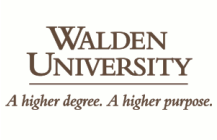

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Teacher beliefs and the implementation of the mathematics curriculum in an urban school district

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COLLEGE OF EDUCATION

This is to certify that the doctoral study by

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Abstract

Teacher Beliefs and the Implementation of the

Mathematics Curriculum in an Urban School District

by

Debra A. Mahone

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Administrator Leadership

Walden University

April 2011

Abstract

Teachers' beliefs about standards-based mathematics curricula can have a direct impact on the implementation of those curricula. Yet, new standards-based curricular approaches, mandated as reform structures under the No Child Left Behind Act (NCLB), fail to account for the beliefs of teachers regarding the curricula in the implementation of new instructional reform practices or policies. The purpose of this quantitative, ex post facto study was to examine pre-existing survey data from a sample (n = 362) of elementary, middle, and high school teachers in an urban school district to analyze the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and implementation of that curriculum. The theory of planned behavior (TPB), whose proponents posit that beliefs direct behavior, provided the theoretical framework for the study. The three constructs of TPB, attitude, subjective norms, and perceived behavioral control, were used as proxies for the study's independent variables: teacher beliefs about the curriculum, teacher beliefs about the professional community, and teacher beliefs about instructional leadership. The dependent variable was curriculum implementation. Both descriptive and inferential statistical analyses were used, including Pearson correlations, to analyze data. The findings of this study showed no significant correlation between teacher beliefs and implementation of the curriculum. School districts, school administrators and mathematic teachers will benefit from understanding the value of professional learning communities, positive social norms and perceived behavioral control as factors for promoting collective accountability under NCLB and teacher practice and implementation of standards-based curriculum reform.

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Dedication

This dissertation is dedicated to my family, whose support has helped me attain my professional goals. To my parents, thank you for your love, which instilled in me a sense of confidence and personal fortitude that has sustained me throughout my life. To my children, Tiffany and Adam, may this achievement serve as inspiration to you as you pursue your life goals. And to my dear and loving husband, thank you for your understanding, your broad shoulders, and your unfailing encouragement.

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Section 1: Introduction to the Study

Since the inception of standards-based testing in the United States, teachers have held conflicting beliefs about curriculum content and curriculum implementation. The standards-based testing era in education reached its maturation in 2003, at which time 48 states and two jurisdictions received approval for their content standards development process (Jorgensen & Hoffman, 2003). Accordingly, content standards and curricula under the No Child Left Behind Act ([NCLB], 2001) are set at the state level and require states to set rigorous educational standards and curricula. However, there are no federal requirements for specific content standards or state-mandated curricula (U.S. Department of Education, 2008). As a result, states are implementing different measures and reform models to ensure that local educational agencies comply with NCLB guidelines and requirements (U.S. Department of Education, 2008). Many states have responded by adopting uniform curricula and by providing increased levels of professional development (Stein & Coburn, 2008). Others have aligned curriculum with state standards and assessments (Stein & Coburn, 2008).

Despite the various approaches taken by state and local policy makers to produce rigorous curricula, few approaches reflect a consideration of whether teachers are actually learning the skills and applying the knowledge necessary to transform their classroom environments (Stein & Coburn, 2008). In addition, many approaches fail to account for the beliefs of the teacher about the curriculum in the implementation of the practice or policy (Stein & Coburn, 2008). New federal, state, and local policies often require teachers to implement classroom instruction and learning that may be different from

existing teacher practices and require teachers to learn new ways of carrying out their work in the classroom (Stein & Coburn, 2008).

Successful reform policies require the transformation of core teachers' learning and instructional practices (Stein & Coburn, 2008). Failures of implementation of curriculum reform policies and practices that do not conform to teacher beliefs are common in the literature (Stein & Coburn, 2008). Researchers now suggest that rather than curriculum reform policy influencing teacher practice, it is more likely that teachers influence and shape curriculum reform policy and practices (Stein & Coburn, 2008). That is to say, teachers interpret, adapt, and even transform policies and curriculum practices according to their beliefs as they put them into place in their classrooms (Coburn, 2001; Stein & Coburn, 2008). Consequently, the transformational learning required of teachers to effect reform policies relies on district coordination of professional development, the alignment of curriculum with teacher beliefs, and the alignment of instruction and assessment within the learning climate (Akinsola, 2008; Lloyd & Herbel–Eisenmann, 2005; Stein & Coburn, 2008). The formal structure of the educational environment, which includes teachers and instructional leaders (e.g., principals, instructional coaches, grade-level teacher teams) provides either opportunities or restraints for reform transformation within what is referred to by Stein and Coburn (2008) as *architectures for learning* or *professional communities*.

The changing and economically competitive world has made the study of mathematics important for students today (Akinsola, 2008; Furner, 1995; Simmt, 2000; Skovsmose, 2000; Steen, 1999). Mathematics is one of the content areas assessed under NCLB (2001) and thereby influences federal, state, and local measures of school

achievement. According to the literature, among the most important factors in developing students' mathematical abilities are the beliefs of teachers in the discipline (Lloyd & Herbel–Eisenmann, 2005; Meyer, 1980). Researchers have shown that what goes on in the mathematics classroom may be directly related to the beliefs teachers hold about mathematics and the mathematics curriculum (Ricks, 2010). It has been argued that these beliefs play a role not only in student achievement, but also in student motivation (Ricks, 2010).

Early research in mathematics education indicated that teaching behavior was affected by teacher beliefs concerning mathematics. Researchers found that mathematics teachers' opinions, beliefs, and inclinations swayed their instructional practices (Bush, Lamb, & Alsina, 1990; Fullan, 1983; Karp, 1991; Kessler, 1985; McGalliard, 1983; Silver, 1985; Thompson, 1984). More recent research shows the significant effect that teachers' beliefs can have in the formation of student beliefs and attitudes toward mathematics as a subject worthy of continued study (Akinsola, 2008; Charalambos, Philippou, & Kyriakides, 2002; Emenaker, 1996; Ernest, 2000; Reboli & Holdick, 2002; Ricks, 2010; Uusimaki & Nason, 2004).

In the literature review in section 2, teachers' beliefs are more fully explored regarding standards-based curricula as a reform structure under NCLB (2001) and the influence of the professional mathematics community and instructional leadership on their beliefs and behaviors in implementing the curriculum. For the purposes of this paper, teacher behavior was defined as implementation of the curriculum. The review of literature in section 2 also contains a description of Ajzen's (1991) theory of planned behavior (TPB), which provided the theoretical framework for this study, and its

application to the relationship between teachers' beliefs and classroom behaviors associated with the implementation of a standards-based mathematics curriculum.

Statement of the Problem

According to the literature, teachers' beliefs about the standards-based mathematics curriculum directly affect the implementation of that curriculum (Akinsola, 2008; Lloyd & Herbel–Eisenmann, 2005; Meyer, 1980; Stein & Coburn, 2008). Yet, new standards-based curricular approaches, mandated as reform structures under NCLB (2001), fail to account for the beliefs of teachers regarding curricula in the implementation of new instructional reform practices or policies (Leana & Phil, 2006).

. Researchers have shown that resources embedded in relationships among teachers, including teachers' beliefs concerning the curriculum, are strong predictors of successful implementation of the curriculum (Lubinski & Benbow, 1994; Thompson, 1984). However, if teachers' beliefs are not congruent with the beliefs underpinning a curriculum reform, then the result of such a mismatch can affect the degree of success of the reform, as well as the teachers' morale and willingness to implement further innovative reforms (Handel & Herrington, 2003).

It has been argued that teachers' beliefs also play a role in the formation of student beliefs and attitudes toward mathematics (Emenaker, 1996; Uusimaki & Nason, 2004). While early research into the teaching of mathematics supported the idea that teachers' beliefs about mathematics curriculum and standards had a powerful impact on the practice of teaching, new research further suggests that teachers with negative beliefs about mathematics standards and mathematics curricula influence a learned helplessness

response from students, whereas the students of teachers with positive beliefs about mathematics standards and mathematics curricula enjoy successful mathematical experiences that result in their seeing mathematics as worthwhile (Charalambos et al., 2002; Ernest, 2000; Reboli & Holdick, 2002).

An abundance of literature is available on teachers' beliefs and perceptions regarding NCLB (2001) legislation and its impact on the curriculum. Much of the literature focuses on teacher concerns that a standards-based curriculum implemented by school districts in response to NCLB has a negative impact on the curriculum by narrowing content and instruction (Ohio Education Association, 2008a). For example, a survey conducted by the National Council of Teachers of English (as cited in McKenzie, 2006) revealed that 76% of the 2,000 literacy teachers surveyed felt that imposed accountability under NCLB had a negative impact on curriculum implementation. Teacher attitudes regarding a standards-based curriculum were cited in a survey of teachers' perceptions of changes resulting from the standards-based reform requirements for the California Standards Test in science and revealed that teachers expressed more favorable attitudes about the standards-based reform requirements in environments where the principal was regarded as a resource of support (Leggett & Wilson, 2007). The results of a survey conducted by Rapp (as cited in Ohanian, 2006) indicated that teachers in the state of Vermont believed that the standards-based requirements under NCLB were harming students. Eighty percent of teachers reported that they believed that students' needs were not being met under NCLB (2001). Eighty-eight percent of the teachers surveyed believed that the mandated curriculum allowed them too little control (Ohanian, 2006). The survey also revealed that 93% of the teachers reported that they believed that

the limited curriculum caused students to love learning less (Ohanian, 2006). Teacher beliefs as reported in these surveys contribute to the abundance of literature espousing the negative impact NCLB (2001) legislation has imposed on curriculum implementation.

On a more local level, as revealed by the Maryland State Department of Education (2009a), the Maryland State Assessment (MSA), a high-stakes test aligned to state standards and outcomes, 36.2% of students in County Public Schools performed below proficiency in mathematics. Only 64% of students met performance targets based on the 2008 end-of-year standards-based assessment (Maryland State Department of Education, 2009a). Additionally, an audit conducted by an external consulting firm revealed that implementation of the standards-based curriculum in middle schools in this district was inconsistent and irregular (Cambridge Education, 2008). Key findings from the audit revealed limited learning and poor-quality teaching overall (Cambridge Education, 2008). The learning environment was described as sterile and teacher-centered (Cambridge Education, 2008). Additionally, teacher classroom instruction was observed as being more compliance driven than student progress guided (Cambridge Education, 2008).

The collective responsibility of teachers for student achievement through the implementation of a standards-based curriculum raises questions regarding the relationship between teachers' beliefs about the standards-based curriculum and teacher behavior with respect to implementation. Researchers have shown that there is wide variation inherent in curricular implementation (Chval, Grouws, Smith, Weiss, & Ziebarth, 2006), which is, in turn, dependent upon teachers' beliefs and orientations

toward the standards-based curriculum and instructional materials (Remillard & Bryans, 2004).

New standards-based curricular approaches, mandated as reform structures under NCLB (2001), fail to account for the beliefs of teachers in the implementation of new instructional reform practices or policies, even though researchers have shown that teachers' beliefs about the standards-based curriculum, particularly the math curriculum, have a direct impact on the implementation of that curriculum. If teachers' beliefs are not congruent with the beliefs underpinning a curriculum reform, then the resulting disconnect can affect the degree of success of the anticipated reform as well as the teachers' morale and willingness to implement further innovative reforms (Handel & Herrington, 2003). An analysis of the relationship between teachers' beliefs (independent variables) regarding the use of a standards-based mathematics curriculum and the implementation of that curriculum (dependent variable) were entailed in this study.

Nature of the Study

A quantitative ex post facto research design was utilized in this study. Pre-existing data from the Process Engineering for Educational Results ([PEER], 2009) County Public Schools Formative Feedback System: Teacher Survey 1 were analyzed to determine the relationship between teacher beliefs about the standards-based mathematics curriculum and its implementation. For the purposes of this study, this survey will be referred to as the *PEER Teacher Survey* or *PEER Survey*. The sample (n = 362) consisted of elementary, middle, and high school teachers in an urban school district.

The following research questions were addressed in this study: (a) What is the relationship between teachers' beliefs regarding the standards-based mathematics

curriculum and implementation of that curriculum? (b) What is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum? and (c) What is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum? The independent variables were beliefs (about the curriculum, professional community, and instructional leadership); the dependent variable was curriculum implementation.

The three constructs of Ajzen's (1991) TPB (attitude, subjective norms, and perceived behavioral control) served as proxies for the three independent variables in the study. Teachers' beliefs about the standards-based curriculum represented Ajzen's construct attitude, teachers' beliefs about their professional community in mathematics represented Ajzen's construct subjective norms, and teachers' beliefs about instructional leadership represented Ajzen's construct perceived behavioral control. Table 1 illustrates the relationship between the independent variables in this study and the constructs of Ajzen's TPB.

Table 1

Relationship Between the Independent Variables and the Constructs of the TPB

Independent Variable	Construct of TPB
Beliefs regarding the standards-based mathematics curriculum	Attitude
Beliefs regarding the professional community in mathematics	Subjective norms
Beliefs regarding instructional leadership of the standards-based mathematics curriculum	Perceived behavioral control

The null hypotheses for the study were the following:

$H_0$1: There is significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum.

$H_0$2: There is no significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum.

$H_0$3: There is no significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum.

The alternative hypotheses were the following:

$H_1$1: There is a significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum.

$H_1$2: There is a significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum.

$H_1$3: There is a significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum.

The descriptive summaries of the data for this study included measures of central tendency and measures of dispersion. A more detailed discussion of the methodology employed to analyze the data in this study is presented in section 3.

Purpose of the Study

The purpose of this quantitative, ex post facto study was to examine pre-existing survey data from a sample of elementary, middle, and high school teachers (n = 362) in an urban school district to analyze the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and implementation of that curriculum.

Relevant information from the pre-existing data set was selected to examine the relationship between teacher beliefs about the standards-based curriculum, the professional community, and instructional leadership and implementation of the curriculum. According to the TBP, which provides the theoretical framework for the study, behavior (defined as implementing the curriculum) is influenced by beliefs about a desired behavior (Ajzen, 1991). Ajzen (1991) stated that beliefs are formed by attitudes about the behavior—or subjective norms, which he defined as social pressure to perform the behavior—and perceived control of the behavior, defined as beliefs about the ease or difficulty of performing the behavior. According to the TPB , beliefs are predictive of behavior (Ajzen, 2008; Fishbein & Ajzen, 1975).

Currently, implementation of standards-based curricula in County Public Schools is monitored through informal and formal classroom teacher observations. Curriculum implementation is further monitored through teacher use of curriculum framework progress guides. Curriculum framework progress guides are designed to provide teachers with a prescriptive guide for curriculum development and implementation, inclusive of a pacing schedule for curriculum implementation. The curriculum framework progress guides also provide direction for incorporating standards and outcomes, goals, objectives,

and indicators into the development and implementation of the curriculum (County Public Schools, 2008b). Student performance data are the outputs of teacher curriculum implementation.

The student performance data gleaned from the MSA (2008) and subsequent audit findings in County Public Schools, coupled with the district's efforts to guide the development and delivery of standards-based instruction through curriculum framework guides, provide reliable information with respect to student outcomes that directly relate to inputs essential to meaningful school improvement reform. The supposition stated by Edmonds (1982) --that teachers have not done all they can to ensure that all students achieve at high levels—provides a lens through which further discussion and research might be viewed even today. In Edmonds's words,

> We can, whenever and wherever we choose, successfully teach all children whose schooling is of interest to us. We already know more than we need to do that. Whether or not we do it must depend on how we feel about the fact that we haven't so far. (p. 23)

As a result of NCLB (2001) legislation and the required alignment between standards-based curriculum and outcomes, barriers to high student achievement should no longer exist. Yet many states are still struggling to meet minimum proficiency standards while also focusing attention on curriculum implementation (Ohio Education Association, 2008b). Despite the various approaches taken by state and local policy makers to produce rigorous curricula, few approaches reflect a consideration of whether teachers are actually learning the skills and applying the knowledge necessary to transform their classroom environments (Stein & Coburn, 2008). Many approaches fail to

account for the role of teacher beliefs in the implementation of the practice or policy. However, according to Marzano (2003), the teacher is still the single most important factor in student achievement. Stein and Coburn (2008) stated that understanding how districts can create organizational environments that foster opportunities for teachers to learn and practice reform strategies can promote transformation of teacher beliefs through the development of architectures for learning or professional communities. Likewise, the resources embedded in relationships among teachers are important predictors of organizational performance and student achievement (Leana & Phil, 2006).

According to Ajzen (1991), human action is guided by beliefs that may facilitate or impede the performance of behavior. Beliefs, in turn, influence behavior (for the purposes of this study, behavior was defined as implementation of the curriculum). Ajzen's TPB helped to explain human actions (such as teacher behavior in implementing the curriculum) in situations where understanding or changing the behavior of people is advantageous to an organization or to a program.

Theoretical Framework of the Study

The TPB (Ajzen, 1991) provided the theoretical framework for this study. Proponents of the TPB posit that human action is guided by beliefs and that beliefs influence behavior (Fishbein & Ajzen, 1975). The TPB is an extension of the theory of reasoned action (a prediction of a person's intention to perform a behavior) (Fishbein & Ajzen, 1975), with a third element added—perceived behavioral control (Ajzen, 1991; Fishbein & Cappella, 2006). Perceived behavioral control refers to the ease or difficulty of performing a behavior (Ajzen, 2006). It encompasses a person's perception of the readily available resources, skills, and opportunities to complete a task or perform a

behavior, as well as the person's own perception of the importance of achieving the results (Ajzen, 2006). The concept of perceived behavioral control is close to the concept of self-efficacy (Bandura, 1997). The beliefs of an individual concerning his or her self-efficacy can have an influence on his or her choice of activities, his or her preparation for the activity, and finally on the effort that he or she exerts during the activity in question (Bandura, 1997).

The TPB (Ajzen, 1991) has been used to explain such human behaviors as one's propensity to diet, exercise, or use condoms (Hale, Householder, & Greene, 2003). The TPB was appropriate for this study because it can be applied to various activities and social conditions (Hale et al., 2003). According to Sheppard, Hartwick, and Warshaw (1988), "more than half of the research on the theory of planned behavior has utilized the model to investigate activities for which the model was not originally intended" (p. 388). In the research referenced by Sheppard et al., it was expected that the model would not provide similar correlations as seen in consumer models. However, it was determined by Hale et al. that the model performed well and had a strong predictive utility when used in situations for which the model was not originally designed. Consequently, the TPB was an appropriate theoretical framework to explain the relationship between a teacher's belief regarding the use of a standards-based curriculum and a teacher's behavior (i.e., implementing the curriculum). Researchers have shown that the theory is "one of the most predictive, persuasion theories" associated with social psychology (Ajzen, 2008, p. 1). However, because behavioral intentions do not necessarily lead to actual behavior, the concept of perceived behavioral control, explains why behavior can be influenced by a belief in one's ability to perform the behavior in question (Ajzen, 2008).

