service No. ED406427)
- Furner, J. M. (2002). The effects of a math curriculum course on the beliefs of preservice teachers regarding the National Council of Teachers of Mathematics' Standards. Retrieved August 12, 2006, from http://www.k-

12prep.math.ttu.edu/journal/pedagogy/furner01/article.pdf

Gardner, D. P., Larsen, Y. W., Baker, W. O., Campbell, A., Crosby, E. A., Foster, C., A., et al. (1983). A Nation at risk: The imperative for educational reform. an open letter to the American people. A report to the nation and the secretary of education. Washington, D.C.: National Commission on Excellence in Education. (ERIC Document Reproduction Service No. ED 226006)

- Garet, M. S., Birman, B. F., Porter, A. C., Desimone, L., Herman, R., & Suk Yoon, K.
 (1999). Designing effective professional development: Lessons from the Eisenhower Program. Washington, DC: United States Department of Education.
- Goldsmith, L. T., & Mark, J. (1999). What is a standards-based mathematics curriculum. *Educational Leadership*, 57(3), 40-44.
- Goldsmith, L. T., Mark, J., & Kantrov, I. (2000). Choosing a standards-based mathematics curriculum. Portsmouth, NH: K-12 Mathematics Curriculum Center Education Development Center, Inc.
- Grouws, S., & Cebulla, K. (2000). Elementary and middle school mathematics at the crossroads. In T. Good (Ed.), *American education: Yesterday, today, and tomorrow* (p.209-255). Chicago, IL: Chicago University Press.
- Hamilton, M. B. (2003). Online survey response rates and times: Background and guidance for industry. Retrieved September 30, 2006, from, http://64.233.167.104/search?q=cache:s3iax5es5sUJ:www.supersurvey.com/paper s/supersurvey_white_paper_response_rates.pdf+online+survey+response+rates&h l=en&gl=us&ct=clnk&cd=1
- Hart, L. C. (2002). Preservice teachers' beliefs and practice after participating in an integrated content/methods course. *School Science and Mathematics*, *102*(1), 4-14.
- Hart, L. C. (2004). Beliefs and perspective of first-year, alternative preparation, elementary teachers in urban classrooms [Electronic version]. School Science and Mathematics, 104(2).

- Hawkins, E. F., Stancavage, F. B., & Dossey, J. A. (1998). School policies and practices affecting instruction in mathematics: Findings from the National Assessment of Educational Progress (Report No. NCES 98-495). Washington, DC: National Center for Education Statistics.
- Institute for Mathematics and Science Education. (1999). *Math Trailblazers: Frequently* asked questions. Retrieved June 26, 2006 from, http://www.math.uic.edu/~imse/IMSE/MTB/FAQs.html
- Kalder, R. S. (2001). A study of the mathematics textbook adoption process in selected New York State school districts. *Dissertations Abstracts International*, 62(05), 1762A. (UMI No. 3014780)
- Kaplowitz, M. D., Hadlock, T. D., & Levine, R. (2004). A comparison of web and mail survey response rates. [Electronic version]. *Public Opinion Quarterly*, 68(1), 94-101.
- Kauffman, D. (2002, April). A search for support: Beginning elementary teachers' use of mathematics curriculum materials. Paper presented at the American Educational Research Association annual meeting. Retrieved October 15, 2006, from, http://scholar.google.com/url?sa=U&q=http://www.gse.harvard.edu/~ngt/Kauffm an_AERA2002.pdf
- Kaufman, J. D., & Dunlap, W. P. (2000). Determining the number of factors to retain: A
 Windows-based FORTRAN-IMSL program for parallel analysis. *Behavior Research Methods, Instruments & Computers, 32*(3), 389-395.
- Kennedy, M. M. (1999). Form and substance in mathematics and science professional development. *NSIE Brief*, *3*(2), 1-7. (ERIC Reproduction Service No. ED 435552)

- Kennedy, M. M., Ball, D. L., & McDiarmid, G. W. (1993). A study package for examining and tracking changes in teachers' knowledge (Report No. 93-1). East Lansing, MI: National Center for Research on Teacher Learning. (ERIC Document Reproduction Service No. 359170)
- Klein, D., & Marple, J. (2000). A comparison of three K-6 mathematics programs: Sadlier, Saxon, and SRA McGraw-Hill. Retrieved June 26, 2006, from, http://mathematicallycorrect.com/k6books.pdf
- Kulm, G. (1999). Making sure that your mathematics curriculum meets *standards*.*Mathematics Teaching in the Middle School*, 4(8), 536-541.
- Larson, N., & Paolino, R. (n.d.). Mathematically correct second grade mathematics review Saxon Math Publishers, Inc. Saxon Math 2: An incremental development. Retrieved June 26, 2006, from, http://mathematicallycorrect.com/books2c.htm
- Lewis, L., Parsad, B., Carey, N., Bartfai, N., Farris, E., Greene, B., & Smerdon, B.
 (1999). *Teacher Quality: A report on the preparation and qualifications of public school teachers* (Report No. NCES 1999-080). Washington, DC: U.S.
 Government Printing Office.
- Lloyd, G. M., & Behm, S. L. (2005). Preservice elementary teachers' analysis of mathematics instructional materials. *Action in Teacher Education*, *26*(4), 48-62.
- Lubinski, C. (1994). The influence of teachers' beliefs and knowledge on learning environments. *Arithmetic Teacher*, *4*, 476-479.
- Ma, L. (1999). *Knowing and teaching elementary mathematics*. Mahwah, NJ: Lawrence Erlbaum Associates.

- Martin, T. S., Hunt, C. A., Lannin, J., Leonard, W., Marshall, G. L., & Wares, A. (2001). How reform secondary mathematics textbooks stack up against NCTM's principles and standards. *Mathematics Teacher*, 94(7), 540-589.
- Mathematical Sciences Education Board & National Research Council. (1990).
 Reshaping school mathematics: A philosophy and framework for curriculum.
 Washington D.C.: National Academy Press.
- Mathematically correct second grade mathematics review: Everyday learning, Everyday Mathematics. (1999). Retrieved June 26, 2006 from, http://mathematicallycorrect.com/books2g.htm
- McKnight, C. C., Crosswhite, F. J., Dossey, J. A., Kifer, E., Swafford, J. O., Travers, K.
 J., et al. (1987). *The underachieving curriculum: Assessing U.S. school mathematics from an international perspective*. Champaign, IL: Stipes.
- Michalowicz, K. D., & Howard, A. C. (2003). Pedagogy in Text: An analysis of mathematics texts from the nineteenth century. In G. M. A. Stanic & J. Kilpatrick (Eds.), A *history of school mathematics* (p. 77-109). Reston, VA: NCTM.
- National Commission on Teaching and America's Future. (1996). *What matters most: Teaching for America's future*. New York: Author. (ERIC Document Reproduction Service No. ED395931)
- National Council of Teachers of Mathematics. (1970). *A history of mathematics education in the United States and Canada*. Washington, DC: Author.

- National Council of Teachers of Mathematics. (1980). An Agenda for action:
 Recommendations for school mathematics of the 1980s. Reston, VA: Author.
 (ERIC Document Reproduction Service No. ED186265).
- National Council of Teachers of Mathematics. (1989). Curriculum and evaluation standards for school mathematics. Reston, VA: Author.
- National Council of Teachers of Mathematics. (1991). Professional standards for teaching mathematics. Reston, VA: Author.
- National Council of Teachers of Mathematics. (1995). Assessment standards for school mathematics. Reston, VA: Author.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- National Council of Teachers of Mathematics. (2006). *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics*. Reston, VA: Author.
- National Research Council. (1989). Everybody counts: A report to the nation on the future of mathematics education. Washington, DC: National Academy Press.
- Naughton, M. T. (2004). John Saxon versus the National Council of Teachers of Mathematics: Looking below the surface of an educational controversy.
 Dissertations Abstracts International, 65(03), 869A. (UMI No. 3124959)

Nietz, J. A. (1961). Old Textbooks. Pittsburgh, PA: University of Pittsburgh Press.