Miller (2005) used the following exercise analogy to define the three constructs of Ajzen's (1991) theory (attitude, subjective norms, and perceived behavioral control). A person's belief about the behavior of exercising could include a belief that exercise is good for him or her, makes him or her feel good, takes too much time, or is uncomfortable (Miller, 2005). Each of these beliefs carries a weight that is greater, less than, or equal to the others (Miller, 2005). The sum of the beliefs represents the person's attitude about exercising Miller, 2005). These beliefs are either favorable or unfavorable and constitute an attitude about exercising (Miller, 2005). Relevant persons within one's social environment (spouse, friends, parents, etc.) may be avid exercisers or lead more sedentary lifestyles and discount exercising (Miller, 2005). The beliefs of the relevant people in a person's life, weighted by how much value the person places on their opinions, represent the person's subjective norms (Ajzen, 2006). Social norms produce social pressure to exercise or not. For example, a person may value the belief or opinion of his or her spouse over that of a friend. According to Miller's analogy, the combined function of attitude and subjective norms toward exercise will lead to one's intention to exercise (or not). Because behavior is influenced by one's confidence and ability in performing the behavior, and because behavioral intentions do not always lead to actual behavior due to circumstances (i.e., accessibility of exercise equipment, physical fitness, health, time, etc.), perceived behavioral control regarding the ease or difficulty of exercising can contribute to the prediction of behavior and therefore serve as a proxy for actual behavior (exercise) (Miller, 2005). Hale et al. (2003) explained that behavioral intentions are shaped by a person's attitudes toward the behavior combined with the subjective norm.

Operational Definitions of Technical Terms

The following terms were defined in order to provide an operational understanding of the context and body of knowledge being studied.

Attitude: Refers to the degree to which a person has a favorable or unfavorable evaluation of a behavior (Hale et al., 2003). Attitudes are formed by the individual weight and sum total of the beliefs about the behavior (Hale et al., 2003).

Behavior: For the purposes of this study, *behavior* refers to teacher implementation of the curriculum.

Behavioral beliefs: Attitudes about the likely outcomes of a behavior and the evaluation of those outcomes (Ajzen, 2006).

Content standards: Broad, measurable statements about what students should know and be able to do in each subject area and grade (Maryland State Department of Education, 2009b).

County Formative Feedback Teacher Survey: This term refers to the pre-existing survey instrument from which data will be extracted for the study (PEER, 2009). For the purposes of this study, it is referred to alternately as the *PEER Teacher Survey* or *PEER Survey*.

Curriculum Framework Progress Guides: Provide specific instructional guidance to teachers regarding the delivery of curriculum inclusive of a pacing timeline for instructional implementation and skill-specific lessons and activities aligned to the objectives and standards assessed on end-of-year high-stakes tests (County Public Schools, 2008b).

Efficacy beliefs: A teacher's efficacy belief is a judgment of his or her capabilities

to bring about the desired outcome of student engagement and learning even among those students who may be difficult or unmotivated (Armor et al., 1976). This judgment may have a powerful effect on student learning (Armor et al., 1976).

Instructional leadership: Refers to a principal's capacity to provide on-the-job managerial accountability for learning outcomes by providing professional support and resources to teachers (Matthews, Moorman, & Nusche, 2007).

Maryland School Assessment (MSA): A test of reading and mathematics that meets the testing requirements of NCLB (Maryland State Department of Education, 2009b).

Perceived behavioral control: Beliefs about the ease or difficulty of performing a behavior, or factors that may facilitate or impede performance of a behavior (Ajzen, 2006).

Process Engineering for Educational Results (PEER): Associated with the Swanson School of Engineering at the University of Pittsburgh and the Learning Research Development Center at the University of Pittsburgh (PEER, 2009). It supports school districts by measuring the quality of the work done in the school district to improve leadership, teaching, and learning (PEER, 2009).

Professional community: Refers to formal support structures of educational environments inclusive of individual teachers, teacher coaches, administrators, or teams (Stein & Coburn, 2008).

Standards-based curriculum: A curriculum in which the state, district, or school specifies the content (Marzano, 2003). It is the curriculum intended to be addressed in a particular course or grade level (Marzano, 2003).

Subjective norms: Perceived social pressure to perform or not perform a specific behavior as determined by the influence of relevant individuals in one's social environment (Hale et al., 2003).

TPB: Refers to the theory of planned behavior (Ajzen, 1985). It provides the theoretical framework for the study.

Voluntary State Curriculum (VSC): The VSC is the document that aligns the Maryland Content Standards and the Maryland Assessment Program (Maryland State Department of Education, 2009a).

Assumptions

Three assumptions guided the design, methodology, and implementation of the study. First, the participants answered the questions on the PEER (2009) teacher survey honestly with respect to their personal experiences regarding the use of a standards-based mathematics curriculum. Second, the participants understood the survey questions in relationship to the response scales. Third, the participants participated willingly in the study without fear or intimidation.

Scope, Delimitation, and Limitations

A possible limitation of this study was that, due to the ex post facto design, survey items selected to explain the relationship between teachers' beliefs and curriculum implementation were not specifically developed for that purpose. The County Formative Feedback Teacher Survey (PEER, 2009), however, closely replicates the theoretical framework design of a TPB questionnaire, and the existing data set associated with the survey provided the data from which a descriptive analysis of the findings could be conducted and applied to the TPB (Ajzen, 1991).

The purpose of survey research, according to Creswell (2003) is to generalize from a sample to a population so that inferences can be made. The scope for this study was limited to teachers of mathematics in 21 schools only, thereby reducing the generalizability of the findings. The sample for this study was restricted to 362 mathematics teachers in 14 elementary schools, 5 middle schools, and 2 high schools in a large urban school district. Two hundred and thirty-seven elementary-school teachers participated in the study. According to those delimitations, generalizations are limited to elementary teachers, due to the larger number of elementary teachers participating in the study.

Significance of the Study

This study is significant for school districts, schools, and teachers attempting to meet minimally proficient levels of student achievement through the implementation of a standards-based curriculum (Ohio Education Association, 2008b). On a more local level, this study was significant because teacher beliefs have an impact on teacher behaviors (Ajzen, 1985) and teacher behaviors have an impact on student achievement in the schools in the study, as measured by NCLB (2001) requirements. Given the various beliefs attributed to teachers across the United States regarding standards-based education, understanding the relationship between teachers' beliefs about a standards-based mathematics curriculum and implementation of that curriculum not only leads to the improvement of teaching skills and student learning, but also contributes to the development of more effective professional development programs (L. Leonard, 2008). The implications for positive social change in the implementation of mathematics curricula and student achievement were significant, as the findings of this study

suggested the need for a different mechanism or approach for reframing and supporting teacher behavior in the classroom, thereby achieving collective teacher accountability for school wide reform under NCLB. It was hoped that the findings from this study added to the body of knowledge relative to how teacher beliefs and attitudes toward standardized mathematics curricula affect implementation of that curricula and, ultimately, student achievement.

Summary

Section 1 included the purpose of the study, which was to examine pre-existing survey data from a sample (n = 362) of elementary, middle, and high school teachers in an urban school district to analyze the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and implementation of that curriculum.

An important relationship exists between teachers' beliefs and teachers' implementation of the standards-based curriculum, and that what goes on in the classroom may be directly related to the beliefs teachers hold about mathematics and the mathematics curriculum. The section also included a brief overview of the methodology for the quantitative, ex post facto study using pre-existing data from the PEER (2009) Teacher Survey of a sample of elementary, middle, and high school teachers in an urban school district and described Ajzen's (1991) theoretical framework that supported the study's findings. A possible social impact of this study was that school districts and schools would benefit from identifying the importance of building instructional leadership capacity to support the implementation of standards-based curricula.

A review of literature addressing teachers' beliefs about the standards-based reform effort under NCLB (2001) is presented in section 2, as is literature addressing the influence of efficacy beliefs, perceived control, and professional communities on teacher beliefs and classroom behaviors. As the leadership style of the principal is a contributing factor in teachers' perceived behavioral control of the curriculum, its influence on teacher implementation of standards-based curriculum was also discussed. The research design and methodology are presented in section 3, followed by a discussion of the results and conclusions in sections 4 and 5.

Section 2: Review of the Literature

Section 2 includes a review of the relevant literature. An overview of NCLB (2001) legislation and its impact on the development of standards-based instruction and curricula are presented, as well as a brief history of the accountability movement in relation to what students should know and be able to do (i.e., curriculum). Principal leadership, self-efficacy, and locus of control are discussed as factors that affect teachers' beliefs (e.g., perceived behavioral control). Teachers' beliefs about the standards-based curriculum, their beliefs about the professional community, and the relevance of the TPB (Ajzen, 1985) are explained.

The search strategies used to research and gather literature included referencing the Walden databases and locating relevant references in peer-reviewed journals through web-search databases. Key words used to locate appropriate sources included *attitudes, beliefs, behaviors, culture, climate, curriculum, standards-based curricula, leadership, perceived behavioral control, ,mathematics curricula, professional communities, efficacy,* and *NCLB*. The literature review included 189 sources, the majority of which were published in the last 5 to 8 years.

Introduction to the Literature Review

According to the literature, teachers' beliefs about the standards-based mathematics curriculum directly affect the implementation of that curriculum (Akinsola, 2008; Lloyd & Herbel–Eisenmann, 2005; Meyer, 1980). Yet new standards-based curricular approaches, mandated as part of the reform structure under NCLB (2001), fail to account for the beliefs of teachers regarding curriculum in the implementation of a new instructional practice or policy.

Resources embedded in relationships among teachers, including teachers' beliefs concerning the curriculum, are strong predictors of successful implementation of the curriculum (Lubinski & Benbow, 1994; Thompson, 1984). However, if mathematics teachers' beliefs are incongruent with the beliefs underpinning a curriculum reform, then the result of such a mismatch could affect the degree of success of the reform, as well as the teachers' morale and willingness to implement further innovative reforms (Handel & Herrington, 2003).

Researchers have stated that for teachers to be successful, they must believe that their core work is significant and is viewed as valid and valuable by other teachers (Little, 1988). Work that is typically valued by teachers is directly relevant to teaching and student learning (Childs–Bowen, Moller, & Scrivner, 2000). Teachers' beliefs notwithstanding, ultimately, public policy affects how and what children learn and how teachers are able to perform their jobs. Understanding the influence of the federally mandated legislation contained in NCLB (2001) on teachers' beliefs about the curriculum is essential for advocates, administrators, and especially teachers who work every day within the constraints of NCLB's federal mandates (Vuksanovich, 2009).

No Child Left Behind: Pre and Post Impact on Curriculum and Achievement

NCLB (2001) is the most recent reauthorization of the Elementary and Secondary Education Act ([ESEA], 1965), which emerged after Russia's successful launch of Sputnik in 1957 and the civil rights push for greater attention to the quality of education in 1964 (Nichols, 2009). The ESEA (1965) provided federal funds for schools but did not require accountability in the use of those funds (Vuksanovich, 2009). Unlike ESEA, NCLB has three main requirements regarding accountability:

- NCLB requires states to provide standardized test results in order to make it possible to evaluate the success or failure of a school's effort to reach every child and bring every child to grade level by the 2013–2014 school year, although subgroups of less than 45 students are not required to be reported (Vuksanovich, 2009).
- NCLB requires states to establish accountability plans that align with NCLB's sanctions (Vuksanovich, 2009).
- NCLB requires every teacher to be highly qualified in his or her subject area through a series of evaluations and teacher testing (Rosenbusch & Jensen, 2005).

To meet these goals, NCLB (2001) requires states to demonstrate adequate yearly progress (AYP) in raising students' test scores in reading and math and in narrowing the test score gap between advantaged and disadvantaged students (Vuksanovich, 2009). Under NCLB, student progress in reading and math areas is monitored by state-selected standardized tests at least once in each of the following grade spans: 3–5, 6–9, and 10–12. Science assessments were added for the 2007–2008 school year (U.S. Department of Education, 2008).

The National Assessment of Educational Progress (NAEP) reported that math scores for fourth and eighth graders significantly improved after the enactment of NCLB (2001) (Center on Education Policy, 2008). However, critics of NCLB maintained that the rise in math and reading scores could be explained by a "dumbing down" of the standardized tests, schools teaching to the test, and modified curriculum emphasizing only the tested subjects (reading and math) at the expense of others (Sunderman, Tracey,

Kim, & Orfield, 2004; Vuksanovich, 2009). According to some critics, NCLB has also been largely responsible for intensifying the move away from local and state control of curriculum to federal control (Berliner, 2009).

The quality of education in the United States has attracted local and national attention for many years. In August 1981, the National Commission on Excellence in Education was chartered to "review and synthesize the data and scholarly literature on the quality of learning and teaching in the nation's schools" (Jorgenson & Hoffman, 2003, p. 2). In a report published in 1983 titled *A Nation at Risk* (1983), several indicators that portended the United State's slide into educational mediocrity were cited. Among the indicators identified were the following (Jorgensen & Hoffman, 2003):

1. About 13% of all 17-year olds in the United States were considered functionally illiterate. Illiteracy among minority youth was estimated to be as high as 40%.
2. Scores consistently declined in the verbal, mathematics, physics, and English areas measured by the Scholastic Aptitude Test (SAT).
3. Nearly 40% of 17-year olds could not draw inferences from material, and only one fifth could write a persuasive essay.

Among the findings, the commission reported that school content (i.e., curriculum) had become diluted and was without a central purpose (Jorgensen & Hoffman, 2003). Students were found to have migrated in large numbers from vocational and college preparatory programs to general-track courses (Jorgensen & Hoffman, 2003). Based on the *A Nation at Risk* report (1983), the evolution of standards-based reform began. The movement resulted in the reauthorization of ESEA (1994) through the

Improving American Schools Act, which required states and school districts to connect state and federal programs to the improvement of all children, not just economically disadvantaged ones (Jorgensen & Hoffman, 2003).

In the last half of the 20th century, a standards movement gained support in the United States, and much of the financing and decision making about educational matters shifted from the local to the state level (Berliner, 2009). According to Berliner (2009), this was done in an effort to ensure that all the children in a state received a free, high-quality public education, regardless of income, race, or the ability of the community to support public schools. As the financing and decision-making responsibilities shifted to the state, many curriculum issues also shifted from the local level to the state (Berliner, 2009). State decisions now influenced what was taught in local schools, and by the end of the 20th century, the authority and power of the local school board to determine curriculum no longer existed (Berliner, 2009).

The trend away from local control of curriculum continued under NCLB (2001). Before the passage of NCLB, states had relatively wide latitude in determining how schools would operate (Nichols, 2009). NCLB effectively took most of the decision-making authority from the state and put it into the hands of federal lawmakers (Nichols, 2009). Control of the curriculum intensified under NCLB with the development of curriculum content standards, an integral part of the NCLB legislation (Berliner, 2009).

The core mandates of ESEA (1994) and the subsequent NCLB (2001) legislation have remained the same—to provide federal dollars to schools with high levels of poverty. However, the compliance mandates have changed, and accountability has increased significantly under NCLB (Vuksanovich, 2009. The cornerstone of NCLB is

the practice of high-stakes testing (based on curriculum content standards) to hold educators and schools accountable for student achievement (Vuksanovich, 2009). Student test scores are used as the criterion to judge whether teachers are teaching and students are learning what they are supposed to be learning (Nichols, 2009). NCLB requires that states annually assess all students relative to established curriculum content standards and create annual statewide performance targets (Herman & Ing, 2009). Supporters of NCLB argue that by holding teachers accountable for how they educate students, particularly disadvantaged students, schools will force teachers to do a better job serving students (Herman & Ing, 2009). Critics argue that the pressure to do well on a test that serves as the sole measure of teacher effectiveness is distorting and corrupting the United State's educational system (Nichols, 2009).

Currently, the focus in the United States is on national content standards. To educators, the standards represent what an educated fifth grader, 15-year old, or high school graduate should know and be able to do (Berliner, 2009). Many of the standards now guiding educators are the products of professional associations such as the National Council of Teachers of Mathematics (NCTM) or organizations such as the National Research Council. However, under NCLB (2001), contemporary content standards are developed at the state level and serve as the foundation for state assessments (Vuksanovich, 2009). Although the standards movement began before NCLB was authorized, the current legislation driving school reform makes it mandatory for every state to have highly challenging curriculum content standards, to assess the learning of these standards, and to create consequences for poor performance on assessments (Berliner, 2009; Herman & Ing, 2009).

Under NCLB (2001), high-stakes testing is required to determine AYP based on curriculum standards. The testing has two fundamental characteristics. First, it applies to standardized tests and not teacher-made tests. Although pre-NCLB testing and evaluation referred to the use of norm-referenced test scores, NCLB (2001) requires each state to use a criterion-referenced standardized assessment for the purposes of educational accountability (Nichols, 2009). Second, high-stakes tests include those created with the explicit goal of holding teachers and/or students accountable. By way of definition, a test has high stakes when the consequences attached to test performance are meant to influence or pressure anyone involved with the testing outcome (Nichols, 2009). Thus, a high-stakes test is any standardized test taken by students in any grade, K–12, the results of which have important consequences for administrators, students, teachers, schools, and districts (Nichols, 2009).

Previously, high-stakes testing under NCLB (2001) was required in the areas of reading and mathematics. Consequently, these subjects have become the areas of the curriculum that have received the most attention from educators. Because of the basic skills orientation required by NCLB in math and reading, the curriculum is narrowing, according to educators, and courses in history, social studies, civics, geography, art, music, and foreign languages have been abridged or dropped across the United States (Berliner, 2009). The loss of these courses was found to be greatest in minority communities (Berliner, 2009).

A report on a survey of 350 school districts revealed that the pressure to do well on tests is felt most in schools where students historically did not do well on achievement tests and in schools that serve poor students (Amrein & Berliner, 2002; Berliner, 2009).