Ohio Department of Education. (2006). ODE interactive: Extract Ohio educational information [Data File]. Available from Ohio Department of Education Web site, http://webapp2.ode.state.oh.us/data/extract_oed_addgrades.asp

Pallant, J. (2001). SPSS survival manual. Buckingham, PA: Open University Press.

- Parsad, B., Lewis, L., & Farris, E. (2000). Teacher preparation and professional development: 2000 (Report No. NCES 2001-088). Washington, DC: U.S. Government Printing Office.
- Perrin, J. R. (2008). A study of the beliefs and reported practices of seventh- and eighthgrade mathematics teachers in relation to NCTM's vision of school mathematics. *Dissertations Abstracts International*, 69(12), 449(A). (UMI No. 3339136)
- Peterson, P. L., Fennema, E., Carpenter, T. P., & Loef, M. (1989). Teachers' pedagogical content beliefs in mathematics. *Cognition and Instruction*, 6(1), 1-40.
- Porter, A. C., Garet, M. S. Desimone, L., Suk Yoon, K., & Birman, B. F. (2000). Does professional development change teaching practice? Results from a three-year study (Report No. 2000-04). Washington, DC: US Department of Education. (ERIC Reproduction Service No. ED 455227)
- Putnam, R. T., Heaton, R. M., Prawat, R. S., & Remillard, J. (1992). Teaching mathematics for understanding: Discussing case studies of four fifth grade teachers. *The Elementary School Journal*, 92(2), 213-228.
- Reys, B. J., & Bay-Williams, J. M. (2003). The role of textbooks in implementing the curriculum principle and the learning principle. *Mathematics Teaching in the Middle School*, 9(2), 120-125.
- Rey, B. J., & Reys, R. E. (2006). The development and publication of elementary mathematics textbooks: Let the buyer beware! *Phi Delta Kappan*, 87(5), 377-383.
- Reys, B. J., Reys, R. E., & Chavez-Lopez, O. (2004). Why mathematics textbooks matter. *Educational Leadership*, 61(5), 61-66.

- Reys, R. E. (2001). Curricular controversy in the math wars: A battle without winners. *Phi Delta Kappan*, *83*(3), 255-258.
- Riley, J. E. (1999). Elementary school mathematics: Factors affecting strategies and materials for instruction. *Dissertations Abstracts International*, 60(06), 1950A. (UMI No. 9933934)
- Saxon Publishers. (2006a). *Frequently asked questions*. Retrieved June 26, 2006 from, http://saxonpublishers.harcourtachieve.com/en-US/sp_faq.htm

Saxon Publishers. (2006b). Intermediate Math. Retrieved June 26, 2006 from,

http://saxonpublishers.harcourtachieve.com/en-

US/Products/default.htm?CatalogNavigationBreadCrumbs=Harcourt%20Achieve

%20Catalog;SaxonMath;Saxon_02_Math45&ShowTop=true&Catalog=Harcourt

%20Achieve%20Catalog&Category=Saxon_02_Math45

Saxon Publishers. (n.d.). *Research summary: Saxon early learning*. Retrieved June 26, 2006 from,

http://saxonpublishers.harcourtachieve.com/HA/correlations/pdf/s/saxon_earlylea rn research.pdf

Schoen, H. L., Fey, J. T., Hirsch, C. R., & Coxford, A. F. (1999). Issues and options in the math wars. *Phi Delta Kappan*, 80(6), 444–453.

Schoenfeld, A. (2001). Mathematics education in the twentieth century. In L. Corno (Ed.), *Education across a century: The centennial volume* (p. 239-278). Chicago, IL: Chicago University Press.

- Schultz, J. E. (2002, October). Mathematics education in rural communities in light of current trends in mathematics education. Retrieved October 15, 2006 from, http://www.acclaim-math.org/docs/working_papers/WP_01_Schultz.pdf
- Schwab, P. (2002). Factors that influence teachers' selection of instructional materials: Information, sources, and benefits. *Dissertation Abstracts International*, 63(06), 5119(B). (UMI No. 3056389)
- Seeley, C. L. (2003). Mathematics textbook adoption in the United States. In G. M. A.
 Stanic & J. Kilpatrick (Eds.), A *history of school mathematics* (p. 957–988).
 Reston, VA: NCTM.
- Sheehan, K. (2001). E-mail survey response rate: A review. Journal of Computer-Mediated Communication, 16(2). Retrieved September 30, 2006, from, http://64.233.167.104/search?q=cache:02dP4RcdHgcJ:jcmc.indiana.edu/vol6/issu e2/sheehan.html+e-mail+survey+response+rate&hl=en&gl=us&ct=clnk&cd=1
- Silver, E. A., & Castro, A. M. (2002, November). Mathematics learning and teaching in rural communities: Some research issues. Paper presented at the meeting of the ACCLAIM Research Symposium, McArthur, OH.
- Snead, L. (1998). Professional development for middle school mathematic teachers to help them respond to NCTM Standards. *Journal of Teacher Education*, 49(4), 287-295.
- St. John, M., Fuller, K. A., Houghton, N., Huntwork, D., & Tambe, P. (2004). Mathematics curricular decision-making: The national landscape. Inverness, CA: Inverness Research Associates.

- Stevens, J. (1999). Intermediate statistics: A modern approach (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Stigler, J. W., & Hiebert, J. (1999). The teaching gap: Best ideas from the world's teachers from improving education in the classroom. New York: The Free Press.

SurveyMonkey.com.(2006). SurveyMonkey.com: Because knowledge is everything. [Online survey software]. Retrieved October 16, 2006, from, http://www.surveymonkey.com/

- Svec, M. (1997, March). Understanding national standards: An evaluation of a professional development program for mathematics teachers. Paper presented at the meeting of the National Association for Research in Science Teaching, Chicago, IL.
- Tabachnick, B., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Pearson Education Co.
- Thompson, A. G. (1984). The relationship of teachers' conceptions of mathematics and mathematics teaching to instructional practices. *Educational Studies in Mathematics*, 15(2), 105-127.
- Thompson, C. L., & Zeuli, J. S. (1999). The frame and the tapestry: Standards-based reform and professional development. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 341-375). San Francisco: Jossey-Bass.
- Trafton, P. R., Reys, B. J., & Wasman, D. G. (2001). Standards-based mathematics curriculum materials: A phrase in search of a definition. *Phi Delta Kappan*, 83(3), 259-64.

University of Chicago School Mathematics Project Everyday Mathematics Center.