Hanushek and Raymond (2005) found that state accountability data, when disaggregated by ethnicity, showed that increases on the NAEP, a federally funded criterion-referenced standardized test (considered a low-stakes test), were much lower for African American and Hispanic students than for Caucasian students. In a qualitative study on the impact of NCLB (2001) on foreign-language elementary school teachers (Vuksanovich, 2009), a teacher stated the problems she saw with testing under NCLB:

> With the standardized testing, in my education class [for my master's degree] we studied who they're written by: white middle class. It's assessing things that are considered important in that culture. So, you know, I feel like it's assessing that kind of cultural knowledge and a lot of students just don't learn like that. And to test in that way is, um.. I just don't think that a standardized test is fair to say if someone can pass, I mean some of these kids, just don't do well on testing and it seems like everything else is just thrown out the door for these tests. I mean they can do fine in all other areas, but when the test comes along they fail because they don't test well. They could do fine if they are tested in other ways. I had a student that was in second grade when I was here before, and I expected_____ to be in 4th grade, but _____ was in 3rd grade, so I don't know what happened, if it was something with testing or what, but ____ was just moved back into 4th grade now, and I don't know if it was a testing thing. _____ is fine socially and I can see maybe testing would be a problem for _____. I just don't think it should be the end-all. …
>
> As far as the testing goes, I just feel like from what I hear, and again, I am not in the midst of it, from what I hear from other elementary school teachers like,

> come after New Year's all the way to March, when they have tests in the Spring, it is just insane. There is a teacher's script, and I just feel like teaching in another way is being sacrificed for that. I guess, if you have to have a standardized test, maybe you do have one, but maybe it's not the only thing, you know pass/fail, it isn't going to be the only thing that is going to move a child on or not, and as far a school's getting funding because they pass, I just, that is really saying to the student and the school "This is the only thing that matters" and anything else you do that's maybe not a standard, doesn't really matter, which excludes those students who don't test well and who think outside the box. (Vuksanovich, 2009, p. 236)

The belief that mandated testing under NCLB (2001) legislation puts pressure on students who typically do not perform well on tests contributes to the convergent teacher beliefs about high-stakes testing. Berliner (2008, p. 371) stated that assessment always affects curriculum, and the responsibility for assessing curriculum and its implementation by the state has shifted to a national focus under NCLB. In addition, according to Berliner, Finn, and Ravitch (2007), one-time supporters of NCLB have begun to decry the narrowing of the curriculum by schools that must meet high-stakes testing levels in math and reading to survive. Finn and Ravitch stated that by compelling states to focus only on math and reading, the United States is losing its competitiveness in ways that matter most. In the teaching of courses in history, literature, arts, and the humanities, which provide the foundation for a democratic civic policy in which each citizen bears equal rights and responsibilities (Finn & Ravitch, 2007, p. 371).

Teacher Beliefs About the Curriculum Under NCLB

A study conducted by the National Council of Teachers of English (McKenzie, 2006) on the perceptions of more than 2,000 literacy teachers revealed that 76% of teachers surveyed felt that imposed accountability under NCLB (2001) had a negative impact on curriculum implementation in the classroom. Consequently, according to the study, tens of thousands of good teachers are retiring early and are demoralized by NCLB legislation (McKenzie, 2006). The study also suggested that teacher morale rarely has been studied in this stage of educational history, which may prevent a true reflection of teachers' beliefs under NCLB (McKenzie, 2006). If beliefs predict behavior according to Ajzen (1991) a comprehensive study of teachers' beliefs and morale during this period of educational reform would contribute to the literature on the relationship between teachers' beliefs about the standards-based curriculum under NCLB and implementation of the curriculum.

In a survey conducted by New York State United Teachers (2007) on teachers' attitudes toward imposed accountability under NCLB (2001), 37.4% of 661 teachers responded that they felt pressured by principals to improve student achievement. Nearly 50% felt pressured by the district, and 31.6% felt pressured by their local school boards (New York State United Teachers, 2007). In the same study, however, when faced with the question of whether NCLB had encouraged teachers to improve their teaching effectiveness with all students, only 1.4% strongly agreed (New York State United Teachers, 2007). In the present study, additional questions were posed about teacher attitudes and motivation in relationship to standards-based curriculum.

Additionally, the results of a survey conducted by Ohanian (2006) indicated that teachers in the state of Vermont believed that the mandated state requirements under NCLB (2001) were harming students. Eighty percent of teachers reported that they believed that students' needs were not being met under NCLB and 88% stated that the mandated curriculum afforded them too little control (Ohanian, 2006). The survey also revealed that 93% of the teachers reported that they believed that the standards-based curriculum caused students to love learning less, which is consistent with other surveys reflecting negative opinions about the impact of NCLB legislation on curriculum implementation.

Similar opinions were expressed by California teachers as captured in a mixed-method study (Leggett & Wilson, 2007) that assessed teachers' perceptions of changes resulting from the standards-based reform. In the study, teachers documented and incorporated standards-based reform requirements while preparing for the California Standards Test in Science (Leggett & Wilson, 2007) A survey was distributed to 30 middle school science teachers from 10 low-performing schools (Leggett & Wilson, 2007). Results were analyzed using Spearman rank order correlations, and interviews were conducted with teachers representing each grade level (Leggett & Wilson, 2007). The results of the survey revealed that teachers with more support from principals (i.e., perceived behavioral control) had a more positive attitude about the standards-based reform requirements (Leggett & Wilson, 2007). The study suggested the importance of a supportive administration in improving student achievement (Leggett & Wilson, 2007).

In another study designed to investigate the impact of NCLB (2001) on Title I middle schools (Gaona, 2008), questions were posed to assess the perceptions of middle

school teachers in regard to changes made under NCLB legislation. Data to assess these changes were collected in three forms: teacher drawings that reflected the changes, teacher interviews, and classroom observations (Gaona, 2008). The themes that were revealed in the findings identified concerns about the validity of high-stakes testing under NCLB, loss of creativity, and the impact of NCLB on special education students (Gaona, 2008). A constant comparative method data analysis was used to compare the data reflected in the drawings, interviews, and observations (Gaona, 2008). The analysis further supported negative teacher beliefs about the impact of NCLB on curriculum implementation.

Teachers are experiencing high levels of stress, as captured in the data included in a qualitative case study by M. Murphy (2008) designed to answer the question of how teachers' work has changed in the age of accountability. The findings of the study were relevant because teachers cited among their answers the pressure to focus on benchmark goals and achievement because of NCLB (M. Murphy, 2008). M. Murphy examined two elementary schools and interviewed six teachers from each school. The findings suggested the need for a sound support mechanism for teachers (subjective norms) to better manage accountability under NCLB (M. Murphy, 2008). Likewise, the study suggested the need for a larger study regarding teacher perceptions and realities in the age of accountability to include elementary, middle, and high school teachers (M. Murphy, 2008). The findings suggested that the stress and pressure in the work place during the age of accountability under NCLB was reduced when mechanism of support were present in elementary schools, but additional studies with middle and high school teachers was recommended (M. Murphy, 2008).

Further research on the topic of beliefs and curriculum under NCLB (2001) yielded a study involving teachers in Fresno, California, and Richmond, Virginia. In the study, teachers expressed their beliefs about the impact of NCLB in the classroom through a survey (Ohio Education Association, 2008b). The survey results revealed that the curriculum under NCLB included "de-emphasized or neglected topics and a focus on tested subjects, probably excessively" (Ohio Education Association, 2008b, p. 2). In contrast, a survey of school principals and teachers conducted by Musser (2003) found positive attitudes toward NCLB and its effect on curriculum implementation. Teachers said that they were more focused under NCLB and that the aligned curriculum contributed to higher student expectations (Musser, 2003). The results of this survey were positive with respect to teacher beliefs regarding the implementation of the curriculum under NCLB legislation and contradictory to other surveys cited.

Influence of Teacher Attitudes on Behaviors

In order to understand the influence of teacher attitudes on behavior fully, one must distinguish between two types of attitudes, according to Ajzen and Fishbein (1980). One type is attitude toward a target (Ajzen & Fishbein, 1980). The second type is attitude toward performing specific behaviors with respect to a target (Ajzen & Fishbein, 1980). Attitude refers to an individual's prevailing tendency to respond favorably or unfavorably to a person or group of people, institutions, events, or objects (Hale et al., 2003, p. 259). Attitudes may be expressed through positive (values) or negative (prejudices) responses (Hale et al., 2003).

Social psychologists distinguish among three components of responses: (a) the cognitive component**,** which describes knowledge about an object, accurate or not; (b) the

affective component, which describes feelings toward an object; and (c) the cognitive or behavioral component, which describes the action taken toward an object (DeSouza, Barros, & Elia, 1998, p. 259). Teachers have many attitudes that influence their behavior, according to the literature: attitudes about teaching physics (DeSouza et al., 1998), the use of information technology and the teaching of gifted students (Shaunessy, 2005), teaching English language learners (Lo, Goswami, & Inoue, 2010), implementing standards-based curricula (Dalhoumi, 2005), the need for educational reform (Linkaityte, 1998), mainstreaming (Olson, 2003), student expectations (Sweatt, 2000), and compensation reform (deArmond & Goldhaber, 2008). In addition, teacher attitudes are an important component in the transmission of values and cultures in schools. The degree to which teacher attitudes consistently impact behavior is largely determined by factors that identify the person and situation in which the behavior is performed and the weight of the attitude (Ajzen & Fishbein, 2005).

Ajzen and Fishbein (2005) examined the hypothesis that attitudes are better predictors of behavior in people who have a low tendency to monitor their own behavior. Sivacek and Crano (1982) found that people who have a stake in the behavior hold attitudes of confidence and that people who feel that the behavior is relevant are likely to act in accordance with their attitudes. Researchers have found that in most situations, three factors concomitantly appear to shape teachers' classroom behaviors through direct and indirect interaction: society, school, and teachers (Leite, 1994). Each of these factors affects teachers whose attitudes are positive toward the promotion of good teaching and learning situations, as well as teachers whose classrooms involve lessons in which facts are simply transmitted to students (DeSouza et al., 1998).

Researchers have shown that teachers' attitudes toward behaviors such as persistence, enthusiasm, commitment, and instructional behavior may be linked to self-efficacy (Tschannen–Moran & Hoy, 2001). Like attitudes, teacher efficacy has proved to be powerfully related to many educational behaviors (Tschannen–Moran & Hoy, 2001). A teacher's efficacy belief is a judgment of his or her capabilities to bring about desired outcomes of student engagement and learning even among those students who may be difficult or unmotivated (Armor et al., 1976). According to Bandura (1977), self-efficacy is mediated by a person's beliefs or expectations about his or her capacity to accomplish certain tasks or to demonstrate certain behaviors successfully (Hackett & Betz, 1981). This expectation determines whether or not a certain behavior or performance will be attempted, the amount of effort the individual will contribute to the behavior, and how long the behavior will be sustained when obstacles are encountered (Akinsola, 2008; Brown, 1999).

Researchers have also shown that teachers with a high sense of efficacy exhibit greater enthusiasm for teaching (Allinder, 1994), have greater commitment to teaching (Coldarcci, 1992), and are more likely to stay in teaching (Burley, Hall, Villeme, & Brockmeier, 1991). Teachers' sense of efficacy has been related to student achievement, motivation (Armor et al., 1976; Midgley, Feldlanfer, & Eccles, 1998), and behavior in the classroom (Akinsola, 2008). According to Akinsola (2008), the efforts invested in teaching, setting goals, and developing aspirations are products of efficacy beliefs. Teachers with a strong sense of efficacy tend to exhibit greater levels of planning and organizational behavior (Allinder, 1994), are more open to new ideas (Guskey, 1988),

and are more willing to experiment with new methods that better meet the needs of students (Stein & Wang, 1988).

Akinsola's (2008) research found that teachers with low self-efficacy expectations regarding their behavior limited the extent to which they participated and were more likely to give up at the first sign of difficulty than those with high self-efficacy (Brown, 1999). Therefore, low efficacy beliefs may serve as barriers to the teaching effectiveness of teachers. Teachers with low self-efficacy tend to be authoritative and teacher-centered, and they tend to have a less clear understanding of the development levels of their students (Akinsola, 2008).

Rubeck and Enochs (1991) found that teachers who were weak in content knowledge tended to have significantly lower personal efficacy than those with strong content knowledge. Teachers with high self-efficacy tended to use inquiry-based approaches, to be student centered, and to believe that they could help students succeed levels (Rubeck & Enochs, 1991). They were also more knowledgeable of student development levels (Rubeck & Enochs, 1991). Self-efficacy helps to define why performance behaviors might differ among teachers even when they have similar knowledge and skills (Pajares & Miller, 1995).

Akinsola (2008) found that teachers of mathematics with a high level of mathematics self-efficacy were willing to expend energy, effort, and time on problem solving and encouraging students in the art of problem solving. A teacher with low mathematics self-efficacy is not as willing to exert energy, effort, and time for mathematics problem solving. According to Akinsola, a teacher with low self-efficacy does not encourage his or her students to persist in solving mathematical problems they

consider too tough to handle. Akinsola concluded that teachers with high mathematics self-efficacy are more likely to foster and encourage student learning, whereas teachers with low mathematics self-efficacy are more likely to model the behavior they wish their students to exhibit.

Influence of Locus of Control on Teacher Behavior

Locus of control is linked to the relationships between teacher self-efficacy and teacher beliefs and between beliefs and behavior. Locus of control is defined as an individual's generalized expectations concerning where control over subsequent events resides—either internally or externally (Gershaw, 1989; Rotter, 1966). Locus of control is the perceived source of control over behavior (Gershaw, 1989; Rotter, 1966) and refers to the types of attributions teachers make for success or failure in school tasks (Grantz, 2006). Internal control is used to describe the belief that control of future outcomes resides primarily in oneself and that a person can control his or her own destiny (Gershaw, 1989). External control refers to the expectation that control is outside oneself, either in the hands of other powerful people or at the mercy of fate, chance, or luck (Rotter, 1966).

Locus of control is grounded in expectancy–value theory (Summers, 2008), a comprehensive theory that incorporates elements of control, or competence, and value. Expectancy–value theory is cognitive in nature and describes human behavior as determined by the perceived likelihood of an event or outcome occurring contingent upon the behavior in question and the value placed on that event or outcome (Akinsola, 2008).

Becker (1987) found that student teachers with an internal locus of control expressed more confidence in themselves than student teachers with an external locus.

Student teachers with an internal locus more frequently attempted to check for their students' understanding of concepts than student teachers with an external locus of control (Becker, 1987). The findings in Becker's (1987) study pointed out the importance of locus of control as a factor that affected behavior patterns in delivering instruction.

Akinsola (2008) found that teachers with an internal locus of control who believed that effort and ability were essential to the learning of mathematics were more likely to motivate and encourage their students to tackle and solve problems, as opposed to teachers with an external locus of control, who were less likely to encourage their students to engage in strenuous problem solving because they attached their personal successes to luck, chance, or fate. A teacher's positive modeling behavior is crucial as a facilitator of positive attitudes in students (Akinsola, 2008).

Principal Instructional Leadership and Teachers' Beliefs and Behavior

An abundance of studies have shown that the day-to-day work of teachers is influenced by external factors and that school leadership is one of the perceived control factors that influence the effectiveness of teachers' behavior (e.g., implementation of the curriculum), as well as the achievement outcomes of students (Matthews et al., 2007; J. Murphy, Hallinger, & Peterson, 1986; Organization for Economic Cooperation and Development [OECD], 2009). Control beliefs are related to the perceived presence of factors that facilitate or impede performance of a behavior (Ajzen, 2006). Perceived behavioral control, for the purposes of this study, refers to beliefs teachers have regarding the instructional leadership of the principal as the source of resources and obstacles related to teachers' engagement in classroom behavior (Crawley & Koballa, 1992) and imposed curriculum reform (Handel, 2003).

One key question researchers have asked is whether there is a relationship between a principal's leadership style and teachers' beliefs about implementation of the curriculum. Proponents of school leadership suggest that principals with an instructional leadership style are the most effective of all perceived control factors because they are within the school context and have greater on-the-job managerial accountability for learning outcomes and the capacity to provide support and resources to teachers (Matthews et al., 2007). Instructional leaders' support of teachers' instructional belief efforts may be manifested in valuing the teachers' contributions to modifications of instructional approaches and materials, providing human and material resources for instruction, providing nonevaluative comments on instructional practices, and protecting teachers' time and efforts from noninstructional tasks (Bossert, Dwyer, Rowan, & Lee, 1982; Méndez–Morse, 1991).

When principals provide instructional support and demonstrate leadership, teachers are more inclined to support curricular projects and policy. Sarason (1982) stated that an instructional principal's contributions to the implementation of a new curricular project were grounded not in direct, programmatic methods "but in giving moral support to the staff" (p. 77). The Teaching and Learning International Survey ([TALIS].OECD, 2009) found that a principal's use of the instructional leadership style was positively associated with teachers' beliefs, practices, professional activities, classroom behavior, and job-related attitudes, whereas the use of an authoritative leadership style was usually less positively related to these variables (OECD, 2009). However, both the TALIS study's (OECD, 2009) and Sarason's (1982) findings agreed that principals' leadership

styles, whether instructional or authoritative, have limited direct association with teachers' beliefs and practices (OCED, 2009; Sarason, 1982).

Research by Czerniak, Lumpe, Haney, and Beck (1999) found that top–down (or authoritative) leadership approaches to curriculum reform efforts that were not related to teachers' attitudes, professional activities, and practices and did not take into consideration local factors such as teachers' beliefs generally failed with regard to implementation of the new reform initiatives. Hughes and Zachariah's (2001) study of 40 public school teachers in Ohio supported the findings of Czerniak et al. (1999) and seemed to contradict Sarason's (1982) and the TALIS study's (OECD, 2009) findings. The Hughes and Zachariah (2001) study focused on the relationship between principals' leadership styles and teacher implementation of new technological programs and instructional reform strategies. The data presented in the study demonstrated a direct correlation between the type of leadership under which the school operated and the beliefs and behaviors of teachers in evaluating their own instructional strategies and collaborating on the implementation of new reform strategies and methods (Hughes & Zachariah, 2001). In contrast, according to the TALIS study (OECD, 2009), the impact of school leadership on teachers' practices and beliefs was found to be indirect and mitigated through the actions of teachers and others.

In Hughes and Zachariah's (2001) study, the attitudes of teachers who reported that they had an authoritarian leadership experience suggested that the teachers had a pessimistic view of their beliefs about their role in the educational community, their relationship with the leader of the educational community, or the value of their role in the process of change related to implementation of innovative technology curricula. The

authors stated that, historically, many technology initiatives were top-down, and in hierarchical structures, teachers often view the pressure to use the reform initiative as a minimization of their role in the organization (Hughes & Zachariah, 2001).

Hughes and Zachariah (2001) further argued that although there might be a host of administrators at the apex of the hierarchical structure imposing change on classroom teachers, ultimately, implementation strategies rest with the teachers. Other research has stated that teachers must be given opportunities to examine their beliefs about teaching and learning in an environment supportive of their beliefs and under leadership that encourages risk taking and reflection (Fullan, 1991).

The TALIS study (OECD, 2009) found that that there was a significant relationship between principals in Malta who had an instructional leadership style and teachers who had constructivist pedagogical beliefs that were more adaptive to reform initiatives in instruction and teaching methodologies. In Belgium, Hungary, and Portugal, however, there was a relationship between a principal's instructional leadership style and teachers' belief in direct transmission of instruction, a style that is behaviorist oriented and less adaptive to constructivist teaching reform methodologies (OECD, 2009).

Constructivist- and behaviorist-oriented mathematics pedagogical beliefs may interact with perceived behavioral control factors such as imposed curriculum reform or standards-based curriculum initiatives. Handel and Herrington (2003) argued that it is precisely the constructivist viewpoint of reform efforts that leads to problems with implementation of new teaching and curriculum initiatives because many teachers of mathematics hold behaviorist beliefs, a fact the researchers stated had strong implications for the shelf life of constructivist-oriented curriculum reform efforts.