(2003). *About everyday mathematics*. Retrieved June 26, 2006 from, http://everydaymath.uchicago.edu/about.shtml

- Van de Walle, J. A. (1999, April). *Reform mathematics vs. the basics: Understanding the conflict and dealing with it.* Paper presented at 77th annual meeting of the National Council of Teachers of Mathematics, San Francisco, CA. Retrieved June 26, 2006 from, http://mathematicallysane.com/analysis/reformvsbasics.asp
- Watson, G. A. (1995). Middle school mathematics teacher change: Social constructivism climbs a step. *Paper presented at the Annual Meeting of the National Council of Teachers of Mathematics*. Boston, MA. (ERIC Reproduction Service No. ED 382469)
- Weiss, I. R., Banilower, E. R., McMahon, K. C., & Smith, P. S. (2001). Report of the 2000 national survey of science and mathematics education. Chapel Hill, NC: Horizon Research, Inc. Retrieved July 20, 2006, from http://www.horizonresearch.com/reports/
- Weiss, I. R., Pasley, J. D., Smith, P. S., Banilower, E. R., & Heck, D. J. (2003). A study of K-12 mathematics and science education in the United States. Chapel Hill, NC: Horizon Research, Inc. Retrieved July 20, 2006, from http://www.horizonresearch.com/reports/
- Wilkins, J. L., & Brand, B. R. (2004). Change in preservice teachers' beliefs: An evaluation of a mathematics methods course. *School Science and Mathematics*, 104(5), 226-232.
- Willoughby, S. S. (1999a). Mathematically correct fifth grade mathematics review: SRA McGraw Hill, SRA Math: Explorations and Applications. Retrieved July 19, 2006 from, http://mathematicallycorrect.com/books5f.htm
- Willoughby, S. S. (1999b). Mathematically correct second grade mathematics review:
 SRA McGraw Hill, SRA Math: Explorations and Applications. Retrieved July 18, 2006 from, http://mathematicallycorrect.com/books2e.htm
- Zollman, A., & Mason, E. (1992). The standards' belief instrument (SBI): Teacher's beliefs about the NCTM standards. *School Science and Mathematics*, 92(7), 359-364.

Heading	Studies
Textbook Alignment	This section begins with research for professional
Preferences,	development in different subject areas (Apthorp et
Professional Development,	al., 2001; Lewis et al., 1999; Parsad et al., 2000). It
and Years of Teaching	transitions into a discussion of studies regarding
Experience	professional development for mathematic education
	(Cohen & Hill, 1998; Kennedy, 1999; Garet et al.,
	1999). Last, it describes studies that discuss the
	influence of professional development in regards to
	textbooks (St. John et al., 2004; Almekbel, 2000).
Mathematics Beliefs,	This section begins with research for mathematics
Professional Development	beliefs (Putnam et al., 1992; Lubinski, 1994; Battista,
Years of Teaching	1994; Cobb et al., 1992). Next, it discussed studies
Experience	for mathematics beliefs and professional
	development training. (Carpenter et al., 1989; Weiss
	et al., 2003; Banilower et al., 2005). The section
	concludes with studies that utilized the Standards
	Beliefs Instrument, the mathematics belief scale for
	this study (Zollman & Mason, 1992; Furner, 1996;
	Hart, 2002; Hart, 2004; Wilkins & Brand, 2004;
	Furner, 2002).
Mathematics Beliefs,	This section begins with research regarding
Professional Development,	professional development training that aligned with
Years of Teaching	the Standards (Watson, 1995). It transitions into a
Experience, and Teacher	study that discusses how several states implemented
Attention to the Standards	professional training that ultimately influenced
	teacher attention to the <i>Standards</i> and their textbook
	alignment preference (Appalachia Rural, 2000). This
	section then moves to a brief discussion of a study
	that investigated 7 th and 8 th grade teacher's degree of
	agreement (beliefs in alignment with the NCTM's
	vision of school mathematics) and awareness of the
	Standards (Perrin, 2008). The next study discussed
	professional development training, years of teaching
	experience, and the level of teacher attention to the
	Standards (Snead, 1998). The last study in this
	section discussed professional development training,
	mathematics beliefs, and teacher attention to the
	Standards (Svec, 1997).
Textbook Alignment	This section opens with a study described a national
Preferences, Mathematics	study for mathematics and science education
Beliefs, Professional	conducted by Horizon Research (Weiss et al., 2001).
Development, Years of	This study investigated teachers' years of teaching
Teaching Experience, and	experience, level of attention to the Standards,

APPENDIX A: STUDIES FROM LITERATURE REVIEW

Teacher Attention to the	emphasis and hours of professional development, and
Standards	a list of the most commonly used mathematics
	textbooks. The level of attention to the Standards and
	emphasis of professional development are the
	variables that will be utilized for this research. Also,
	this section included a qualitative study that
	discussed the mathematics beliefs and emphasis and
	hours of professional development of elementary
	school mathematics teachers (Kauffman, 2002).
	Lastly, this section concluded with a mixed methods
	study that reported on how middle school
	mathematics teachers use Standards-based and
	traditional textbooks (Chavez-Lopez, 2003).
	Pertinent to this research hours and emphasis of
	professional development, years of teaching
	experience, mathematics beliefs, and textbook
	preference were discussed.

APPENDIX B: RECRUITMENT OF PARTICIPANTS PROTOCOL

The recruitment of subjects for the study will adhere to the following protocol.

- The first randomly chosen district's superintendent will be contacted via phone.
 Permission will be requested for study to be conducted in district and to contact principal(s). The two replies are the following:
 - a. Consent will be granted for study to take place in district. Thus, proceed to 2.
 - b. Consent will not be granted for study to take place in district. Thus, proceed to 5.
- A principal in district will be contacted via phone to gain consent to conduct study in the school. The two replies are the following:
 - a. Consent will be granted to conduct study in school. Thus, proceed to 3.
 - b. Consent will not be granted to conduct study in the school. Thus, proceed to 5.
- Once consent has been granted from the principal to conduct the study in the school, then two paths will take place. They are the following:
 - a. Principal or a contact person in the school will distribute email contacts to teachers. If 500 teachers have been sent the survey, then data collection process stops.
 - b. Researcher will distribute email contacts to the teachers. If 500 teachers have been sent the survey, then the data collection process stops.
- 4. The second (third, fourth, fifth,...) randomly chosen district's superintendent will be contacted via phone to ask permission for study to be conducted in district and to contact principal(s). Two replies will take place:
 - a. Consent will be granted to conduct study in school. Thus, proceed to 2.
 - b. Consent will not be granted to conduct study in school. Thus, proceed to 4.

- 5. The second (third, fourth, fifth, ...) principal in district will be contacted to gain consent to conduct study and contact teacher(s). Two replies will take place:
 - a. Consent will be granted to conduct study in school. Thus, proceed to 3.
 - b. Consent will not be granted to conduct study in school. Thus, proceed to 6 or if this is the last school in district then proceed to 4.

APPENDIX C: INSTRUMENT

I. Teache	er Bac	kgroun	d Informat	tion				
1. Please	provi	de the 1	name of yo	our schoo	l district a	nd scho	ool.	
S	chool	Distric	t					
S	chool							
2. What	grade	level do	o you teac	h? Circle	one.			
K	C .	1 st	2^{nd}	3 rd	4 th	5 th	6 th	
3. How r	nany y	ears ha	ive you tai	ught at th	e K-12 lev	el prior	to this year?	
4. Are yo	ou mal	e or fei	nale? Circ	ele one.	Male		Female	
5. Do yo	u have	e each c	of the follo	wing deg	grees? Circ	le all th	at apply.	
Bachelo	ors		Masters		Master	r + 30	Doctorate	
II. Backg	ground	l Inforn	nation on I	Mathema	tics Textbo	ook		
6. Please textbook	provi you a	de the t re using	itle, publis g.	sher, and	copyright	date of	the main K-6 th mathematic	s
Title								
Publisher	r							
Copyrigh	nt Date	9						
7 Do vo	u feel	that the	e mathema	tics texth	ook vou a	re using	t is more traditional or alig	ne

7. Do you feel that the mathematics textbook you are using is more traditional or aligned with the National Council of Teachers of Mathematics Standards document? Circle one.