Handel's (2003) study, conducted among 122 secondary mathematics teachers in the Sydney metropolitan area in Australia, profiled teachers to determine the orientation of beliefs about mathematics and the mathematics curriculum. Handel found that the correlation pattern between behaviorist and constructivist items suggested the existence of two completely distinct constructs underlying teachers' beliefs and practices, indicating that these two pedagogical constructs—constructivist- and behaviorist-oriented pedagogies—act as internal behavioral controls governing teachers' mathematical beliefs and instructional behaviors regarding new curriculum initiatives or reforms.

An example of the effect of leadership styles on teacher behaviors and beliefs about professional collaboration and collective learning, as mentioned by Senge (1990), is cited in the TALIS study (OECD, 2009), in which teachers' collaborative behavior and participation in professional communities (subjective norms) was found to be related to management style. In the TALIS study (OECD, 2009), when principals used an instructional leadership style of management, teachers were more likely to cooperate and work together in groups or teams for job-related purposes such as administrative tasks, team teaching of students, collective collaboration, and professional development. Administrative, or authoritative, leadership styles or management were not associated with teachers' beliefs and behaviors relating to professional activities (OECD, 2009).

Finally, in a study in New South Wales, researchers examined the relationships between the transformational and transactional leadership styles of school principals in secondary schools and teachers' beliefs about outcomes, such as teacher perceived behavioral control (Bennett, Marsh, & Craven, 2005). The researchers found that teachers in schools with hands-off principals felt more autonomous in the classroom, had more

control over the curriculum, and directed their focus toward student achievement (Bennett et al., 2005).

Teacher Beliefs About Professional Communities

Increasingly, attention is being given to the need to establish and sustain schools as professional learning communities, especially in light of NCLB's (2001) new norms of high-stakes testing and accountability for learning outcomes (L. Leonard, 2008). An important aspect of that objective is teachers' beliefs about the inherent value of professional communities and the collective capacity of teachers to work together toward continuous school improvement and, by extension, toward enhanced student outcomes (Hord, 1997; P. Leonard & Leonard, 2001; Rosenholtz, 1989).

Central to creating conditions favorable to teacher collaboration are commonly held beliefs and objectives (Hord, 1997; Mitchell, 1995; Odden & Wohlstetter, 1995; O'Neill, 1995). In effect, each of the cited researchers stated, if teachers do not share the same essential perspectives on what constitutes desirable educational practice and do not maintain a common commitment to shared goals, they are unlikely to work toward collective purposes consistently. Senge (1990) pointed out that there is a marked distinction between persons who are truly committed to a goal and those who are merely compliant because they wish to avoid incurring negative feedback from those in authority positions. This distinction for those in the field of education, according to Fullan (2001), has important implications in terms of teacher fidelity to collaborative processes. As a result, Fullan stated, teachers who are

truly committed to collaboration—as opposed to mere compliance—are more likely to be contributors to its realization.

Numerous educational organizations and teacher training agencies (e.g., the National Board for Teaching Standards, the Interstate New Teacher Assessment and Support Consortium, and the National Staff Development Council) have formally adopted standards explaining the critical importance of professional collaborative relationships (L. Leonard, 2008). The preference for such collegial environments is evident when teachers and administrators work together, share their knowledge, contribute ideas, and develop plans to achieve educational and organizational goals (L. Leonard, 2008). Essentially, teacher collaboration is a requisite for a professional learning community in which teachers "constantly search for new ways of making improvements" (Fullan, 2001, p. 60). Professional collaborative relationships are essential to the development of environments in which teachers beliefs and behaviors are influenced by colleagues whose opinions are perceived to be relevant and in environments where subjective norms have been developed.

The literature is replete with research about the nature and importance of professional learning communities and the local professional norms and practices that support or inhibit effective professional development and community learning. Researchers such as Darling–Hammond and Ball (1997); Darling–Hammond and Sykes (1999); Eaker, Dufour, and Dufour (2002); Little (in press); Loucks–Horsley, Hewson, Love, and Stiles (1998); Putnam and Borko (2000); Schlager and Fusco (2003); and Smylie, Allensworth, Greenberg, Harris, and Luppescu (2001) described a shared vision of the characteristics of effective teacher professional learning communities. However,

not all researchers have seen the move to professional learning communities in a positive light.

Tarnoczi (2006) critically examined learning communities based on the assumption that professional learning community practices and discourse are a workplace construction and, like any social construction, preferentially support particular relationships and institutionalize uses of power that are not always obvious. Spencer (2001) stated that "learning organizations might mask the reassertion of employer rights, which is one of the new forms of oppression and control in the workplace that should be acknowledged in workplace-learning research" (p. 33). The research of Tarnoczi and Spencer contradict the supposition that professional learning communities enhance collaboration among teachers by promoting environments that support collegiality and positive social norms.

Through cultural and professional experiences teachers' beliefs and practices change. In her reflections on the implementation of professional learning communities, Skytt (2003) concluded, "The power in this new model is not in the structural and procedural changes that can be implemented in the school but in the cultural and professional changes that teachers and administrators experience as they take back the education process" (p. 1). By focusing on notions of culture and professionalism, Skytt suggested that professional learning communities exercise control of teachers by shaping the way teachers think about school and themselves.

Teachers' beliefs and attitudes about the inherent worth of collaborative practice may have a significant impact on any attempt to establish professional learning environments successfully. L. Leonard (2008) stated that latent conflicts might be

exposed when the basic and strongly held assumptions and beliefs behind collaborative value orientations are examined. Schein (1985, 1990, 1992) identified seven underlying dimensions of organizational culture that are useful for understanding the basic assumptions and beliefs associated with a collaborative value orientation. Four of these orientations are helpful in understanding the basic teacher assumptions about collaborative practices in schools (L. Leonard, 2008):

1. The nature of human activity: To what extent and under what circumstances might teachers engage in collaborative practices?
2. The nature of human relationships: To what extent are teachers involved in making decisions about the nature of their work? Is teacher work characterized by teamwork or competition?
3. Homogeneity vs. diversity: To what extent are commonly held values and beliefs important for achieving school goals?
4. The nature of time: In terms of teacher work, is collaboration an appropriate use of teachers' time, and if so, is there sufficient opportunity to undertake it?

L. Leonard (1997) and P. Leonard and Leonard (2001) suggested that beliefs and values of teachers and administrators pertaining to these four dimensions of organizational culture might differ. Additionally, these beliefs may be incompatible with attempts to create and sustain professionally collaborative cultures (L. Leonard, 1997; P. Leonard & Leonard, 2001).

Two key questions provided direction to L. Leonard's (1997) study and to the subsequent P. Leonard and Leonard (2001) study: (a) To what extent do teachers value collaborative practices in schools? and (b) to what extent do teachers perceive

collaborative processes as occurring in their schools? In an extension of L. Leonard's (1997) study, a third question gave guidance to the P. Leonard and Leonard study: What precise forms of joint work activities do teachers undertake, and is such joint work actually collaborative in the professional sense of the term (i.e., are teachers sufficiently engaged in shared activities that address teaching and learning processes in the classroom)? The intent of the study was to explore the nature of teachers' collaborative beliefs and practices further (P. Leonard & Leonard, 2001).

In the P. Leonard and Leonard (2001) study, a self-administered questionnaire was distributed to 500 randomly selected teachers in 88 schools in 10 public school districts, parishes, and counties in Northern Louisiana. The instrument was composed of 52 items, 24 of which were in Likert-type response form (ranging from 1 = *strongly disagree* to 5 = *strongly agree*), with the remaining items addressing descriptive aspects of the teachers' schools, demographic information, and a selection checklist of various common forms of shared teacher work (P. Leonard & Leonard, 2001). These forms of shared activities included team planning, peer observation, joint in-service (e.g., participating in workshops with school colleagues), extracurricular activities, and other forms of joint, or common, activities (P. Leonard & Leonard, 2001). Respondents were also asked to indicate if they believed that students do better on standardized tests if their teachers are regularly involved in professional collaboration (P. Leonard & Leonard, 2001).

There appeared to be a general sense among teachers as to what is desirable in terms of sustaining schools as collaborative communities (P. Leonard & Leonard, 2001). However, conditions in their schools continued to impede the realization of these ideals

(P. Leonard & Leonard, 2001). For example, teachers scored their personal beliefs about the nature of shared teacher work and working relationships higher than they did the actual circumstances in their schools (P. Leonard & Leonard, 2001). Although they indicated that professional collaboration is *highly desirable,* they rated actual collaborative work in their schools significantly lower (P. Leonard & Leonard, 2001).

Given the emphasis currently being given to high-stakes testing and mechanisms of school accountability under NCLB (2001), it is noteworthy that there was strong respondent support for the statement that students do better on standardized tests when their teachers "are regularly involved in professional collaboration" (89.1% responded affirmatively, 8.6% were uncertain or said it depended, and 2.3% responded negatively) (P. Leonard & Leonard, 2001). The responses also indicated a collective belief that teachers actually "collaborate better when they genuinely like each other," yet there was an accompanying perception that faculty in their schools did not have as high an affinity for each other as required to promote optimal collaborative practices (P. Leonard & Leonard, 2001).

There were also significant differences in comparisons between the respondents' beliefs/perceptions and the actual circumstances (i.e., "schools function better when teachers have highly similar values and beliefs" [Teacher Survey, Appendix A, survey statement 6] and "diversity of opinion and practice promotes the maintenance of a healthy school organization" [Teacher Survey, Appendix A, survey statement 7]) (P. Leonard & Leonard, 2001).

There was strong agreement with the survey items suggesting that "teachers need sufficient time to work together professionally" (Teacher Survey, Appendix A, survey

statement 8) and “frequent professional collaboration is an appropriate use of teachers’ time” ([Teacher Survey, Appendix A, survey statement 9] P. Leonard & Leonard, 2001). However, perceptions of actual conditions were much less supportive and, again, were significantly different from the teacher-belief portion of the paired items (P. Leonard & Leonard, 2001).

L. Leonard (1997) found that teachers provided strong support for the basic precepts of collaborative practice. In terms of the nature of their professional work, the teachers indicated that they believed that collaborative practice was, indeed, highly desirable, that it should be characterized by high levels of participation in decision making, and that teaching should be about cooperation and teamwork rather than competition and individualism (L. Leonard, 1997). For each of these items, however, they rated the actual circumstances evident in their schools as lacking (L. Leonard, 1997), which may provide reason to question the influence of subjective norms in similar environments. Additionally, in terms of collaborative relationships—and in spite of strong support for them—they stated that conditions in their schools did not reflect trusting and caring environments, that teachers did not seem to like each other sufficiently, that levels of shared values and beliefs were not adequate, and that diversity of opinion was not promoted to a desirable extent (L. Leonard, 1997).

Applying the Theory of Planned Behavior to Behavioral Outcomes

Ajzen’s (1985) TPB relies on three components to predict behavior: (a) attitude, (b) subjective norms, and (c) perceived behavioral control. In its simplest form, the TPB suggests that a person’s voluntary behavior may be predicted by his or her attitude about the behavior and how he or she thinks other people whose opinions are valued view the

behavior (Ajzen, 1985). The TPB has a strong predictive factor, according to Hale et al. (2003), and was born, out of the frustration experienced in traditional attitude–behavior research models that found weak correlations between attitudes and performance of behaviors. In applying the TPB, one might argue that teacher behavior may be predicted and significantly affected by teachers' attitudes, which predict their intention or motivation to implement standards-based curriculum.

One of the three general constructs of the TPB is the concept of subjective norms, which are the combined expectations of relevant individuals and groups (Hale et al., 2003). According to this construct, teachers' attitudes are shaped by perceptions of what other people of importance, such as the principal, think about whether they perform the behavior or not (Hale et al., 2003). Attitudes represent the sum of beliefs about a particular behavior weighted by how much value is placed on the belief (Ajzen, 2008). For example, a teacher might believe that the standards-based curriculum is void of creativity and that implementing the curriculum as prescribed will produce higher scores on unit and end-of-course exams. His or her belief about higher test scores may carry a greater weight than beliefs about the delivery of creativity-void content. The sum of both beliefs represents the teacher's attitude about the curriculum.

Behavioral intention is a combination of attitudes about a behavior and subjective norms (Ajzen, 2008). Thus, a teacher's attitude about the standards-based curriculum combined with the subjective norms (perceived social pressure) leads to an intention to implement the curriculum or not. A 4-year longitudinal study explored high school completion rates among African American students using Ajzen's TPB (Davis & Ajzen, 2003). Davis and Ajzen attempted to identify factors that determine students' intentions

to stay in school and, at the end, measured whether students successfully graduated from school. With its emphasis on personal beliefs, perceived social expectations, and self-efficacy, the TPB was an appropriate assessment for studying factors that influence high school students' decisions to stay in school (Davis & Ajzen, 2003).

The Davis and Ajzen (2003) study was designed not only to predict intentions and actual high school graduation rates, but also to determine actions. The target behavior to be determined was actual high school graduation. A questionnaire that contained questions to assess intention, attitude, subjective norms, and perceived behavioral control was administered and questions were also posed to 10 students in a focus group (Davis & Ajzen, 2003). These questions were constructed to provide more information on behavioral, normative, and control belief items (Davis & Ajzen, 2003). The results relative to prediction of intentions and behaviors yielded significant correlations to all theoretical constructs of TPB (Davis & Ajzen, 2003). The results showed that students who completed high school formed more favorable attitudes toward staying in school than those who had low behavioral intentions (Davis & Ajzen, 2003). Consequently, the methods and constructs from the study will provide an excellent model for applying the TPB to the relationship between teachers' beliefs toward a standards-based curriculum and curriculum implementation.

Relying on the TPB, Bamberg and Schmidt (2003) conducted a longitudinal study to investigate the effects of an intervention, a prepaid bus ticket, on increased bus use among college students. In this context, the logic of past behavior was used as a predictor of later behavior (Bamberg & Schmidt, 2003). The theory afforded an accurate prediction of intention and behavior before and after the intervention. The study was reported as one

of the few attempts to use the theory as a conceptual framework for an intervention to effect change in behavior (Bamberg & Schmidt, 2003).

The questionnaire used for the Bamberg and Schmidt (2003) study was designed to assess the following constructs: attitude, subjective norm, perceived behavioral control, and intention. Responses were provided on a 5-point Likert scale (Bamberg & Schmidt, 2003). Self-reports of actual behavior were obtained by issuing a second questionnaire to assess actual travel behavior. However, without a nonintervention control group, it was difficult to determine with any degree of certainty whether a prepaid bus ticket influenced behavioral intentions to use this travel mode or if other factors were responsible (Bamberg & Schmidt, 2003). Attitudes, subjective norms, perceptions of behavioral control, and intentions with respect to increased bus usage were, however, significantly more favorable in increasing bus ridership (Bamberg & Schmidt, 2003). The prediction of travel mode as applied to the TPB framework highly correlated with past behavior and was consistent with the major hypothesis, demonstrating a high utility for predicting intentions (Bamberg & Schmidt, 2003).

Using a mail survey, Ajzen's (1991) TPB was applied to the prediction and explanation of hunting. Hunting intentions were strongly influenced by attitudes, subjective norms, and perceptions of behavioral control (Hrubes & Ajzen, 2003). Behavioral beliefs, according to Ajzen (1991), produce favorable or unfavorable attitudes toward the behavior. Normative beliefs result in perceived social pressure or subjective norms, and control beliefs give rise to perceived behavioral control, or the perceived ease or difficulty of performing a behavior (Ajzen, 1991). In combination, attitudes toward the behavior, subjective norms, and perceptions of behavioral control lead to the formation of

behavioral intention (Fishbein & Ajzen, 1975). As a general rule, the more favorable the attitude and subjective norms, and the greater the perceived control, the stronger the intention to perform the behavior in question.

Given a sufficient degree of actual control over the behavior, people are expected to carry out their intentions when the opportunity arises (Hrubes & Ajzen, 2003). In the Hrubes and Ajzen study (2003), a questionnaire was developed to assess variables associated with three outdoor recreational activities: hunting, wildlife viewing, and outdoor recreation. The items assessed attitudes, subjective norms, perceived behavioral control, and intentions (Hrubes & Ajzen, 2003). For all the items, the target behavior was hunting over the next 12 months (Hrubes & Ajzen, 2003). Two 7-point scales were used to assess participants' intentions to engage in hunting (Hrubes & Ajzen, 2003). To summarize, all the measures used to capture and analyze the data revealed that intentions proved to be most closely related to self-reported hunting behavior (Hrubes & Ajzen, 2003). In sum, the research demonstrated that TPB has considerable power in predicting hunting intentions and behavior (Hrubes & Ajzen, 2003).The results were recommended as a lens to identify attitudes that may influence decisions to engage or not to engage in hunting (Hrubes & Ajzen, 2003).

The utility of the TPB (Ajzen, 1985) was directly applied to a study conducted to determine teachers' beliefs and intentions regarding the implementation of science education reforms (Haney, 1996). Survey research was used to collect data on 800 teachers in order to assess attitudes and intent to implement four strands of the science model in grades, 4, 6, 9, and 12 in schools in Ohio (Haney, 1996). Although the study employed the three constructs established by Ajzen (1985, 1991)—attitude, subjective

norm, and perceived behavioral control—the results revealed that attitude toward the behavior held the greatest influence on intent to implement the four strands. Two data collection instruments were used, an interview and a questionnaire. Thirteen teachers were randomly selected for the interview. Although 800 teachers received invitations to complete the questionnaire, the final sample included 250 teachers (Haney, 1996). A total response rate of 52% was obtained from the questionnaire (Haney, 1996). Internal consistency was assessed by applying Cronbach's alpha analysis and content and construct validity were assessed as the items for the questionnaire emerged from the participants and correlated with direct and indirect measures (Haney, 1996). Statistical analysis revealed the following key finding: Teachers' attitudes toward the behavior had the most influence on intention to implement the strands of the science model (Haney, 1996). The results suggested that science in-service programs that focus solely on arming teachers with skills do not provide achievement benefits if there is no emphasis on factors that influence teachers' attitudes about the science model (Haney, 1996).

Consistent with the previous studies employing the TPB (Ajzen, 1985, 1991), the constructs of attitude, subjective norms, and perceived behavioral control correlated significantly, either individually or in combination, to intent to perform the behavior.

Summary of the Literature Review

Section 2 included an overview of the impact on curriculum in the United States before and after NCLB was enacted in 2002, focusing on the impact of the legislation on teachers' beliefs about curriculum and implementation. A brief history of curriculum control in the United States showed the shift from local to state to federal control under NCLB, under which high-stakes testing disproportionately affects poor minority students.