Traditional

Aligned with Standards Document

III. Questions 8-31 describe characteristics of K-6 mathematics curriculum materials (textbooks and supplementary materials). Please provide your degree of agreement with each item.

8. Better curriculum materials frequently use calculators to develop mathematical ideas.

	strongly disagree	disagree	neutral	agree	strongly agree
9.	The best curric mathematical r	ulum materials de easoning and con	evelop mathema	tical topics by fost ong students.	ering
	strongly disagree	disagree	neutral	agree	strongly agree
10.	Curriculum ma definite starting	terials that are more g and ending point	ost successful hat ts for mathemat	ave chapters and/or ical topics.	r units with
	strongly disagree	disagree	neutral	agree	strongly agree
11.	Curriculum ma procedural/com	terials are most e putational skills.	effective when the $(e.g., 78 + 56)$	heir primary focus	is developing
	strongly disagree	disagree	neutral	agree	strongly agree
12.	Better curricult chapters titles t Race).	um materials shou hat need not iden	ald have attractiv tify the mathem	ve and motivating atical content (e.g.	units and/or , The Amazing
	strongly disagree	disagree	neutral	agree	strongly agree
13.	Better curriculu	um materials rest	rict student use o	of calculators.	
	strongly disagree	disagree	neutral	agree	strongly agree
14.	Most lessons ir class instruction	n curriculum mate n.	erials should em	phasize teacher-ce	ntered, whole-

strongly	disagree	neutral	agree	strongly
disagree				agree

15. Curriculum materials that are most successful have a flexible organizational scheme with multiple points of entry.

	strongly disagree	disagree	neutral	agree	strongly agree
16.	Better curriculu practicing math algorithmic/pro	um materials plac nematical concep ocedural problem	e the most emph ts by individuall s.	asis on students re y completing	egularly
	strongly disagree	disagree	neutral	agree	strongly agree
17.	The most effec previous/new n	tive method for s nathematics mate	tudents to maste rial in games or	r skills is to alway activities.	s embed
	strongly disagree	disagree	neutral	agree	strongly agree
18.	Most lessons in class, small-cla	n curriculum mate ss, and individua	erials should emp l-class instruction	phasize student-dii on.	rected, whole-
	strongly disagree	disagree	neutral	agree	strongly agree
19.	The most effec that consist of p material.	tive method for s previously learne	tudents to maste d and a very few	r skills is to praction newly learned ma	ce problems athematics
	strongly disagree	disagree	neutral	agree	strongly agree
20.	Curriculum ma and ways of thi	terials should lar nking about solv	gely focus on in ing problems.	vestigating mather	natical topics
	strongly disagree	disagree	neutral	agree	strongly agree
21.	The most useful evaluations of j	ll assessment mat previously learne	erials emphasize d material.	e frequent, individu	ual paper-pencil
	strongly disagree	disagree	neutral	agree	strongly agree
22.	Better curriculu	um materials focu	is on students' w	vorking in small gr	oups or pairs

solving contextual problems that build a foundation for algorithms/procedures.

strongly	disagree	neutral	agree	strongly
disagree				agree

23. Curriculum materials should primarily focus on teaching students to solve real world problems by developing mathematical ideas, testing them out, defending and proving them, and sharing their thinking with others.

	strongly disagree	disagree	neutral	agree	strongly agree
24.	Curriculum ma steps/rules for	aterials should pr solving mathema	imarily focus on atical problems a	teaching students and basic facts.	to learn
	strongly disagree	disagree	neutral	agree	strongly agree
25.	The best curric pieces.	culum materials a	ılways develop r	nathematical topic	s in very small
	strongly disagree	disagree	neutral	agree	strongly agree
26.	In curriculum mathematical	materials, lessons topics.	s should integrat	e a number of diffe	erent
	strongly disagree	disagree	neutral	agree	strongly agree
27.	Curriculum ma developing ma	aterials are most athematical topics	effective when a s in the context of	t all times their foo of dilemmas and/or	cus is stories.
	strongly disagree	disagree	neutral	agree	strongly agree
28.	Curriculum mathematical	aterials should la topics.	rgely focus on re	epetition and review	w of
	strongly disagree	disagree	neutral	agree	strongly agree
29.	Better curricul topic.	um materials hav	ve units and/or cl	hapters named by r	nathematical
	strongly disagree	disagree	neutral	agree	strongly agree
30.	In curriculum	materials, lesson	s should teach a	single mathematic	al topic.
	strongly disagree	disagree	neutral	agree	strongly agree

strongly	disagree	neutral	agree	strongly
disagree				agree

- IV. Questions 32-47 describe mathematics teaching and learning. Please provide your degree of agreement with each statement.
- 32. Problem solving should be a SEPARATE, DISTINCT part of the mathematics curriculum.

strongly	disagree	agree	strongly
disagree			agree

33. Students should share their problem-solving thinking and approaches WITH OTHER STUDENTS.

strongly	disagree	agree	strongly
disagree			agree

34. Mathematics can be thought of as a language that must be MEANINGFUL if students are to communicate and apply mathematics productively.

strongly	disagree	agree	strongly
disagree			agree

35. The goal of mathematics instruction is to help children develop the beliefs that THEY HAVE THE POWER to control their own success in mathematics.

strongly	disagree	agree	strongly
disagree			agree

36. Children should be encouraged to justify their solutions, thinking and conjectures in a SINGLE way.

strongly	disagree	agree	strongly
disagree			agree

37. The study of mathematics should include opportunities of using mathematics in OTHER CURRICULUM AREAS.

strongly	disagree	agree	strongly
disagree			agree

38.	The mathematics curriculum consists of several discrete strains such as computation, geometry, and measurement, which can be best taught in ISOLATION.			ch as ht in
	strongly disagree	disagree	agree	strongly agree
39.	In K-4 mathematics, IN writing numbers SYM	NCREASED emphasis BOLICALLY.	should be given to re	eading and
	strongly disagree	disagree	agree	strongly agree
40.	In K-4 mathematics, In WORDS (key words)	NCREASED emphasis to determine which op	should be given to use rations to use in prol	se of CLUE olem solving.
	strongly disagree	disagree	agree	strongly agree
41.	In K-4 mathematics, sl	cill in computation sho	ould PRECEDE word	problems.
	strongly disagree	disagree	agree	strongly agree
42.	Learning mathematics storing it easily in retri reinforcement.	is a process in which s evable fragments as a	students ABSORB IN result of repeated pra	FORMATION, ctice and
	strongly disagree	disagree	agree	strongly agree
43.	Mathematics SHOULI algorithms.	D be thought of as a CO	OLLECTION of conc	epts, skills, and
	strongly disagree	disagree	agree	strongly agree
44.	A demonstration of good reasoning should be regarded EVEN MORE THAN students' ability to find correct answers.			
	strongly disagree	disagree	agree	strongly agree
45.	Appropriate calculator	s should be available t	o ALL STUDENTS a	at ALL TIMES.
	strongly disagree	disagree	agree	strongly agree

46. Learning mathematics must be an ACTIVE PROCESS.

strongly	disagree	agree	strongly
disagree			agree

47. Children ENTER KINDERGARTEN with considerable mathematical experience, a partial understanding of many mathematical concepts, and some important mathematical skills.

strongly	disagree	agree	strongly
disagree			agree

- V. Please give your opinion about statements 48-51 in regard to the National Council of Teachers of Mathematics' (NCTM) work in setting standards for mathematics curriculum, instruction, and assessment.
- 48. I am prepared to explain the NCTM *Standards* to my colleagues.

	strongly disagree	disag	;ree	agree	strongly agree
49.	The Standard	s have been the	oroughly discus	ssed by teachers	in this school.
	strongly disagree	disag	ŗree	agree	strongly agree
50.	There is a sch	ool-wide effor	t to make chang	ges inspired by th	ne Standards.
	strongly disagree	disag	ree	agree	strongly agree
51.	Teachers in th	is school have	implemented t	the Standards in	their teaching.
	strongly disagree	disag	jree	agree	strongly agree
VI.	For items 52-: participated ir emphasized?	56 consider all 1 during the las	the profession of 5 years. How	al development/tr much was each	raining you have of the following
52.	Deepening my	y own mathem	atics content ki	nowledge.	
	not at all	slightly	somewhat	a good deal	to a great extent

	not at all	slightly	somewhat	a good deal	to a great extent
54.	Learning	how to use inquiry	y/investigation-ori	ented teaching st	trategies.
	not at all	slightly	somewhat	a good deal	to a great extent
55.	Learning	how to use techno	ology in mathemati	ics instruction.	
	not at all	slightly	somewhat	a good deal	to a great extent
56.	Learning	how to assess stud	lent learning in ma	athematics.	
	not at all	slightly	somewhat	a good deal	to a great extent
IV.	What is the profession	ne total amount of nal development tr	time over the past raining that empha	t five years you h sized the areas b	ave spent on below.
57.	Deepening	g my own mathen	natics content know	wledge.	
	None	Less than 6 Hours	6-15 Hours	16-35 Hours	More than 35 Hours
58.	Understar	nding student thinl	king in mathemation	CS.	
	None	Less than 6 Hours	6-15 Hours	16-35 Hours	More than 35 Hours
59.	Learning	how to use inquiry	y/investigation-ori	ented teaching st	trategies.
	None	Less than 6 Hours	6-15 Hours	16-35 Hours	More than 35 Hours
60.	Learning	how to assess stuc	lent learning in ma	athematics.	
	None	Less than 6 Hours	6-15 Hours	16-35 Hours	More than 35 Hours

Understanding student thinking in mathematics.

53.

Comments regarding your mathematics textbook and/or the selection of your mathematics textbook are welcome.

If you are interested in participating in a 10-minute phone interview regarding this study, then please respond with your name and phone number to one of the emails.

Code	Statement	References
TR Instr	Most lessons in curriculum	Naughton, 2004; Riley, 1999;
1	materials should	Goldsmith & Mark, 1999; Martin,
	emphasize teacher-	Hunt, Lannin, Leonard, Marshall, &
	centered, whole-class	Wares, 2001; Saxon Publishers 2006b;
	instruction.	Van de Walle 1999; Larson & Paolina,
		n.d.; Saxon Publishers, n.d.; Fey 1999;
		Lloyd & Behm 2005;Klein & Marple
		2000; California Mathematics Project
		2005; Willoughby, 1999b
I K Instr	Curriculum materials	Klein & Marple, 2000; Larson &
2	should primarily focus on	Paolina, n.d.; Naughton, 2004;
	stans/rules for solving	American Association for the
	mathematical problems	Advancement of Science [AAAS],
	and basic facts.	2000, willougilby, 1999a
TR Instr	The best curriculum	Klein & Marple, 2000; Saxon
3	materials always develop	Publishers, n.d.; Saxon Publishers,
	mathematical topics in	2006a; Willoughby, 1999b
	very small pieces.	
TR	The most effective method	Saxon Publishers, 2006b; Saxon
St Wk	for students to master	Publishers, n.d.; Larson & Paolina,
1	skills is to practice	n.d.; Bishop, 1997; Klein & Marple,
	providents that consist of	2000, AAAS, 2000, California Mathematics Project, 2005:
	very few newly learned	Willoughby 1999b
	mathematics material	w moughoy, 17770
	mathematics material.	
TR	Better curriculum	Larson & Paolina, n.d.; Lloyd & Behm,
St Wk	materials place the most	2005; Bishop, 1997; California
2	emphasis on students'	Mathematics Project, 2005; Martin et
	regularly practicing	al., 2001; AAAS, 2000; Trafton et al.,
	mathematical concepts by	2001; Willoughby, 1999a; Willoughby,
	individually completing	1999b
	algorithmic/procedural	
	problems.	
TR	In curriculum materials,	Larson & Paolina, n.d.; Saxon
Cont	lessons	Publishers, n.d.; AAAS, 2000; Kulm,
1	should teach a single	1999; Willoughby, 1999a; 1999b
	mathematical	
	topic.	
1	1	

APPENDIX D: REFERENCES FOR TEXTBOOK ALIGNMENT PREFERENCES

TR Cont 2	Curriculum materials should largely focus on repetition and review of mathematical topics.	Klein & Marple, 2000; Larson & Paolina, n.d.; Saxon Publishers, 2006b; Saxon Publishers, n.d.; Naughton, 2004; AAAS, 2000; Bishop, 1997; Goldsmith & Mark, 1999; Willoughby, 1999b
TR Cont 3	Curriculum materials are most effective when its primary focus is developing procedural/computational skills. (e.g., 78 + 56)	Klein & Marple, 2000; Larson & Paolina, n.d.; AAAS, 2000; Trafton, Reys, & Wasman, 2001; Fey, 1999; Goldsmith & Mark, 1999; Bishop, 1997; Willoughby, 1999a
TR Org 1	Better curriculum materials have units and/or chapters named by mathematical topic.	Kulm, 1999; California Mathematics Project, 2005; Willoughby, 1999a; Willoughby, 1999b
TR Org 2	Curriculum materials that are most successful have chapters and/or units with definite starting and ending points for mathematical topics.	Kulm, 1999; Willoughby, 1999b
TR Assess	The most useful assessment materials emphasize frequent, individual paper-pencil evaluations of previously learned material.	Larson & Paolina, n.d.; Saxon Publishers, n.d.; Kulm, 1999; AAAS, 2000
TR Tech	Better curriculum materials restrict student use of calculators.	Klein & Marple, 2000; AAAS, 2000
SB Instr 1	Most lessons in curriculum materials should emphasize student- directed, whole-class, small-class, and individual-class instruction.	Mathematically Correct, 1999; Institute for Mathematics, 2003; Trafton, Reys, & Wasman, 2001; Goldsmith & Mark, 1999; University of Chicago, 2003

SB Instr 2	Curriculum materials should primarily focus on teaching students to solve real world problems by developing mathematical ideas, testing them out, defending and proving them, and sharing their thinking with others.	Goldsmith et al., 2000; Mathematically Correct, 1999; Kulm, 1999; Institute for Mathematics, 2003; Trafton, Reys, & Wasman, 2001; Goldsmith & Mark, 1999; Martin et al., 2001; AAAS, 2000; ARC Center, 2003
SB Instr 3	materials develop mathematical topics by fostering mathematical reasoning and communication among students.	Institute for Mathematics, 2003; University of Chicago, 2003; AAAS, 2000; Mathematically Correct, 1999; Fey, 1999
SB St Wk 1	The most effective method for students to master skills is to always embed previous/new mathematics material in games or activities.	Goldsmith et al., 2000; Mathematically Correct, 1999; Kulm, 1999; University of Chicago, 2003; Goldsmith & Mark, 1999; AAAS, 2000; ARC Center, 2003; Bishop, 1997
SB St Wk 2	Better curriculum materials focus on students' working in small groups or pairs solving contextual problems that build a foundation for algorithms/procedures.	Mathematically Correct, 1999; Martin et al., 2001; AAAS, 2000; ARC Center, 2003; Fey, 1999; Lloyd & Behm, 2005
SB Cont 1	In curriculum materials, lessons should integrate a number of different mathematical topics.	Goldsmith et al., 2000; Mathematically Correct, 1999; Kulm, 1999; Institute for Mathematics, 2003; University of Chicago, 2003; AAAS, 2000; ARC Center, 2003; Fey, 1999
SB Cont 2	Curriculum materials should largely focus on investigating mathematical topics and ways of thinking about solving problems.	Goldsmith et al., 2000; Kulm, 1999; Institute for Mathematics, 2003; Lloyd & Behm, 2005; University of Chicago, 2003; Goldsmith & Mark, 1999; ARC Center, 2003; Fey, 1999
SB Cont 3	Curriculum materials are most effective when at all times their focus is developing mathematical topics in the context of dilemmas and/or stories.	Goldsmith et al., 2000; Mathematically Correct, 1999; Goldsmith & Mark, 1999; AAAS, 2000; ARC Center, 2003