Teachers' attitudes toward the curriculum under NCLB and the unintended consequences of excessive focus on tested academic subjects to the exclusion of others was included. Studies on teacher beliefs and behavior showed that teacher efficacy is related to teacher behavior and linked to locus of control, both of which affect teacher curriculum beliefs and behavior patterns. However, principal leadership style has little direct effect on teachers' beliefs and behaviors, yet it is a factor in teachers' perceived behavior control. Internal control factors such as constructivist- or behaviorist-oriented pedagogies were found to affect teachers' behavior toward the implementation of new standards-based curricula, either positively or negatively. In a study of secondary teachers in countries participating in a major international survey, the TALIS study (OECD, 2009) showed that principals who adopt an instructional leadership style are more likely to affect teacher behavior and implementation of the curriculum, as well as teacher participation in collaborative professional activities, as opposed to principals who adopted an administrative leadership style. Studies employing the TPB (Ajzen, 1985, 1991) provided examples of the utility of the theoretical framework and also provided examples of the three constructs that guided the research in this study (attitude, subjective norms, and perceived behavioral control).

Section 3 includes the methodology used in the study, as well as a description of the sample and the population for the study. Methods of data analysis were also provided.

Section 3: Methodology

Section 3 includes a written discussion of the ex post facto research design, the methodology, and the procedures used in analyzing data for the study. The population and sample of the participants are described as well as the instrument used to collect the data. A description of the data collected is also included. An explanation of the descriptive and inferential analyses used for the research is included, and survey questions used in the pre-existing survey fielded in 2009 are identified..

Research Design and Approach

The purpose of this study was to examine pre-existing survey data from a sample of (n = 362) elementary, middle, and high school teachers in an urban school district to analyze the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and implementation of the curriculum. I used a quantitative, ex post facto research design. An existing data set provided by PEER (2009) was analyzed for this study. Data abstracted from the County Formative Feedback System Teacher Survey 1 (PEER, 2009) were used in this study to examine the relationship between teachers' beliefs regarding their standards-based mathematics curriculum, professional community, and instructional leadership and implementation of the curriculum.

The objectives of PEER (2009) were to support school districts in measuring the quality of the work done within the school district to improve leadership, teaching, and learning in mathematics. Key actionable and measurable elements that influence the quality of student outcomes in mathematics were identified (e.g., curriculum and instructional materials, teacher beliefs, and teacher leader beliefs). Constructs such as

coherence, quality, design process, access, and use of the curriculum were also identified to further define how the specific elements influence student learning (PEER, 2009).

Thirty one questions related to the constructs of Ajzen's (1991) TPB were selected from 162 items from the PEER (2009) survey instrument, also known as the County Formative Feedback System Teacher Survey 1 (PEER, 2009), to measure teachers' beliefs about the mathematics curriculum, the professional community, and instructional leadership. One question from the survey was selected to measure curriculum implementation. The question selected was one of only two questions in the survey that assessed teacher use of the curriculum and the only question that addressed implementation. Descriptive and inferential statistics were used to examine the relationship between the independent variables—beliefs about the standards-based curriculum (attitude), beliefs about the professional community in mathematics (subjective norms), and beliefs about instructional leadership (perceived behavioral control)—and the dependent variable (curriculum implementation). The questions selected from the PEER teacher survey to measure teachers' attitudes about the standards-based curriculum were extracted from questions designed to assess the factors, curriculum and materials. Questions were extracted from the PEER teacher survey to measure subjective norms from questions that assessed the factor of professional community and to measure perceived behavioral control from questions that assessed the factor of instructional leadership (i.e., professional support). One question was selected from the PEER teacher survey to measure curriculum implementation. Appendix A illustrates this grouping.

A survey was identified as an appropriate instrument to capture data from teacher respondents. According to Creswell (2003, p. 153), a survey's design provides a

quantitative or numeric description of the trends, attitudes, or opinions of a population. The purpose of survey research (Creswell, 2003) is to generalize from a sample to a population so that inferences may be made. These inferences relate to a characteristic, attitude, or behavior of the population (Creswell, 2003). The use of a pre-existing data set based on survey research in this study allowed for inferences to be made about the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and the implementation of that curriculum by examining the responses from a sample of the teacher population in a large urban school district. Pre-existing data extracted from 31 questions from the PEER teacher survey provided quantitative and numeric descriptions of trends.

PEER (2009) did not conduct a statistical analysis of the findings. Therefore, the ex post facto research design and approach I selected were justifiable given the absence of statistical analysis of the previously collected data, the existing availability of the data, the relevance of the data to the purpose of the study, and the relevance of the data to the research questions of the study.

Setting and Sample

The population, or entire group, included for the study was public school teachers. The population from which the sample was drawn represented a large urban school district in Maryland with a K–12 teacher population of 10,000 full-time teachers. Seventy-six percent of the teacher population in the district was female and 24% was male. African Americans made up 50% of the teacher population, while 34% was Caucasian. The Asian population comprised 11% of the population, and Hispanics and American Indians comprised less than 15%. The school district was the second largest in

the state of Maryland and the 17th largest district in the United States (County Public Schools, 2008a). Seventy-three percent of the teacher population was highly qualified in the core academic subjects under NCLB (2001) designations (County Public Schools, 2008a).

The sample selected for the comprehensive formative assessment pilot conducted by PEER (2009) included 1,076 participants. Those participants included executive directors, principals, assistant principals, math coaches, teacher leaders, and math teachers (PEER, 2009). For the current study, only responses to the teacher survey were extracted and analyzed, which included 537 eligible teachers. The sample size was originally selected because it represented the total number of mathematics teachers within the identified feeder patterns and, therefore, the number of teachers eligible to participate in the County Public Schools Formative Feedback System Teacher Survey 1 (PEER, 2009). The responses of (n = 362) mathematics teachers, who responded to the survey, were analyzed. The participants represented teachers of mathematics in two high school feeder patterns that included 21 elementary schools and 5 middle schools in County Public Schools (PEER, 2009). The teachers were selected because the schools within this feeder pattern represented a large population of English as a second language learners (Sherer, 2009). The decision to limit the sample to teachers of mathematics in this feeder pattern for the study was made because of the trends and lagging student performance indicators in mathematics in the district for the past several years and the enhanced resources provided to the mathematics instructional program (Sherer, 2009). Stratification techniques were not employed by PEER to ensure that the sample was a representative proportion of participants with characteristics of the population.

Instrumentation and Materials

PEER (2009) designed the instrument used for this study. PEER is a team of educational researchers, school system experts, and system engineers associated with the University of Pittsburgh. PEER supports the work of school districts by assisting them in identifying the effectiveness of multiple initiatives that school districts across the country undertake in an attempt to meet federal and state accountability requirements (PEER, (2009). PEER assists districts in determining how and why the initiatives failed or succeeded. This is accomplished by providing data to assist educators in making decisions about strategy, practice, and resource allocation (PEER, 2009).

The County Public Schools Formative Feedback System Teacher Survey 1 (PEER, 2009) was an attitudinal survey designed around a 5-point Likert continuous scale (strongly disagree, disagree, agree, strongly agree, and don't know). One hundred thirty-three questions on the PEER (2009) teacher survey were designed using this 5-point Likert scale. Other questions were captured on 4-point scales assessing quality (i.e., excellent, good, fair, and poor) (PEER, 2009). Some questions elicited yes or no responses (PEER, 2009). Thirty one items aligned to curriculum, professional community, and instructional leadership were selected from the County Public Schools Formative Feedback System Teacher Survey 1 (PEER, 2009) to examine the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and implementation of that curriculum (see Appendix A).

PEER (2009) identified actionable and measurable elements that influence student learning in a school system. Table 2 shows the elements identified by PEER.

Table 2

School System Elements and Constructs Defined

A. Curriculum and instructional materials
Coherence • Alignment with state standards, assessments, and curriculum guides • Alignment with district benchmark assessments and expectations for student performance • Alignment of district instructional program, K–12 • Curriculum remains reasonably stable over time so that teachers have sustained opportunities to learn how to teach it well
Quality • A clear, high minimum set of standards that every student is expected to meet is established at every grade level in each subject • Curriculum and materials meet standards for content accuracy, sequencing, and coverage • Curriculum and materials provide high-quality support for the work of teachers • Curriculum and materials support the work of students in rigorous tasks • Curriculum and materials include high-quality assessments
Design process • Initial input from school staff members and ongoing feedback for improvement and revision
Access • Materials have been developed/selected/adopted • Educators and students have materials they need
Use • Materials are being used to support high-quality teaching and learning

Note. Adapted from *Report of Preliminary Findings: County Public Schools Formative Feedback System Pilot* by Process Engineering for Educational Results, 2008, Swanson School of Engineering, University of Pittsburgh.

One of the actionable and measurable elements that influences student learning in a district, as identified by PEER (2009), is the element of teacher beliefs and teacher leader beliefs. The teacher survey conducted by PEER not only assessed implementation of system initiatives, but also design (i.e., curriculum design) and delivery of instruction (i.e., curriculum implementation). Once the data were collected, PEER provided data reports and an initial analysis of the participant responses to the school district. The purpose of this report was to support actions for strengthening district- and school-level work and to focus the use of district resources based on the findings from the research (PEER, 2009).

The PEER (2009) teacher survey, designed for County Public Schools as a formative feedback system pilot, was used to analyze the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum. Table 3 shows the elements of the professional community that influence student learning as identified by PEER.

The following elements were mapped to district-level priorities: (a) curriculum and instructional materials, (b) assessment and use of data, (c) district instructional leadership, and (d) professional development. District priorities were mapped at the school level to five elements: (a) school instructional leadership, (b) professional community, (c) professional development, (d) teacher beliefs, and (e) teacher knowledge and skills. The five elements mapped to the classroom were (a) diagnostic adaptation, (b) content coverage, (c) instructional quality, (d) instructional time, and (e) student engagement (PEER, 2009). .

Table 3

School System Elements and Constructs Defined

Professional community
Access to expertise • Principal-to-principal support • Executive director-to-principal support • Curriculum/instruction/assessment leadership-to-principal support • Central IT/budget/etc.-to-principal support
Structures for collaboration • Monthly meetings • Network meetings/cross-school meetings • Study groups
Social networks • Who talks to whom • What individuals talk about • Quality of talk • Frequency of talk
Quality of community • Culture of risk taking and trust (social trust) • Makes practice/work public (deprivatization of practice) • Culture of collaboration • Focus on student learning • Shared norms and values • Collective responsibility • Open and closed communities (Talbert)
Amount of interaction
Perceived value/impact of interaction

Note. Adapted from *Report of Preliminary Findings: County Public Schools Formative Feedback System Pilot* by Process Engineering for Educational Results, 2008, Swanson School of Engineering, University of Pittsburgh.

Each element has several constructs that define how the element influences student learning based on studies on improving districts and schools (PEER, 2009). For example, the constructs that define the element of curriculum and instructional materials are listed below and are also defined in Table 2:

1. Coherence of the curriculum and instructional materials
2. Quality of the curriculum and instructional materials
3. Curriculum instructional material design and process
4. Access to the curriculum and instructional materials
5. Use of the curriculum and instructional materials

The constructs that define instructional leadership are identified in Appendix B.

Validity

As cited by Sumter (2003), validity may be assessed through cognitive testing. Cognitive testing assesses the validity of an instrument by soliciting feedback from people who react to the survey questions through an interview. Piloting was conducted for the PEER survey, and data were collected via questionnaires, practice logs, focus groups, observations, and interviews (PEER, 2009). Among the data collected in the survey were responses to questions that elicited teacher beliefs regarding the quality of the standards-based mathematics curriculum (PEER, 2009). Other questions relevant to the theoretical construct employed by Ajzen (1991) to explain behavior focused on teacher and teacher leader beliefs (PEER, 2009).. Content validity was present in terms of how the survey questions solicited elements that influenced student learning in a school system.

Reliability

Reliability was determined for the PEER (2009) survey by the developers of the survey. “A key technique for determining reliability is to calculate the extent to which each item in the survey correlates with the rest of the items” (Ross, McDougall, Hogaboam–Gray, & Lesage, 2003, p. 348). The developers of the PEER (2009) teacher survey determined internal consistency using Cronbach’s alpha values for factors that related to teachers’ beliefs regarding satisfaction with the mathematics curriculum, teachers’ beliefs regarding their professional community, and teachers’ beliefs regarding instructional leadership (i.e., professional support) (Kisa, 2010). Reliability was satisfactory, with coefficients including a Cronbach’s alpha of .90 for curriculum, .79 for professional support (i.e., instructional leadership), and .70 for professional community (Kisa, 2010).

PEER (2009) did not conduct statistical analysis of the findings. As a means of determining relationships between the independent and dependent variables, I employed descriptive and inferential statistics including a Pearson correlation to determine the degree of the relationship between the variables of teachers’ beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum, teachers’ beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum, and teachers’ beliefs regarding instructional leadership and implementation of the standards-based curriculum.

Data Collection and Analysis

Teachers participating in County Public Schools formative assessment took two 30-minute surveys over the course of the 2008–2009 school year (PEER, 2009). The

survey was issued electronically in January and May 2009 and teachers were given a 2-week window to complete the survey (PEER, 2009). In the January 2009 survey, the following elements were addressed: (a) district and school instructional leadership, (b) assessments and data use, (c) curriculum and materials, (d) teacher/leader beliefs, (e) professional development, and (f) professional community (PEER, 2009). The May 2009 survey addressed the following elements: (a) school instructional leadership, (b) professional development, (c) professional community, (d) teacher knowledge and skills, and (e) content coverage and instructional time (PEER, 2009). Teachers were introduced to the County Public Schools formative assessment and the teacher survey by individual principals during a staff (Sherer, 2009). The survey was accessible to teachers through the district's e-mail via a link and a letter of introduction, which explained the purpose of the survey, accompanied the e-mail (Sherer, 2009). The survey was open to teachers via the link for 14 days and a $600 incentive was provided to the school with the highest participation rate (Sherer, 2009). According to Sherer (2009) a 72% response rate was achieved. Data derived from the County Public Schools Formative Feedback System Teacher Survey 1 (PEER, 2009) was analyzed after acquiring permission from PEER (2009) to access the data and run the statistical analysis.

In order to determine whether a relationship existed between the independent variable (teachers' beliefs about the standards-based mathematics curriculum) and the dependent variable (curriculum implementation), the following research questions were addressed:

1. What is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum?

2. What is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum?
3. What is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum?

Based on the research questions, the following hypotheses were developed:

$H_0$1: Null hypothesis: There is no significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum.

$H_1$1: Research hypothesis: There is a significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum.

$H_0$2: Null hypothesis: There is no significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum.

$H_1$2: Research hypothesis: There is a significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum.

$H_0$3: Null hypothesis: There is no significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum.

$H_1$3: Research hypothesis: There is a significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum.

Both descriptive and inferential statistical analyses were used to examine and analyze the secondary data. Descriptive statistics for this study included measures of central tendency and measures of dispersion. Inferential statistics were used to infer from the data teachers' beliefs regarding the standards-based mathematics curriculum (attitudes), teachers' beliefs regarding their professional community in mathematics (subjective norms), teachers' beliefs regarding instructional leadership (perceived behavioral control), and the implementation of the standards-based mathematics curriculum. There were three independent variables—teachers' beliefs regarding the mathematics curriculum, teachers' beliefs regarding their professional community in mathematics, and teachers' beliefs regarding instructional leadership—and one dependent variable, implementation of the standards-based mathematics curriculum. SPSS statistical software was used to calculate descriptive statistics and correlations.

Data for the independent variables were represented by and collected from the following responses:

1. Independent variable: teachers' beliefs regarding the standards-based mathematics curriculum. Agree or disagree:

- County Public Schools prioritizes student learning and achievement.
- County Public Schools has a curriculum aligned with state standards.
- County Public Schools has a coherent grade-by-grade curriculum.

- County Public Schools has a clear expectation for student performance aligned with the curriculum.
- County Public Schools addresses the instructional needs of English language learners at our school.
- County Public Schools has a district staff that is highly skilled at curriculum and instruction.
- The curriculum guide(s) promote(s) consistency of instruction among classes at the same grade level.
- The curriculum guide(s) promote(s) continuity of instruction between grades.
- The curriculum guide(s) and supporting materials are aligned with each other.
- The curriculum guide(s) has (have) enough flexibility for me to effectively teach my students.
- I regularly use the curriculum guide(s) in planning my lessons.
- The curriculum guide(s) provide(s) useful suggestions for assessing student progress.
- The curriculum guide(s) provide(s) useful suggestions about instructional strategies.
- The curriculum guide(s) help(s) me prepare my students for the state tests.
- The curriculum guide(s) appropriately address(es) the needs of students with individualized education plans (IEPs) and 504s.
- The curriculum guide(s) appropriately address(es) the needs of highly able students.

2. Independent variable: teachers' beliefs regarding their professional community in mathematics. How often or how useful:

- I watched another teacher model instruction in math.
- Another teacher observed me teach a math class and gave me feedback.
- I watched another teacher teach a math class and gave him or her feedback.
- I watched an instructional leader model instruction in math.
- An instructional leader observed me teach math and gave me feedback about improving my math teaching techniques.
- An instructional leader observed me teach math and gave me feedback about my use of the curriculum.
- An instructional leader studied my students' math work and commented on ways I could improve their learning of math.

3. Independent variable: teachers' beliefs regarding instructional leadership. Agree or disagree:

- The principal at my school sets high standards for teaching and learning.
- The principal at my school helps us adapt our teaching practices according to analysis of state or district assessment results.
- The principal at my school helps us understand and use the curriculum guide(s) to guide our teaching.
- The principal at my school arranges for support when I need it (e.g., access to coaches, outside consultants, district curriculum staff, etc.).

- The principal at my school regularly attends professional development sessions in which I participate.
- The principal at my school fills up my planning time with logistical and administrative items.
- The principal at my school spends too much time out of the building.

Data for the dependent variable were represented by and collected from the following responses:

4. Dependent variable: implementation of the standards-based mathematics curriculum. Agree or disagree:

- My teaching is well aligned with the district's curriculum.

Descriptive statistics were used to describe and summarize the distribution of the responses quantifiably. A Pearson correlation measures the degree and the direction of the linear relationship between two variables (Creswell, 2003). The Pearson correlation was used to determine the degree of the relationship between the variables of teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum, teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based curriculum, and teachers' beliefs regarding instructional leadership and implementation of the standards-based curriculum.

Role of the Researcher

Because my professional position and responsibilities require oversight of school improvement and accountability requirements under NCLB (2001) for all schools in the school district, it was necessary to avoid any appearance of personal or professional evaluation of teacher performance. Consequently, through the use of pre-existing data,

the researcher–participant working relationship was eliminated, thereby providing another benefit of the research design and justification for the use of the existing data set for this study. My role in this study was that of a data analyst and reporter of findings. The existence of an existing data set precluded direct involvement in the research design, administration, and data collection. Consequently, the researcher–participant relationship was not compromised by virtue of my position and responsibilities in the district. I was, however, fully responsible for the data analysis.