SB	Better curriculum	Goldsmith et al., 2000; Kulm, 1999;
Org	materials should have	AAAS, 2000
1	attractive and motivating	
	units and/or chapters titles	
	that need not identify the	
	mathematical content (e.g.,	
	The Amazing Race)	
SB	Curriculum materials that	Goldsmith et al., 2000; Kulm, 1999;
Org	are most successful have a	Institute for Mathematics, 2003
2	flexible organizational	
	scheme with multiple	
	points of entry.	
SB	The most useful	Goldsmith et al., 2000; Kulm, 1999;
Assess	assessment materials	California Mathematics Project, 2005;
	emphasize varied means of	Institute for Mathematics, 2003;
	evaluation (e.g.,	AAAS, 2000; ARC Center, 2003; Fey,
	observations, oral work,	1999
	written work, student	
	demonstrations of	
	presentations either	
	individually or in small	
	groups)	
SB	Better curriculum	Goldsmith et al., 2000; Institute for
Tech	materials frequently use	Mathematics, 2003; University of
	calculators to develop	Chiango 2002: APC Contar 2002:
	calculators to develop	Cincago, 2005, ARC Center, 2005,

APPENDIX E: DESCRIPTION OF KEY AREAS FOR TEXTBOOK DIFFERENCES

Area	Description
Instruction	The instruction area refers to how the textbook expects the mathematical topics to be taught.
Content	The content area refers to the quantity and process of how the mathematics topics are learned in the textbook.
Student Work	The student work area refers to the how the textbook expects students to learn and practice the math topics in the classroom.
Organization	The organization area refers to the length, starting or ending points of math topics and the flexibility of a textbook's organizational scheme. This area also refers to the name of the chapters or units within textbooks.
Assessment	The assessment area refers to the means of assessment and materials that textbooks offer.
Technology	The technology area refers to the frequency of use for calculators that textbooks offer.

APPENDIX F: REFERENCES FOR EMPHASIS OF PROFESSIONAL

DEVELOPMENT

Statement	References
Deepening my own mathematics	Porter, Garet, Desimone, Suk Yoon,
content knowledge	Birman, 2000; Garet et al., 1999;
	Weiss, Pasley, Smith, Banilower, &
	Heck, 2003; Weiss et al., 2001;
	Banilower, Boyd, Pasley, & Weiss,
	2005
Understanding student thinking in	Porter et al., 2000; Garet et al., 1999;
mathematics	Weiss et al., 2003; Weiss et al., 2001;
	Banilower et al., 2005
Learning how to use	Porter et al., 2000; Garet et al., 1999;
inquiry/investigation-oriented	Choy, Chen, & Ross, 1998; Weiss et
teaching strategies	al., 2001; Banilower et al., 2005
Learning how to use technology in	Porter et al., 2000; Garet et al., 1999;
mathematics instruction	Lewis et al., 1999; Hawkins,
	Stancavage, & Dossey, 1998; Choy et
	al., 1998; Weiss et al., 2001;
	Banilower et al., 2005
Learning how to assess learning in	Porter et al., 2000; Garet et al., 1999;
mathematics	Lewis et al., 1999; Choy et al.; Weiss
	et al., 2001; Banilower et al., 2005

APPENDIX G: PHONE SCRIPTS FOR SUPERINTENDENTS AND K-6 PRINCIPALS

Researcher and Superintendent Phone Conversation:

Researcher:

Hello, my name is Valerie Blom and I am a mathematics education doctoral student at Ohio University. I am conducting research on elementary mathematics textbooks, mathematics beliefs, and emphasis of professional development training in the state of Ohio and my call is to ascertain permission to conduct this research in your district. Additionally, I would need to contact the K-6 principals to gain permission for the research to be conducted in their schools. Can you speak to me at the moment regarding this, would a later time be preferable, or do you not wish for your district to participate?

Superintendent Response:

One possible response: "Yes, the research may be conducted in my district and you may contact the principals". The other possible response: "No, I do not wish for this research to be conducted in my district".

Researcher response:

One possible response: "Fantastic! I will be contacting the principals in your district to gain permission for the study to be conducted in their schools. Of course the principals and/or teachers may decline to participate. Thank you for allowing me to conduct this research in your district". The other possible response: "Thank you for your time and consideration. Have a great day".

Researcher and K-6 Elementary Principal Phone Conversation:

Researcher:

Hello, my name is Valerie Blom and I am a mathematics education doctoral student at Ohio University. I spoke to the district superintendent to gain permission to contact you regarding the research I am conducting on elementary mathematics textbooks, mathematics beliefs, and emphasis of professional development training in the state of Ohio. My call is to ascertain permission to conduct this research in your school. Specifically, your K-6 teachers who teach mathematics would be asked if they would complete a 15-minute on-line survey regarding this research. In order to collect my data, I need to send the K-6 teachers in your school three different email contacts. The first contact is an initial letter that explains they have been selected to participate, are under no obligation to do so, the purpose of the study, monetary compensation, their consent to participate is their completion of the survey, and the web link to the survey. The second contact is a thank you email that expresses my appreciation for those who have participated and if they still wish to participate in the study please do so soon. The third contact is a final letter that explains the study is coming to a close and if they have not participated then please do so within the next week. You, a contact person in your school, or I can send the teachers these email contacts. If I distributed the emails, then I would need the teachers' school email addresses. Another option would be a paper copy of the three contacts along with the survey. Would you like your school to participate in the study and if so then what option do you prefer with regards to the distribution of the contacts?

Principal Response:

One possible response: "Yes, the research may be conducted in my school and you may email the teachers. I (or my secretary) will send you the email address". Another possible response: "Yes, the research may be conducted in my school and I (or my secretary) will email the teachers". Another possible response: "Yes, the research may be conducted in my school. Please send me the paper copies of the surveys and letters."

The other possible response: "No, I do not wish for this research to be conducted in my school".

Researcher Response:

One possible response: "Fantastic! I will be contacting the teachers in your school to gain consent for them to participate in the study. They will receive the initial email from me in a few days. If teachers so choose they may decline to participate. Thank you for allowing me to conduct this research in your school". Another possible response: "Fantastic! I will send you (or school secretary) the three email/paper contacts at the appropriate times for you to forward to the teachers. Thank you for allowing me to conduct my research in your school". The other possible response: "Thank you for your time and consideration. Have a great day".

APPENDIX H: CONTACTS

Initial Email

Dear Fellow Educator,

Greetings! After seeking permission from your district's superintendent and school principal, I am delighted to be sending you this email. They have agreed for research regarding K-6 textbooks, mathematics beliefs, and emphasis of professional development training to be conducted in your school.

This letter serves three purposes. It informs you of your selection to participate, describes some of its details, and provides a link to the survey (see below). If you choose to participate, then your school will receive a gift certificate to *Staples* (\$3.00 per teacher) as a thank you for the time you spent completing the survey. This reward will be distributed within four to five weeks.

Over the past two decades much attention has been given to mathematics curriculum materials. This is due in part because American schools depend greatly on textbooks for instructional delivery. Yet few studies have been conducted on the relationship between textbooks, beliefs, and professional development training.

You are one of a small number of K-6 educators who teach mathematics that has been asked to respond to this issue. In order that the results truly represent the thinking of elementary teachers in Ohio's districts, it is important that each fifteen-minute questionnaire be completed and returned. Your completion of the survey will be your consent to participate in the study. As someone who has worked in our nation's public schools, I know that your schedule is busy and your time is valuable, but your response is important. And please know that you are under no obligation to complete the survey.

167

You may be assured of complete confidentiality. Your name will never be placed on the questionnaire or used for any other purpose.

The web link to the survey is <web link>. Please click on the link (or copy and paste it in the address bar/window and press enter) and answer the questions.

I would be happy to answer any questions you have about this project. Please write or call. My telephone number is (614) 607 6545 and my e-mail address is <vnblom@msn.com>.

Sincerely and with much thanks,

Valerie N. Blom

Thank You Contact

Dear Fellow Educator,

Hello again! Two weeks ago an email was sent to you regarding research I am conducting for K-6 mathematics textbooks, mathematics beliefs, and professional development training. Your district was randomly drawn from all the districts in the state of Ohio to participate in this study.

If you have already completed the survey, then please accept my sincere thanks. If not and you still wish to participate in this study, then please do so as soon as possible. I am especially grateful for your help because it is only by asking educators like yourself to share your opinions that we can better understand the needs for mathematics education. If you began the survey, did not complete it, and still wish to do so, then using the SAME computer click on the web link. The web link will take you to the point where you stopped. Again, gift certificates to *Staples* will be awarded to schools for each teacher that completes the survey (\$3.00 per teacher). The gift certificates will be distributed within four to five weeks after the initial email contact.

The web link to the survey is <web link>. Please click on the link (or copy and paste it in the address bar/window and press enter) and answer the questions as best you can.

Sincerely and with much thanks,

Valerie Blom

Project Director

vnblom@msn.com

614 607 6545

Final Contact

Dear Fellow Educator,

During the last four weeks I have sent you two mailings about an important research study I am conducting in the state of Ohio. Its purpose is to gain further understanding of K-6 teachers opinions regarding mathematics textbooks, mathematics beliefs, and professional development training.

The study will be drawing to a close in one week, and this the last contact that will be made with the random sample of districts. Hearing from the teachers in this small sample statewide helps assure that the survey results are as accurate as possible. I also want to assure you that your participation in the study is voluntary, and if you prefer not to respond that's fine. If you began the survey, did not complete it, and still wish to do so, then using the SAME computer click on the web link. The web link will take you to the point where you stopped.

Finally, I greatly appreciate your willingness to consider this request. The web link is provided if you choose to participate. <web link>

Sincerely,

Valerie Blom

Project Director

vnblom@msn.com

614 607 6545

APPENDIX I: HISTOGRAMS OF SUMMATED SCORES



Textbook Alignment Preferences





Mathematics Beliefs



Emphasis of Professional Development

Hours of Professional Development





Teachers Attention to the NCTM Standards

APPENDIX J: PERCENTAGE OF RESPONSES PER ITEM FOR VARIABLES

	Mean Std Dev N	Strongly Disagree to Disagree	Neutral (N)	Strongly Agree (SA) to Agree (A)	Did Not Disagree = N + SA + A
Most lessons in curriculum materials should emphasize student-directed, whole-class, small-class, and individual-class instruction. <i>SB instruction 1</i>	3.15 .74 244	1.68	11.50	86.10	97.6
Curriculum materials should primarily focus on teaching students to solve real world problems by developing mathematical ideas, testing them out, defending and proving them, and sharing their thinking with others. <i>SB instruction 2</i>	2.89 .87 245	8.60	16.30	75.10	91.40
The best curriculum materials develop mathematical topics by fostering mathematical reasoning and communication among students. <i>SB instruction 3</i>	3.18 .67 245	1.60	7.30	91.00	98.30
In curriculum materials, lessons should integrate a number of different mathematical topics. <i>SB content 1</i>	2.52 .85 244	15.60	22.10	62.3	84.40
Curriculum materials should largely focus on investigating mathematical topics and ways of thinking about solving problems. <i>SB content 2</i>	2.92 .80 245	7.30	9.40	83.3	92.7
Curriculum materials are most effective when at all times their focus is developing mathematical topics in the context of dilemmas and/or stories. <i>SB content 3</i>	2.04 .82 245	29.00	38.80	32.20	71.00
The most effective method for students to master skills is to always embed previous/new mathematics material in games or activities. SB student work 1	2.68 .85 243	9.90	25.50	64.60	90.10
Better curriculum materials focus on students' working in small groups or pairs solving contextual problems that build a foundation for algorithms/procedures. <i>SB</i> <i>student work 2</i>	2.62 .84 245	9.80	27.30	62.90	90.20
Better curriculum materials should have attractive and motivating units and/or chapters titles that need not identify the mathematical content (e.g., The Amazing Race). <i>SB organization 1</i>	1.80 .96 244	41.80	33.20	25.00	58.20
Curriculum materials that are most successful have a flexible organizational scheme with multiple points of entry. <i>SB organization 2</i>	2.96 .72 244	5.30	10.70	84.00	94.70
The most useful assessment materials emphasize varied means of evaluation (e.g., observations, oral work, written work, student demonstrations of presentations either individually or in small groups) <i>SB</i> assessment	3.23 .76 245	2.40	9.80	87.80	97.60
Better curriculum materials frequently use calculators to develop mathematical ideas. (Aligned with NCTM Standards documents) SB technology	2.04 .95 245	27.30	41.60	31.00	72.60
Most lessons in curriculum materials should emphasize teacher-centered, whole-class instruction. TR <i>instruction 1</i>	2.69 .88 243	70.50	17.60	11.80	29.40
Curriculum materials should primarily focus on teaching students to learn steps/rules for solving mathematical problems and basic facts.	1.78 .99 245	26.70	29.80	43.70	73.50

Textbook Alignment Preferences: Percentage per Item

The best curriculum materials always develop mathematical topics in very small pieces. <i>TR</i> <i>instruction 3</i>	1.78 .88 245	24.50	31.40	44.10	75.50
In curriculum materials, lessons should teach a single mathematical topic. <i>TR content 1</i>	2.29 .89 244	51.30	25.80	22.90	48.70
Curriculum materials should largely focus on repetition and review of mathematical topics. <i>TR content 2</i>	1.56 1.01 244	23.80	22.10	54.10	76.20
Curriculum materials are most effective when their primary focus is developing procedural/computational skills. (e.g., 78 + 56) <i>TR content 3</i>	2.15 1.05 245	46.50	21.60	31.80	53.40
The most effective method for students to master skills is to practice problems that consist of previously learned and a very few newly learned mathematics material. <i>TR student work 1</i>	1.71 1.01 243	29.60	18.10	51.20	69.30
Better curriculum materials place the most emphasis on students regularly practicing mathematical concepts by individually completing algorithmic/procedural problems. <i>TR</i> student work 2	1.89 1.02 244	33.60	23.80	42.60	66.40
Better curriculum materials have units and/or chapters named by mathematical topic. <i>TR organization 1</i>	1.72 .82 245	18.00	40.80	41.20	82.00
Curriculum materials that are most successful have chapters and/or units with definite starting and ending points for mathematical topics. <i>TR organization 2</i>	2.11 1.03 244	40.20	27.50	32.40	59.90
The most useful assessment materials emphasize frequent, individual paper-pencil evaluations of previously learned material. <i>TR assessment</i>	2.03 .96 245	37.60	28.60	33.90	62.50
Better curriculum materials restrict student use of calculators. <i>TR technology</i>	2.51 .88 243	57.20	28.40	14.40	42.80