During the data analysis process, data was maintained in a secure personal file and office. All computer files were maintained in a password-secured personal computer. Appropriate measures were taken to protect participant information. I maintained full responsibility for analyzing and reporting the findings of the study consistent with all requirements established by Walden University. An International Review Board approval number of 09-08-10-0333168 was assigned on September 8, 2010.

In summary, section 3 included a discussion of the research design, methodology, and analysis of the data. The population, sample, instrument, variables, and data collection processes were detailed, and the role of the researcher was explained.

The following chapter, chapter 4, will focus on the research questions and hypotheses addressed in the study and overall data analysis and presentation.

Section 4: Results

The purpose of this study was to examine preexisting survey data from a sample of elementary, middle, and high school teachers (n = 362) in an urban school district to analyze the relationship between teachers' beliefs regarding the use of a standards-based mathematics curriculum and implementation of that curriculum. The problem under investigation was that new standards-based curricular approaches, mandated as reform structures under NCLB (2001), fail to account for the beliefs of teachers about curricula (Leana & Phil, 2006). The following research questions were identified to explore the relationship between teachers' beliefs and implementation of a standards-based mathematics curriculum:

1. What is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum?
2. What is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum?
3. What is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum?

The independent variables were beliefs about the curriculum, professional community, and instructional leadership. The dependent variable was curriculum implementation. The three constructs of Ajzen's (1991) TPB (attitude, subjective norms, and perceived behavioral control) served as proxies for the three independent variables and provided the theoretical framework for the study. Table 1 (presented in section 1),

illustrates the relationship between the independent variables and the constructs of Ajzen's TPB. Additionally, Appendix A illustrates the association between the research questions, survey factors, and theoretical constructs.

The null hypotheses for the study included the following:

$H_0$1: There is no significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum.

$H_0$2: There is no significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum.

$H_0$3: There is no significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum.

Conversely, the alternative hypotheses included the following:

$H_1$1: There is a significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum

$H_1$2: There is a significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum.

$H_1$3:. There is a significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum.

Section 4 includes the results of the statistical analyses performed to address the research questions and to test the stated hypotheses. In this section, the data analysis procedures for this study are reviewed, and the data are interpreted.

Survey Results and Data Analysis

The data were analyzed in a manner consistent with the research questions posed in this study. Hypotheses were developed for each research question. Corresponding questions from a preexisting survey, the County Public Schools Formative Feedback System Teacher Survey (PEER, 2009) were selected to align with each hypothesis. The corresponding survey questions were grouped under factors representing curriculum, professional community, and instructional leadership. Each question was aligned to an independent variable associated with a corresponding factor in the survey. Each factor was then aligned to one of the constructs of Ajzen's (1991) TPB (attitude, subjective norms, and perceived behavioral control. The data were examined using descriptive, inferential, and correlational statistics.

Data analysis began with the calculation of descriptive statistics for each question grouped under the three research questions and survey factors (curriculum, professional community, and instructional leadership). Internal consistency was determined using Cronbach's alpha for factors related to teachers' beliefs about the mathematics curriculum, their professional community, and instructional leadership ([i.e., professional support] Kisa, 2010). Reliability was satisfactory, with Cronbach's alpha coefficients ranging from .90 for curriculum, .79 for professional support (instructional leadership), and .70 for professional community (Kisa, 2010). Statistics were captured utilizing the secondary data to identify the mean, median, mode, and standard deviations for data

aligned to each research question and factor, but the variation in the number of respondents for each question proved irrelevant in terms or averages generated from the Likert scale used in the survey. Therefore, an analysis of the mean, median, and standard deviations was not conducted.

The next step in the analysis involved examining each of the three research questions and associated hypotheses. Each null hypothesis was then tested with a Pearson correlation using an alpha of .05 two-tailed test. The first research question was what is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum? The associated null hypothesis was tested by computing Pearson correlations between survey questions aligned to teachers' beliefs about the standards-based mathematic curriculum and implementation of that curriculum.

The second research question was what is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum? The associated null hypothesis was tested by computing the Pearson correlations between the survey questions aligned to teachers' beliefs about their professional community in mathematics and implementation of the standards-based mathematics curriculum.

The third research question was what is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum? The associated null hypothesis was tested by computing the Pearson correlations between the survey questions aligned to teachers' beliefs about

instructional leadership and implementation of the standards-based mathematics curriculum.

The null hypotheses were tested by separately computing the Pearson correlations between each survey question aligned to curriculum, professional support, or instructional leadership and curriculum implementation.

Research Question 1

The first research question was what is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum? The independent variable was teachers' beliefs about the curriculum and the theoretical construct (proxy) was attitude. Sixteen corresponding survey questions were aligned to this research question and to the corresponding hypotheses. Table 4 shows descriptive statistics for participants' responses to questions about teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum.

The responses to the items assessing teachers' attitudes about the curriculum were examined to determine if the frequency of any response was particularly high or low. The percentage column in Table 4 reflects the number of responses to each question divided by the total number of responses. Overwhelmingly, participants either agreed or strongly agreed with each of the 16 questions regarding teachers' beliefs about the standards-based mathematics curriculum. Thus, the responses represented a favorable attitude toward the curriculum and a high frequency count.

The largest percentage of agreement was observed in Item 2, "County has a curriculum aligned with state standards" (48.9% agreed, 47.3% strongly agreed, $n = 186$).

Table 4

Descriptive Statistics for Teachers' Beliefs Regarding the Standards-Based Mathematic Curriculum

Question		Frequency	Percentage
1. PGCPS prioritizes student learning and achievement.			
Valid	Strongly disagree	6	3.2
	Disagree	16	8.6
	Agree	80	43.2
	Strongly agree	77	41.6
	Don't know	6	3.2
	Total (*n*)	185	100.0
Missing	0	177	
Total		362	
2. PGCPS has a curriculum aligned with state standards.			
Valid	Strongly disagree	3	1.6
	Agree	91	48.9
	Strongly agree	88	47.3
	Don't know	4	2.2
	Total (*n*)	186	100.0
Missing	0	176	
Total		362	
3. PGCPS has a coherent grade-by-grade curriculum.			
Valid	Strongly disagree	5	2.7
	Disagree	17	9.1
	Agree	91	48.9
	Strongly agree	68	36.6
	Don't know	5	2.7
	Total (*n*)	186	100.0
Missing	0	176	
Total		362	
4. PGCPS has a clear expectation for student performance aligned with the curriculum.			
Valid	Strongly disagree	3	1.6.
	Disagree	17	9.3
	Agree	92	50.3
	Strongly agree	70	38.3
	Don't know	1	0.5
	Total (*n*)	183	100.0
Missing	0	179	
Total		362	
5. PGCPS addresses the instructional needs of English language learner students at our school.			
Valid	Strongly disagree	9	4.9
	Disagree	21	11.4
	Agree	76	41.1
	Strongly agree	65	35.1
	Don't know	14	7.6
	Total (*n*)	185	100.0
Missing	0	177	
Total		362	

Table 4 (continued)

Question	Frequency	Percentage
6. PGCPS has district staff highly skilled at curriculum and instruction.		
Valid Strongly disagree	5	2.7
Disagree	21	11.4
Agree	82	44.3
Strongly agree	53	28.6
Don't know	24	13.0
Total (*n*)	185	100.0
Missing 0	177	
Total	362	
7. The curriculum guide(s) promote consistency of instruction among classes at the same grade level.		
Valid Strongly disagree	3	2.2
Disagree	12	8.8
Agree	94	68.6
Strongly agree	27	19.7
Don't know	1	0.7
Total (*n*)	137	100.0
Missing 0	225	
Total	362	
8. The curriculum guide(s) promote continuity of instruction between grades.		
Valid Strongly disagree	3	2.2
Disagree	20	14.6
Agree	82	59.9
Strongly agree	16	11.7
Don't know	16	11.7
Total (*n*)	137	100.0
Missing 0	225	
Total	362	
9. The curriculum guide(s) and supporting materials are aligned with each other.		
Valid Strongly disagree	4	3.0
Disagree	26	19.3
Agree	85	63.0
Strongly agree	19	14.1
Don't know	1	0.7
Total (*n*)	135	100.0
Missing 0	227	
Total	362	
10. The curriculum guide(s) have enough flexibility to effectively teach my students.		
Valid Strongly disagree	11	8.1
Disagree	34	25.2
Agree	71	52.6
Strongly agree	16	11.9
Don't know	3	2.2
Total (*n*)	135	100.0
Missing 0	227	
Total	362	

Table 4 (continued)

Question	Frequency	Percentage
11. I regularly use the curriculum guide(s) in planning my lessons.		
Valid Strongly disagree	7	5.2
Disagree	4	3.0
Agree	66	48.9
Strongly agree	58	43.0
Total (*n*)	135	100.0
Missing	227	
Total	362	
12. The curriculum guide(s) provide useful suggestions for assessing student progress.		
Valid Strongly disagree	6	4.4
Disagree	25	18.5
Agree	79	58.5
Strongly agree	24	17.8
Don't know	1	0.7
Total (*n*)	135	100.0
Missing 0	227	
Total	362	
13. The curriculum guide(s) provide useful suggestions about instructional strategies.		
Valid Strongly disagree	2	1.5
Disagree	34	25.2
Agree	78	57.8
Strongly agree	20	14.8
Don't know	1	0.7
Total (*n*)	135	100.0
Missing 0	227	
Total	362	
14. The curriculum guide(s) help me prepare my students for state tests.		
Valid Strongly disagree	2	1.5
Disagree	19	14.5
Agree	72	55.0
Strongly agree	11	8.4
Don't know	27	20.6
Total (*n*)	131	100.0
Missing 0	231	
Total	362	
15. The curriculum guide(s) appropriately address the needs of students with IEPs and 504s.		
Valid Strongly disagree	11	8.1
Disagree	56	41.5
Agree	56	41.5
Strongly agree	4	3.0
Don't know	8	5.9
Total (*n*)	135	100.0
Missing 0	227	
Total	362	

Table 4 (continued)

Question		Frequency	Percentage
16. The curriculum guide(s) appropriately address the needs of highly able students.			
Valid	Strongly disagree	6	4.5
	Disagree	32	24.2
	Agree	82	62.1
	Strongly agree	10	7.6
	Don't know	2	1.5
	Total (*n*)	132	100.0
Missing	0	230	
Total		362	

The next most favorable response was to Item 11, "I regularly use the curriculum guide(s) in planning my lessons" (48.9% agreed, 43.0% strongly agreed, *n* = 135).

The third-highest percentage of favorable responses was for Item 4, "County Public Schools has a clear expectation for student performance aligned with the curriculum." Nearly 89% either agreed or strongly agreed (50.3% agreed, 38.3% strongly agreed, *n* = 183). These responses reflected a favorable attitude toward the standards-based mathematic curriculum

The lowest percentage of agreement, reflecting an unfavorable attitude toward the standards-based mathematic curriculum, was observed in Item 15, "The curriculum guide(s) appropriately address the needs of students with IEPs and 504s." Only 45% agreed with the statement (41.5 agree, 3% strongly agree, *n* = 135). The second-lowest percentage of agreement was reflected in Item 14, "The curriculum guide(s) help me prepare my students for the state tests." About 63% of participants agreed with this item (55% agreed, 8.4% strongly agreed, *n* = 131). In contrast, 16% of participants disagreed or strongly disagreed, and 20.6% responded that they did not know.

The third-lowest percentage of agreement, reflecting an unfavorable attitude toward the standards-based mathematic curriculum, was indicated in Item 10, "The curriculum guide(s) have enough flexibility to effectively teach my students." Nearly 65% of teachers either agreed or strongly agreed, while 33.3% either disagreed or strongly disagreed with this statement and 2.2% responded that they did not know.

Null Hypothesis 1

The associated null hypothesis for Research Question 1 was there is no significant relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum. As shown in Table 5, the hypothesis was tested by computing the Pearson correlations between questions representing the independent variable, teachers' beliefs regarding the standards-based mathematic curriculum (attitude), and the dependent variable, curriculum implementation. Sixteen corresponding questions were identified to test the hypothesis. The only significant correlations between teachers' beliefs about the curriculum (attitudes) and the dependent variable (curriculum implementation) were observed in Item 2, "County Public Schools have a curriculum aligned to state standards" ($r = .158$, $p = .045$), and Item 4, "County Public Schools has a clear expectation for student performance aligned with the curriculum" ($r = .177$, $p = .026$). Consequently, the null hypothesis for Items 2 and 4 would be rejected. Collectively, however, the 16 questions identified to test this hypothesis were not significantly correlated. Thus, the null hypothesis for Research Question 1 was not rejected.

Table 5

Correlations Between Teachers' Beliefs Regarding the Standards-Based Mathematics Curriculum and Implementation of That Curriculum

Scale	My teaching is well aligned with the district's curriculum *r* (*p*)
1. PGCPS prioritizes student learning and achievement.	.107 (*p* = .176)
2. PGCPS has a curriculum aligned with state standards.	.158 (*p* = .045)*
3. PGCPS has a coherent grade-by-grade curriculum.	.104 (*p* = .190)
4. PGCPS has a clear expectation for student performance aligned with the curriculum.	.177 (*p* = .026)*
5. PGCPS addresses the instructional needs of English language learner students at our school.	.062 (p = .433)
6. PGCPS has district staff highly skilled at curriculum and instruction.	.101 (p = .204)
7. The curriculum guide(s) promote consistency of instruction among classes at the same grade level.	.110 (p = .230)
8. The curriculum guide(s) promote continuity of instruction between grades.	-080 (p = .385)
9. The curriculum guide(s) and supporting materials are aligned with each other.	.101 (p = .275)
10. The curriculum guide(s) have enough flexibility to effectively teach my students.	.021 (p = .818)
11. I regularly use the curriculum guide(s) in planning my lessons.	.032 (p = .730)
12. The curriculum guide(s) provide useful suggestions for assessing student progress.	.048 (p = .605)
13. The curriculum guide(s) provide useful suggestions about instructional strategies.	.134 (p = .144)
14. The curriculum guide(s) help me prepare my students for the state tests.	.107 (p = .252)
15. The curriculum guide(s) appropriately address the needs of students with IEPs and 504s	.134 (p = .146)
16. The curriculum guide(s) appropriately address the needs of highly able students.	.056 (p = .545)

*$p < 0.05$, **$p < .0.01$.

Research Question 2

The second research question was what is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum? The independent variable was teachers' beliefs about their professional community in mathematics, and the theoretical construct (proxy) was subjective norms. Seven corresponding survey questions were aligned to this research question and to the subsequent hypothesis. Table 6 shows descriptive statistics for participants' responses to questions about teachers' beliefs regarding their professional community in mathematics curriculum and implementation of that curriculum.

The individual items in this scale were examined to determine if there were questions for which the frequency of a response was high or low. Of the seven survey questions regarding teachers' beliefs about their professional community (subjective norms) in mathematics, responses ranged from 84.3% to 93.3% of teachers responding that they never had experiences with their subjective norms or only had 1–2 experiences. The percentages reflected the frequency with which teachers observed other teachers or instructional leaders model instruction or were observed by other teachers and received feedback. The data reflected low frequencies for items aligned with teachers' beliefs about their professional community in mathematics (subjective norms).

The highest frequency of teacher responses was observed in Item 3, "I watched another teacher teach a math class and gave him/her feedback." In all, 71% responded *never* and 23% responded *1–2 times* (n = 163).

Table 6

Descriptive Statistics for Teachers' Beliefs Regarding Their Professional Community in Mathematics and Implementation of the Standards-Based Mathematics Curriculum

Question		Frequency	Percentage
1. I watched another teacher model instruction in math.			
Valid	Never	82	50.0
	1–2 times	59	36.0
	3–5 times	15	9.1
	6–10 times	4	2.4
	More than 10 times	4	2.4
	Total (*n*)	164	100.0
Missing	0	198	
Total		362	
2. Another teacher observed me teach a math class and gave me feedback.			
Valid	Never	79	47.9
	1–2 times	60	36.4
	3–5 times	19	11.5
	6–10 times	4	2.4
	More than 10 times	3	1.8
	Total (*n*)	165	100.0
Missing	0	197	
Total		362	
3. I watched another teacher teach a math class and gave him/her feedback.			
Valid	Never	115	70.6
	1–2 times	37	22.7
	3–5 times	8	4.9
	6–10 times	1	0.6
	More than 10 times	2	1.2
	Total (*n*)	163	100.0
Missing	0	199	
Total		362	
4. I watched an instructional leader model instruction in math.			
Valid	Never	90	54.2
	1–2 times	54	32.5
	3–5 times	16	9.6
	6–10 times	3	1.8
	More than 10 times	3	1.8
	Total (*n*)	166	100.0
Missing	0	196	
Total		362	

Table 6 (continued)

Question		Frequency	Percentage
5. An instructional leader observed me teach math and gave me feedback about improving my math teaching technique.			
Valid	Never	69	42.1
	1–2 times	75	45.7
	3–5 times	17	10.4
	6–10 times	1	0.6
	More than 10 times	2	1.2
	Total (*n*)	164	100.0
Missing	0	198	
Total		362	
6. An instructional leader observed me teach math and gave me feedback about my use of the curriculum.			
Valid	Never	85	51.8
	1–2 times	60	36.6
	3–5 times	16	9.8
	6–10 times	1	0.6
	More than 10 times	2	1.2
	Total (*n*)	164	100.0
Missing	0	198	
Total		362	
7. An instructional leader studied my students' math work and commented on ways I could improve their learning of math.			
Valid	Never	90	55.6
	1–2 times	54	33.3
	3–5 times	16	9.9
	6–10 times	1	0.6
	More than 10 times	1	0.6
	Total (*n*)	162	100.0
Missing	0	200	
Total		362	

The second-highest frequency of teacher responses was observed in Item 7, "An instructional leader studied my students' math work and commented on ways I could improve their learning of math" (55.6% never, 33.3% 1–2 times, $n = 162$). The third-highest frequency of responses was observed in Item 6, "An instructional leader observed me teach math and gave me feedback about my use of the curriculum" (51.8% never, 36.6% *1*–2 times, $n = 164$).

Null Hypothesis 2

The associated null hypothesis for Research Question 2 was there is no significant relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum. As shown in Table 7, this hypothesis was tested by computing the Pearson correlations between the questions representing the independent variable—teachers' beliefs about their professional community (subjective norms) in mathematics—and the dependent variable—curriculum implementation. Seven corresponding questions were identified to test this hypothesis.

There were no significant correlations between the independent variable—teachers' beliefs about their professional community (subjective norms) in mathematics and the dependent variable—curriculum implementation. Separately and collectively, the responses to the seven questions that tested the second hypothesis did not show significant correlation. Thus, the null hypothesis for Research Question 2 was not rejected.

Table 7

Correlations Between Teachers' Beliefs Regarding Their Professional Community in Mathematics and Implementation of the Standards-Based Mathematics Curriculum

Scale	My teaching is well aligned with the district's curriculum *r* (*p*)
1. I watched another teacher model instruction in math.	–.001 (*p* = .985)
2. Another teacher observed me teach a math class and gave me feedback.	.102 (*p* = .198)
3. I watched another teacher teach a math class and gave him/her feedback.	.152 (*p* = .056)
4. I watched an instructional leader model instruction in math.	–.035 (*p* = .662)
5. An instructional leader observed me teach math and gave me feedback about improving my math teaching technique.	.062 (*p* = .440)
6. An instructional leader observed me teach math and gave me feedback about my use of the curriculum.	.103 (*p* = .195)
7. An instructional leader studied my students' math work and commented on ways I could improve their learning in math.	.054 (*p* = .505)

*$p < .05$, **$p < .01$.

Research Question 3

Research Question 3 was what is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum? The independent variable was teachers' beliefs about instructional leadership, and the theoretical construct (proxy) was perceived behavioral control. Seven survey questions were aligned to this question and the subsequent hypothesis. Table 8 shows descriptive statistics for participants' responses to questions examining teachers' beliefs about instructional leadership and implementation of the standards-based curriculum.

Table 8

Descriptive Statistics for Teachers' Beliefs Regarding Instructional Leadership and Implementation of the Standards-Based Mathematic Curriculum

Question		Frequency	Percentage
1. The principal at my school sets high standards for teaching and learning.			
Valid	Strongly disagree	2	1.1
	Disagree	1	0.6
	Agree	45	25.4
	Strongly agree	126	71.2
	Don't know	3	1.7
	Total (*n*)	177	100.0
Missing	0	185	
Total		362	
2. The principal at my school helps us adapt our teaching practices according to analysis of state and district assessment results.			
Valid	Strongly disagree	3	1.7
	Disagree	12	6.9
	Agree	85	48.9
	Strongly agree	68	39.1
	Don't know	6	3.4
	Total (*n*)	174	100.0
Missing	0	188	
Total		362	
3. The principal at my school helps us understand and use the curriculum guide(s) to guide our teaching.			
Valid	Strongly disagree	3	1.7
	Disagree	33	18.9
	Agree	83	47.4
	Strongly agree	52	29.7
	Don't know	4	2.3
	Total (*n*)	175	100.0
Missing	0	187	
Total		362	

Table 8 (continued)

Question	Frequency	Percentage
4. The principal at my school arranges for support when I need it (e.g., access to coaches, outside consultants, district curriculum staff).		
Valid Strongly disagree	6	3.4
Disagree	12	6.8
Agree	87	49.2
Strongly agree	55	31.1
Don't know	17	9.6
Total (*n*)	177	100.0
Missing 0	185	
Total	362	
5. The principal at my school regularly attends professional development sessions in which I participate.		
Valid Strongly disagree	4	2.3
Disagree	27	15.5
Agree	86	49.4
Strongly agree	44	25.3
Don't know	13	7.5
Total (*n*)	174	100.0
Missing 0	188	
Total	362	
6. The principal at my school fills up my planning time with logistical and administrative items.		
Valid Strongly disagree	38	22.0
Disagree	73	42.2
Agree	43	24.9
Strongly agree	11	6.4
Don't know	8	4.6
Total (*n*)	173	100.0
Missing 0	189	
Total	362	
7. The principal at my school spends too much time out of the building.		
Valid Strongly disagree	61	34.7
Disagree	70	39.8
Agree	19	10.8
Strongly agree	5	2.8
Don't know	21	11.9
Total (*n*)	176	100.0
Missing 0	186	
Total	362	

The individual items in this scale were examined to determine the frequency of teachers' responses in terms of agreement regarding instructional leadership. The largest percentage of agreement was observed in Item 1, "The principal at my school sets high standards for teaching and learning." In all, 97% either agreed or strongly agreed with this item (25.4% agreed, 71.2% strongly agreed, n = 177). The next-highest percentage was observed in Item 2, "The principal at my school sets high standards for teaching and learning" (48.9% agreed, 39.1% strongly agreed, n = 174). The third-most frequent response was observed in Item 4, "The principal at my school arranges for support when I need it" (49.2% agreed, 31.1% strongly agreed, n = 177). A total of 80% of teachers either agreed or strongly agreed with this item.

For two items, a higher percentage of teacher responses reflected disagreement: Item 7, "The principal at my school spends too much time out of the building" (39.8 disagreed, 34.7% strongly disagreed, n = 176), and Item 6, "The principal at my school fills up my planning time with logistical and administrative items" (42.2% disagreed, 22.0% strongly disagreed, n = 173). Overwhelmingly, teachers' responses to items regarding their beliefs about instructional leadership (perceived behavioral control) reflected high frequencies of favorable response to instructional leadership.

Null Hypothesis 3

The associated null hypothesis for Research Question 3 was there is no significant relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum. As shown in Table 9, the hypothesis was tested by computing the Pearson correlations between responses to the questions representing the independent variable—teachers' beliefs regarding instructional

leadership (perceived behavioral control)—and implementation of the standards-based mathematics curriculum. Seven questions were identified to test the hypothesis.

Table 9

Correlations Between Teachers' Beliefs Regarding Instructional Leadership and Implementation of the Standards-Based Mathematics Curriculum

Scale	My teaching is well aligned with the district's curriculum r (p)
1. The principal at my school sets high standards for teaching and learning.	.176 (p = .025)*
2. The principal at my school helps us adapt our teaching practices according to analysis of state and district assessment results.	.144 (p = .069)
3. The principal at my school helps us understand and use the curriculum guide(s) to guide our teaching.	.116 (p = .146)
4. The principal at my school arranges for support when I need it (e.g., access to coaches, outside consultants, district curriculum staff).	.063 (p = .424)
5. The principal at my school regularly attends professional development sessions in which I participate.	.120 (p = .131)
6. The principal at my school fills my planning time with logistical and administrative items.	.028 (p = .724)
7. The principal at my school spends too much time out of the building.	.045 (p = .146)

*p < .05, **p < .01.

The only significant correlation between teachers' beliefs regarding instructional leadership (perceived behavioral control) and implementation of the standards-based curriculum was observed in Item 1, "The principal sets high standards for teaching and learning" (r = .176, p = .025). In terms of Item 1 alone, the null hypothesis for Research Question 3 would be rejected. As a whole, however, the responses to the seven questions

identified to test the hypothesis were not significantly correlated. Thus, the null hypothesis for Research Question 3 was not rejected.

Summary of the Section

In summary, the findings resulting from the analysis of data related to the three research questions yielded significant correlations between only two survey items. One item was aligned to teachers' beliefs regarding the standards-based curriculum and curriculum implementation (the dependent variable) and represented the theoretical construct, attitude. Responses representing teachers' beliefs about the standards-based mathematics curriculum were overwhelmingly favorable, and teachers' attitudes regarding implementing the curriculum were positive. The other item represented the theoretical construct, perceived behavioral control. The findings suggested that study participants possessed a high degree of perceived behavioral control over the standards-based mathematics curriculum and that instructional leaders in their schools (e.g., the principals) contributed to teachers' perceived sense of control. Collectively, responses to the survey questions identified to address the study's three research questions were not significantly correlated. Consequently, the null hypothesis for each of the study's research question was not rejected. The concluding section will provide a summary of the study and interpretation of the findings. It will also include implications for social change and recommend actions for further study and examination.

Section 5: Results, Conclusions, and Recommendations

This section includes the results, conclusions, and recommendations resulting from the problem stated in section 1, the literature review in section 2, and the methodology and analysis of the results presented in sections 3 and 4. Section 5 consists of the following sections: summary of the study, interpretation of the findings for each research question, implications for social change, recommendations for action, and recommendations for further study and conclusions.

Summary of Research Study

The purpose of this study was to examine secondary data from a survey in which mathematic teachers answered questions regarding their beliefs about the standards-based mathematics curriculum. Three hundred sixty-one (n = 361) elementary, middle, and high school teachers comprised the sample. The relationship between teachers' beliefs about a standards-based mathematics curriculum, professional community, and instructional leadership and curriculum implementation was examined. Researchers such as Akinsola (2008), Little (1988), Lloyd & Herbel–Eisenmann (2005), and Meyer (1980) have shown that teachers' beliefs about the standards-based mathematics curriculum directly affect the implementation of that curriculum. The three constructs of Ajzen's (1991) TPB—attitude, subjective norms, and perceived behavioral control—served as proxies for the independent variables, beliefs about the curriculum, professional community and instructional leadership. The problem established from the research was the failure of the NCLB (2001) reform effort in considering the beliefs of teachers with regards to the implementation of the standards-based curricula (Leana & Phil, 2006).

Three research questions were addressed in this study: (a) What is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum? (b) What is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum? and (c) What is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum? Descriptive and inferential statistics were used to examine the relationships between the independent variables—beliefs about the standards-based curriculum (attitude), beliefs about the professional community in mathematics (subjective norms), and beliefs about instructional leadership (perceived behavioral control)—and the dependent variable (curriculum implementation).

Interpretation of Findings

Research Question 1

The first research question of this study was what is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum? The independent variable was teachers' beliefs about the curriculum and the theoretical construct (proxy) was attitude. Understanding the influence of federally mandated legislation contained in NCLB (2001) on teachers' beliefs about the standards-based curriculum is essential for advocates, administrators, and teachers, especially, who work every day within the constraints of NCLB's federal mandates (Vuksanvich, 2009). According to Ajzen (1991) beliefs are either favorable or unfavorable and constitute an attitude about a behavior or object.

The results of this study indicated that the responses representing teachers' beliefs about the standards-based mathematics curriculum were overwhelmingly favorable, and teachers' attitudes regarding the curriculum were positive. The largest percentage of agreement, as referenced in Table 4, was observed in the item, "County has a curriculum aligned with state standards." The next-highest favorable response was for the item, "I regularly use the curriculum guide(s) in planning my lessons." Nearly 89% either agreed or strongly agreed, "County has a clear expectation for student performance aligned with the curriculum."

All but two of the survey items aligned to Research Question 1 reflected a favorable attitude toward the standards-based mathematics curriculum. The lowest percentage of agreement, reflecting an unfavorable attitude toward the standards-based mathematics curriculum, was observed in those items regarding how the curriculum addressed the needs of students with IEPs and 504s. The second-lowest percentage of agreement was reflected in the item that addressed how the curriculum prepared students for state tests.

According to Ajzen (1991), human action is guided by beliefs that may facilitate or impede the performance of behaviors, and beliefs, in turn, influence behavior. Research cited in this study showed that instruction in mathematics classrooms might be directly related to the beliefs teachers hold about mathematics and the mathematics curriculum. Likewise, researchers consistently found that mathematics teachers' opinions, beliefs, and inclinations swayed their instructional practices (Bush, Lamb, & Alsina, 1990; Fullan, 1983; Karp, 1991; Kessler, 1985; McGalliard, 1983; Silver, 1985; Thompson, 1984). Participants in this study consistently expressed beliefs and attitudes

that were favorable with regard to the standards-based mathematics curriculum. Thus, it could be argued that based on the frequency of positive responses from the sample, teachers' beliefs (attitudes) could lead to implementation of the standards-based mathematics curriculum and to a rejection of the null hypothesis.

However as reflected in Table 5, findings from the analysis of data related to Research Question 1 yielded significant correlations for only two items: "County Public Schools has a curriculum aligned to state standards" and "County has a clear expectation for student performance aligned with the curriculum." These correlations indicated that there was a positive relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum when (a) teachers believed that the curriculum was aligned to state standards and (b) when teachers believed that the school district had clear expectations for student performance aligned to the curriculum. However, the null hypothesis for Research Question 1 was not rejected because each of the 16 questions identified to test this hypothesis was not significantly correlated. The findings resulting from the outcomes presented in section 4 suggested that teachers with positive attitudes regarding the standards-based mathematics curriculum were more inclined to implement the curriculum.

Research Question 2

The second research question was what is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum? The independent variable was teachers' beliefs regarding their professional community in mathematics, and the theoretical construct (proxy) was subjective norms.

Researchers have suggested that commonly held beliefs and objectives are central to creating conditions favorable to teacher collaboration (Hord, 1997; Mitchell, 1995; Odden & Wohlstetter, 1995; O'Neill, 1995). Senge (1990) pointed out that there is a marked distinction between persons who are truly committed to a goal and those who are merely compliant because they wish to avoid incurring negative feedback from those in authority. Findings from this study reflected that teachers had few opportunities to either observe other teachers or to be observed by other teachers modeling instruction or giving feedback. Thus, teachers had few opportunities to engage with their professional community around the standards-based mathematics curriculum.

The scale responses in this survey included n*ever,* 1–2 times, 3–5 times, 6–10 times, and more than 10 times. The most frequent responses relative to the research question were never and 1–2 times. The following items received the highest percentage of responses of never and 1–2 times: "I watched another teacher teach a math class and gave him/her feedback," "An instructional leader studied my students' math work and commented on ways I could improve their learning of math," and "An instructional leader observed me teach math and gave me feedback about my use of the curriculum." Ajzen (2008) explained that the beliefs of relevant people in a person's life, weighted by the value one places on those beliefs, represent subjective norms. Other researchers agreed that if teachers do not share the same essential perspectives on what constitutes desirable educational practice and do not maintain a common commitment to shared goals, they are unlikely to consistently work toward collective purposes (Fullan, 2001).

Findings from this study suggested that social norms, required to produce social pressure to perform a behavior (i.e., curriculum implementation) did not exist for the

sample represented in this study. The frequency of responses for those items indicating how often teachers had observed or had been observed by their subjective norms was high for responses of never and 1–2 times indicating that teachers never had those opportunities or had experienced those opportunities only one or two times. Findings from Pearson correlations conducted on items representing teachers' beliefs about their professional community in mathematics and implementation of the standards-based mathematics curriculum reflected no significant correlation, individually and collectively. Thus, the null hypothesis for Research Question 2 was not rejected. The findings suggested that although the literature was replete with research about the nature and importance of professional learning communities—and local professional norms and subjective norms that support or inhibit effective professional development and community learning, regular and sustained opportunities for practice must be provided for teachers to actualize the benefits of a professional learning community.

Research Question 3

The third research question for this study was what is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum? The independent variable was teachers' beliefs regarding instructional leadership, and the theoretical construct (proxy) was perceived behavioral control. Perceived behavioral control refers to the ease or difficulty of performing a behavior. It encompasses a person's perception of the readily available resources, support, skills, and opportunities to complete a task or perform a behavior, as well as one's perception of the importance of achieving the results. An abundance of studies have shown that the day-to-day work of teachers is influenced by external factors and that

school leadership is one of the perceived control factors that influences the effectiveness of teachers' behavior (e.g., implementation of the curriculum), as well as the achievement outcomes of student*s* (Matthews et al., 2007; Murphy, Hallinger, & Peterson, 1986; OECD, 2009).

Table 8 revealed that the frequency of favorable responses aligned to items reflecting teachers' beliefs regarding instructional leadership (perceived behavioral control) was high. The largest percentage of agreement was observed in the following items: "The principal at my school sets high standards for teaching and learning," "The principal at my school helps us adapt our teaching practices according to analysis of state or district assessment results," and "The principal at my school arranges for support when I need it." Teachers' responses reflecting disagreement were observed in only two items: "The principal at my school spends too much time out of the building" and "The principal at my school fills up my planning time with logistical and administrative items." Frequency counts for these two items were high, suggesting that teachers disagreed that their principal spent too much time out of the building or imposed administrative items on their planning time

Outcomes presented in section 4 resulted in findings that suggested that study participants possessed a high degree of perceived behavioral control over the standards-based mathematics curriculum and that instructional leaders in their schools (e.g., the principals) contributed to teachers' perceived sense of control. According to Bandura (1977), self-efficacy is mediated by a person's beliefs or expectations about his or her capacity to successfully accomplish certain tasks or to demonstrate certain behaviors (Hackett & Betz, 1981). These expectations determine whether or not a certain behavior

or performance will be attempted, the amount of effort the individual will put toward the behavior, and how long the behavior will be sustained when obstacles are encountered (Akinsola, 2008; Brown, 1999).

The only significant correlation observed between teachers' beliefs regarding instructional leadership (perceived behavioral control) and implementation of the standards-based mathematics curriculum was referenced in Table 9 and was observed in a single item, "The principal sets high standards for teaching and learning." These findings suggested that perceived behavioral control generated by high expectations and support provided by the instructional leader was significantly related to the implementation of the standards-based mathematics curriculum. Because there was no significant correlation observed between each of the items aligned to the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based curriculum, however, the null hypothesis for Research Question 3 was not rejected. However, practical application of the findings would suggest that the principal, as an instructional leader, could greatly influence teachers' behavior (i.e., implementation of the curriculum) by exhibiting high standards for teaching and learning.

Implications for Social Change

The findings in this study have implications for mathematics curriculum reform implementation, which advocates have supported for approximately 10 years, as outlined in the *Principals and Standards for School Mathematics* (NCTM, 2000). Researchers have found that teachers' beliefs are critical to the successful implementation of mathematics reform (Battista, 1994; Cohen, 1990), especially at the elementary school level (Yates, 2006). In fact, the literature on teacher change suggested that real and

lasting change is achieved only if teachers' belief systems support the underlying premises of the changes they are asked to implement (Chapman, 2002). Bezwick (2006) stated that it is not enough to provide teachers with resources, curriculum materials, and ideas without attending to their relevant beliefs. The implications for positive social change are significant, as the findings of this study suggested a need for a different mechanism or approach for reframing and supporting teacher behavior in the classroom and thereby achieving collective teacher accountability for the implementation of standards-based curriculum reform under NCLB (2001).

The alignment between mathematics reform and teachers' beliefs and practices must be closely matched. Yates (2006) noted, "The poor history of reform in mathematics has been attributed to a lack of congruence between the intent of the curriculum innovations and teachers' pedagogical knowledge, beliefs and practices" (p. 443). As a critical factor in educational reform, the relationship between mathematics teachers' beliefs and instructional practices is highly complex (Pajares, 1992). Although many studies suggested there is a relationship between teachers' beliefs and instructional practices, the causality is difficult to explain (Buzeika, 1996). Nevertheless, the subject has attracted the attention of mathematics researchers and reformers. The consensus is, according to Yates (2006), "Most mathematics education reforms have been introduced by education authorities through a top-down approach, which ignores teachers, beliefs and pedagogical practices and the changes which would be necessary for them to be able to embrace the innovation" (p. 443; see also Norton, McRobbie, & Cooper, 2002; Perry, Howard, & Tracey, 1999). Thus, in the process of reform, policymakers and curriculum implementers have largely neglected mathematics teachers' beliefs. Further studies might

provide information on the relationships (or lack thereof) between teacher beliefs and practice and might help to alleviate the mismatch between "intended" and "attained" curricula (Cuban, 1993).