	Mean Std Dev N	Strongly Disagree	Disagree	Agree	Strongly Agree
Problem solving should be a SEPARATE, DISTINCT part of the mathematics curriculum.	.89 .54 246	19.5	73.2	6.1	1.2
Children should be encouraged to justify their solutions, thinking and conjectures in a SINGLE way.	.96 .66 245	20.8	64.9	11.4	2.9
The mathematics curriculum consists of several discrete strains such as computation, geometry, and measurement, which can be best taught in ISOLATION.	.98 .58 246	16.7	69.1	13.4	0.8
In K-4 mathematics, INCREASED emphasis should be given to reading and writing numbers SYMBOLICALLY.	1.47 .58 241	2.1	50.6	45.2	2.1
In K-4 mathematics, INCREASED emphasis should be given to use of CLUE WORDS (key words) to determine which operations to use in problem solving.	2.18 .60 246	1.6	5.3	66.3	26.8
In K-4 mathematics, skill in computation should PRECEDE word problems.	1.55 .72 245	3.3	48.6	38.4	9.8
Learning mathematics is a process in which students ABSORB INFORMATION, storing it easily in retrievable fragments as a result of repeated practice and reinforcement.	1.73 .65 246	2.4	30.5	58.5	8.5
Mathematics SHOULD be thought of as a COLLECTION of concepts, skills, and algorithms.	2.15 .49 246	0.0	5.7	74.0	20.3
Students should share their problem-solving thinking and approaches WITH OTHER STUDENTS. (Aligned with Standards)	2.47 .55 246	0.4	1.6	48.4	49.6
Mathematics can be thought of as a language that must be MEANINGFUL if students are to communicate and apply mathematics productively. (<i>Aligned with</i> <i>Standards</i>)	2.43 .51 246	0.0	0.4	55.7	43.9
A goal of mathematics instruction is to help children develop the beliefs that THEY HAVE THE POWER to control their own success in mathematics. (<i>Aligned with</i> <i>Standards</i>)	2.28 .56 246	0.4	4.1	62.6	32.9
The study of mathematics should include opportunities of using mathematics in OTHER CURRICULUM AREAS. (<i>Aligned with Standards</i>)	2.42 .51 245	0.0	0.8	55.9	43.3
A demonstration of good reasoning should be regarded EVEN MORE THAN students' ability to find correct answers. (<i>Aligned with Standards</i>)	1.92 .62 246	0.8	21.1	63.4	14.6
Appropriate calculators should be available to ALL STUDENTS at ALL TIMES. (<i>Aligned with Standards</i>)	1.40 .70 245	5.7	55.9	31.4	6.9
Learning mathematics must be an ACTIVE PROCESS. (<i>Aligned with Standards</i>)	2.44 .51 245	0.0	0.8	54.3	44.9
Children ENTER KINDERGARTEN with considerable mathematical experience, a partial understanding of many mathematical concepts, and some important mathematical skills. (<i>Aligned with Standards</i>)	1.33 .83 246	15.9	41.9	35.4	6.9

Mathematics Beliefs: Percentage Per Item

	Mean Std Dev N	Strongly Disagree	Disagree	Agree	Strongly Agree
I am prepared to explain the NCTM <i>Standards</i> to my colleagues.	1.53 .73 245	7.3	39.2	46.9	6.5
The NCTM <i>Standards</i> have been thoroughly discussed by teachers in this school.	1.50 .80 246	9.3	41.1	39.8	9.8
There is a school-wide effort to make changes inspired by the NCTM <i>Standards</i> .	1.63 .75 246	6.9	32.9	50.4	9.8
Teachers in this school have implemented the NCTM <i>Standards</i> in their teaching.	1.87 .74 245	4.1	22.4	55.9	17.6

Teacher Attention to the NCTM Standards: Percentage Per Item

Emphasis of Professional Development: Percentage Per Item

	Mean Std Dev N	Not at All	Slightly	Somewhat	A Good Deal	To a Great Extent
Deepening my own mathematics content knowledge.	1.99 1.15 245	13.9	15.5	37.6	23.7	9.4
Understanding student thinking in mathematics.	2.11 1.12 245	11.4	14.7	33.5	31.8	8.6
Learning how to use inquiry/investigation-oriented teaching strategies.	2.05 1.12 245	11.0	18.0	35.1	26.9	9.0
Learning how to use technology in mathematics instruction.	1.70 1.11 245	16.7	24.9	35.1	18.0	5.3
Learning how to assess student learning in mathematics.	2.08 1.10 245	10.6	14.3	40.0	26.5	8.6

	Mean Std Dev N	None	Less than 6 hours	6-15 hours	16-35 hours	More than 35 hours
Deepening my own mathematics content knowledge.	1.43 1.10 245	20.0	38.4	26.9	8.2	6.5
Understanding student thinking in mathematics.	1.51 1.05 245	14.7	41.2	28.2	10.2	5.7
Learning how to use inquiry/investigation-oriented teaching strategies.	1.49 1.05 245	15.1	42.4	27.8	8.2	6.5
Learning how to assess student learning in mathematics.	1.47 1.04 245	13.9	46.9	23.3	10.2	5.7

Hours of Professional Development: Percentage Per Item

APPENDIX K: COMPONENT MATRIX FOR TEXTBOOK ALIGNMENT

	Component						
	1	2	3	4	5	6	7
CM TR ASSESS paper pencil	.64						
CM SB ST WK 2 small groups or pairs	.64	.31					
CM TR INSTR 2 steps rules	.63	41					
CM TR CONT 3 procedural computational skill	.61	42					
CM SB INSTR 2 solve real world problems	.59	.48					
CM SB INSTR 3 math reasoning and communication	.58	.33					
CM TR ST WK 2 algorithmic procedural problems	.57						
CM TR INSTR 1 teacher centered	.57						
CM SB ASSESS assessment varied	.52	.38			.31	32	
CM TR CONT 1 single mathematical topic	.51			.36			
CM SB CONT 2 investigating	.47	.38				.34	
CM TR CONT 2 repetition and review	.45	44		34			
CM SB ST WK 1 games or activities.	.33	.51					
CM SB INSTR 1 student centered	.34	.41					.36
CM SB ORG 1 attractive and motivating units		.35			31		
CM SB TECH use calculators			.80				
CM TR TECH restrict calculators			.63	40			
CM TR ORG 2 chapters units definite	.47			.54			
CM TR ORG 1 name math topic	.40			.49			
CM SB CONT 1 integrate different	.34			.42	.38		
CM SB ORG 2 flexible organizational scheme					.59	.46	
CM SB CONT 3 dilemmas and or stories.		.42				.58	
CM TR ST WK 1 previously and newly		35				.36	.56
CM TR INSTR 3 small pieces.	.32		.33				.40

PREFERENCES

Note. Appendix D includes the code for the items above.