Recommendations for Action

An important finding of this study was that participants did not have the benefit of a professional learning community or access to local professional norms and subjective norms that supported effective professional development and professional community learning. Yet, one of the most important factors affecting curriculum alignment and change in mathematics education, according to Clarke (1997), is the spirit of collegiality, collaboration, and experimentation among teachers. Professional learning communities make a difference by building accountability, continuing inquiry, and fostering community and self-governance for teachers (Darling-Hammond, 1996; DuFour & Eaker, 1998; Hord, 1997).

Tsai (2007) stated,

> Teachers move toward professional autonomy as they continue to construct their ideas about mathematics and how the autonomy is best taught to their students. Professional teaching autonomy is developed when teachers have opportunities to share their views with others and to hear and debate the views of others. One way of exchanging various perspectives would be the teachers participating in a professional teaching community. (p. 217)

Tsai added that teachers develop professionally when they have the opportunity to share and debate the views of others. Through exchanging points of view, Tsai argued, teachers develop an appreciation for diversity of thought and become better at seeing one

another's perspectives, which leads to better pedagogical reasoning (p.217) Beswick (2006) argued that providing time, opportunities, and stimuli for teachers to reflect on their beliefs is also important and consistent with a social constructivist view of learning that recognizes that teacher change is learning. Regular and sustained opportunities for practice should be provided to the teachers in this sample to actualize the benefits of a professional learning community.

The results of this study are important to school districts and administrators in the development of effective professional learning communities and to teachers as they develop the autonomy to implement mathematics curricula within professional learning communities. The results of this study would be beneficial to audiences at local, state and national educational conferences and journals such as the National Staff Development Conference and the Journal for Research in Mathematics Education.

Recommendations for Further Study

The findings in this study have implications for additional research on teacher beliefs related to teaching mathematics, teacher effectiveness, and mathematics reform. As was cited in this study, researchers have suggested that beliefs are the best predictors of individual behavior and that teachers' beliefs influence their perceptions and judgments, which, in turn, affect classroom performance (Pajares, 1992). Teachers' beliefs are related to several professional and academic outcomes (Ashton & Webb, 1986) and to beliefs about student control, interest, perseverance, and achievement (Woolfolk & Hoy, 1990). In fact, Fenstermacher (1979), Kagen (1992), and Pintrich (1990) argued that the study of beliefs should be the focus of teacher effectiveness research.

Yet, for teachers of mathematics, there often is a mismatch between beliefs and implementation of curriculum. Cronin-Jones (2006) found that teachers' belief structures were incongruent with the underlying philosophy of the intended curriculum and that those beliefs hampered successful implementation of that curriculum. Handal and Herrington (2003) argued that if mathematics teachers' beliefs are not congruent with the beliefs underpinning an educational reform, then the aftermath of such a mismatch can affect the degree of success of the innovation or reform, as well as teachers' morale and willingness to implement further innovations. Further study should be undertaken to investigate to what extent new mathematics curriculum materials influence teachers' dispositions toward the teaching of mathematics and, ultimately, the impact of the new curriculum material on the alignment or misalignment of teachers' beliefs.

Conclusions

Teachers' beliefs related to classroom practices are one of the most researched themes in teacher cognition research (Khonamri & Salimi, 2010; Leatham, 2006). Early, as well as recent research (e.g., Handel & Herrington, 2003; Khonamri & Salimi, 2010; Kyeleve & Williams, 1996; Leder, Pehkonen, & Torner, 2002; McLeod & McLeod, 2002; Nunan, 1992; Pajares, 1992; Yates, 2006) focused on the role of teachers' beliefs in determining professional behavior and classroom practices in implementing curriculum. Researchers generally hypothesized that teachers' beliefs affect the delivery of the curriculum in a significant way and play a central role in teaching practices (Handel & Herrington, 2003; Kagan, 1992; Pajares, 1992; Speer, 2005).

However, it is unclear whether teachers' beliefs influence their instructional behavior or their practices influence their beliefs (Buzeika, 1996; Yates, 2006). Raymond

(1997) suggested, "In many instances, teaching style is governed by the sum of *other* factors despite the teachers' perceptions that beliefs should play a major role in determining practice" (p. 570). For teachers delivering curriculum, issues of classroom management, pacing and timing of lessons, the amount of teacher talk, and the quality of instruction and explanation to students may be more important than teachers' beliefs (Khonarmi & Salimi, 2010; Nunan, 1992). In addition, researchers acknowledged teachers' beliefs as "being notoriously difficult to define" (Pajares, 1992, p. 2; see also McLeod & McLeod, 2002). Beliefs are formed by individual experiences and conditions that are varied, personal and sometimes difficult to justify or explain.

The purpose of this study was to investigate the relationship between selected beliefs of a sample of elementary, middle and high school mathematics teachers and implementation of the standards-based curriculum. The study focused on three independent variables: teachers' beliefs about the standard-based curriculum, teachers' beliefs about the professional community, and teachers' beliefs regarding instructional leadership. The study followed Ajzen's (1991) and Ajzen and Fishbein's (1985) theoretical concept that an individual's behavior follows from his or her beliefs, and utilized Ajzen's constructs—attitude, subjective norms, and perceived behavioral control—as proxies for the study's independent variables.

Analysis of the data revealed no significant relationships between teachers' beliefs about the standard-based mathematics curriculum and implementation of the curriculum, no significant relationships between teachers' beliefs regarding the professional community and implementation of the curriculum, and no significant relationships between teachers' beliefs regarding instructional leadership and

implementation of the curriculum. With respect to the relationship between teachers' beliefs in all three areas and implementation of the curriculum, the study's alternative or research hypotheses were unsupported by the data.

However, the findings of no significant relationships between the independent variables and the dependent variables in this study appeared to support findings in other studies. For example, Chou (2008) concluded that there were no significant relationships between the participants' beliefs and their use (or implementation) of different reading approaches. Similarly, Khonarmi and Salini (2010) determined that there was no significant correlation between teachers' beliefs about the importance of reading strategies and their self-reported classroom practices. Khonarmi and Salini rationalized the lack of relationship as follows: "The inconsistency between teachers' beliefs and their practices is not unexpected" (p. 104). Perceived behavioral control and a sense of efficacy are factors that impact behavior. Earlier researchers (e.g., Fang, 1996; Johnson, 1992, 1994; Pace & Powers, 1981) found, "The complexities of classroom life often constrain a teacher's abilities" (Khonarmi & Salini, 2010, p. 104). Thus, other factors such as lack of procedural knowledge and time, large classes, and differing ability levels of students may have had a powerful influence on teachers' beliefs and similarly, may have affected their classroom practices.

Data for this study were derived from teacher self-reports and not classroom observations. Thus, definitive observational conclusions about the relationship between teacher beliefs about a standard-based mathematics curriculum and actual classroom implementation of the curriculum were not drawn for the sample of teachers identified in this study.

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Appendix A: Survey Questions Groups Under Research Questions,

Survey Factors, and Theoretical Constructs

Research Question 1:
What is the relationship between teachers' beliefs regarding the standards-based mathematics curriculum and implementation of that curriculum? TPB Construct: Attitude—Refers to the degree to which a person's evaluation is favorable or unfavorable.

Survey Factor: Curriculum and Materials

How much do you agree or disagree with each of the following statements?

Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know

1. PGCPS prioritizes student learning and achievement.
2. PGCPS has a curriculum aligned with state standards.
3. PGCPS has a coherent grade-by-grade curriculum.
4. PGCPS has a clear expectation for student performance aligned with the curriculum.
5. PGCPS addresses the instructional needs of English language learner students at our school.
6. PGCPS has district staff highly skilled at curriculum and instruction.
7. The curriculum guide(s) promote consistency of instruction among classes at the same grade level.
8. The curriculum guide(s) promote continuity of instruction between grades.
9. The curriculum guide(s) and supporting materials are aligned with each other.
10. The curriculum guide(s) have enough flexibility to effectively teach my students.
11. I regularly use the curriculum guide(s) in planning my lessons.
12. The curriculum guide(s) provide useful suggestions for assessing student progress.
13. The curriculum guide(s) provide useful suggestions about instructional strategies.
14. The curriculum guide(s) help me prepare my students for the state tests.
15. The curriculum guide(s) appropriately address the needs of students with IEPs and 504s.
16. The curriculum guide(s) appropriately address the needs of highly able students.

Research Question 2:
What is the relationship between teachers' beliefs regarding their professional community in mathematics and implementation of the standards-based mathematics curriculum?

TPB Construct: Subjective Norms—Refers to perceived social pressure to perform or not perform a behavior as determined by the influence of relevant individuals in one's environment.

Survey Factor: Professional Community

So far this school year, how often did the following things occur in mathematics?

Never	1-2 times	3-5 times	6-10 times	More than 10 times

1. I watched another teacher model instruction in math.
2. Another teacher observed me teach a math class and gave me feedback.
3. I watched another teacher teach a math class and gave him/her feedback.
4. I watched an instructional leader model instruction in math.
5. An instructional leader observed me teach math and gave me feedback about improving my math teaching technique.
6. An instructional leader observed me teach math and gave me feedback about my use of the curriculum.
7. An instructional leader studied my student's math work and commented on ways I could improve their learning of math.

Research Question 3:
What is the relationship between teachers' beliefs regarding instructional leadership and implementation of the standards-based mathematics curriculum? TPB Construct: Perceived Behavioral Control—Refers to the perceived ease or difficulty of performing a behavior.

Survey Factor: Instructional Leadership (Professional Support)

Think about the leadership your principal provides at your school. Please indicate the extent to which you agree or disagree with each of the following statements about your principal's leadership.

Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know

1. The principal at my school sets high standards for teaching and learning.
2. The principal at my school helps us adapt our teaching practices according to analysis of state or district assessment results.
3. The principal at my school helps us understand and use the curriculum guide(s) to guide our teaching.
4. The principal at my school arranges for support when I need it (e.g., access to coaches, outside consultants, district curriculum staff).
5. The principal at my school regularly attends professional development sessions in which I participate.
6. The principal at my school fills up my planning time with logistical and administrative items.
7. The principal at my school spends too much time out of the building.

Survey Question—Curriculum Implementation & Content Coverage

1. My teaching is well aligned with the district's curriculum.

Appendix B: PEER: School System Elements and Constructs Defined

C. Instructional Leadership (Professional Support)—District and School

Leader Beliefs (analyzed with teacher beliefs)

- Students: intelligence and how students learn; collective responsibility for student learning; students' capacity for learning; home environment influence
- Self-efficacy: own capacity; self as learner; ability to impact student learning; impact of their own leadership practice on the quality of school leader practice, teacher instructional practice, and student learning results
- Instruction: what constitutes high-quality teaching practice; impact of high-quality teaching on learning; instructional program efficacy
- Leadership change: change needed; school capacity; accountability; ownership/ responsibility; collaborative process; capacity of others; how adults learn

Leader Knowledge and Skills

- Recognizing indicators of high-quality curriculum, assessments, and instructional practice
- Knowledge about how to effectively lead, support, and monitor the improvement of instructional practice in various contexts and with high public accountability
- Knowledge about how to develop and manage an organization that supports and sustains high-quality instructional practice and achieves high-quality learning results
- Knowledge of context and practices for assigned role
- Years of role experience

Setting Direction: Establishing an Effort-Based Vision of High-Quality Teaching, Learning, and Leadership

- Having an effective theory of action and strategy that creates coherence in the instructional program and defines priorities for improvement of leadership, teaching, and learning
- Identifying and articulating an effort-based vision of high-quality student learning
- Identifying and articulating an improvement plan that is aligned with district goals for improvement and uses district-approved curriculum guides, instructional materials, and assessments of progress
- Establishing clear roles and high performance expectations for teaching, learning, and leadership informed by research-based standards of practice
- Creating shared language and meanings around vision and strategy for improvement
- Fostering acceptance of collective responsibility for success of all students
- Fostering acceptance of the development of group goals and the identification of evidence of progress and success (collaborative development of improvement strategy, actions for improvement, and processes for monitoring implementation and impact)
- Making differentiated learning support linked to grade-level standards a priority for students who traditionally struggle
- Communicating key elements of vision effectively, continuously, and to all stakeholders
- Setting direction/goals in line with the test (state, district assessments, etc.)

Appendix C: List of Largest U.S. School Districts as of September 2006

(Enrollment Data Released in March 2009)

Rank	School district	State	Students
1	New York City Public Schools	New York	999,150
2	Los Angeles Unified School District	California	707,627
3	Chicago Public Schools	Illinois	413,694
4	Miami–Dade County Public Schools	Florida	353,790
5	Clark County School District	Nevada	303,448
6	Broward County Public Schools	Florida	262,813
7	Houston Independent School District	Texas	202,936
8	Hillsborough County Public Schools	Florida	193,517
9	Hawai'i Department of Education	Hawaii	180,728
10	School District of Philadelphia	Pennsylvania	178,241
11	Orange County Public Schools	Florida	175,245
12	Fairfax County Public Schools	Virginia	173,573
13	School District of Palm Beach County	Florida	171,431
14	Dallas Independent School District	Texas	159,144
15	Gwinnett County Public Schools	Georgia	152,043
16	Montgomery County Public Schools	Maryland	137,814
17	Prince George's County Public Schools	Maryland	131,014
18	San Diego City Schools	California	130,983
19	Charlotte–Mecklenburg Schools	North Carolina	128,789
20	Wake County Public School System	North Carolina	128,748
21	Duval County Public Schools	Florida	125,176
22	Detroit Public Schools	Michigan	117,609
23	Memphis City Schools	Tennessee	117,349
24	Pinellas County Schools	Florida	109,915
25	Cobb County School District	Georgia	107,274
26	Baltimore County Public Schools	Maryland	105,839
27	DeKalb County School System	Georgia	101,396
28	Albuquerque Public Schools	New Mexico	95,493
29	Polk County Public Schools	Florida	92,801

Appendix C (continued)

Rank	School district	State	Students
30	Jefferson County Public Schools	Kentucky	92,659
31	Cypress–Fairbanks Independent School District	Texas	92,135
32	Long Beach Unified School District	California	90,663
33	Milwaukee Public Schools	Wisconsin	89,912
34	Jefferson County Public Schools	Colorado	86,154
35	Baltimore City Public School System	Maryland	84,515
36	Fulton County School System	Georgia	83,861
37	Northside Independent School District	Texas	82,587
38	Austin Independent School District	Texas	82,140
39	Fort Worth Independent School District	Texas	79,457
40	School District of Lee County	Florida	78,981
41	Jordan School District	Utah	78,299
42	Fresno Unified School District	California	77,555
43	Brevard Public Schools	Florida	74,785
44	Mesa Public Schools	Arizona	74,128
45	Metropolitan Nashville Public Schools	Tennessee	73,731
46	Anne Arundel County Public Schools	Maryland	73,066
47	Denver Public Schools	Colorado	72,561
48	Virginia Beach City Public Schools	Virginia	72,538
49	Guilford County Schools	North Carolina	71,722
50	Prince William County Public Schools	Virginia	70,948
51	Greenville County School District	South Carolina	67,537
52	Granite School District	Utah	67,502
53	Fort Bend Independent School District	Texas	67,014
54	Seminole County Public Schools	Florida	66,351
55	Volusia County Schools	Florida	65,867
56	Mobile County Public School System	Alabama	65,097
57	Washoe County School District	Nevada	64,954
58	Pasco County Schools	Florida	64,689
59	Arlington Independent School District	Texas	63,082
60	El Paso Independent School District	Texas	62,857

Appendix C (continued)

Rank	School district	State	Students
61	Davis School District	Utah	62,193
62	Elk Grove Unified School District	California	61,881
63	North East Independent School District	Texas	61,255
64	Tucson Unified School District	Arizona	60,333
65	Knox County Schools	Tennessee	59,663
66	Aldine Independent School District	Texas	58,831
67	Chesterfield County Public Schools	Virginia	58,455
68	San Bernardino City Unified School District	California	57,398
69	Santa Ana Unified School District	California	57,286
70	Garland Independent School District	Texas	56,955
71	District of Columbia Public Schools	District of Columbia	56,943
72	Alpine School District	Utah	56,460
73	Boston Public Schools	Massachusetts	56,388
74	San Francisco Unified School District	California	56,183
75	Columbus City Schools	Ohio	56,003
76	Cleveland Metropolitan School District	Ohio	55,593
77	San Antonio Independent School District	Texas	55,406
78	Cumberland County Schools	North Carolina	53,621
79	Plano Independent School District	Texas	52,997
80	Clayton County Public Schools	Georgia	52,533
81	School District of Osceola County, Florida	Florida	52,012
82	Capistrano Unified School District	California	51,512
83	Winston-Salem/Forsyth County Schools	North Carolina	51,325
84	Katy Independent School District	Texas	51,201
85	Atlanta Public Schools	Georgia	50,631
86	Loudoun County Public Schools	Virginia	50,383
87	Douglas County School District RE-1	Colorado	50,370
88	Corona–Norco Unified School District	California	49,865
89	Pasadena Independent School District	Texas	49,851
90	Cherry Creek School District	Colorado	49,684
91	Sacramento City Unified School District	California	49,355

Appendix C (continued)

Rank	School district	State	Students
92	Anchorage School District	Alaska	49,230
93	East Baton Rouge Parish Public Schools	Louisiana	49,197
94	Lewisville Independent School District	Texas	49,060
95	Howard County Public Schools	Maryland	49,048
96	Garden Grove Unified School District	California	48,802
97	Brownsville Independent School District	Texas	48,334
98	San Juan Unified School District	California	47,862
99	Henrico County Public Schools	Virginia	47,680
100	Shelby County Schools	Tennessee	47,126

Curriculum Vitae

Debra A. Mahone

Career History:

Executive Director, School & Leadership Development (July 2009–present) *Prince George's County Public Schools, Maryland*

Director, Department of School Improvement & Accountability (2000–2009) *Prince George's County Public Schools, Maryland*

Interim Principal, Central High School (2007–2008) Prince George's County Public Schools, Maryland

President, Vision Educational Consulting, Inc. (2003–Present) *Maryland and Washington, DC*

Supervisor, Department of School Improvement & Accountability (1999–2000) *Prince George's County Public Schools, Maryland*

Principal, Gwynn Park Middle School (1995–1999) *Prince George's County Public Schools, Maryland*

Area Teacher Specialist (1991–1995) *Prince George's County Public Schools, Maryland*

Coordinator, Humanities and International Studies (1990–1991) *Central High School, Prince George' s County Public Schools, Maryland*

English Teacher (1973–1990) *Central High School, Prince George's County Public Schools, Maryland and Little Rock, Arkansas*

Education & Certification

Master's Degree, Administration and Supervision (1995) *Bowie State University*
Bachelor's Degree, English & Journalism (1973) *University of Central Arkansas*
Coursework in teaching students with special needs (1988) *University of Maryland*

Teaching Certification K–12 English, LAN Arts