A Study Of Efficacy Beliefs For Urban And Suburban School Teachers Trained In A Brain-Based Model Of Instruction

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A STUDY OF EFFICACY BELIEFS FOR
URBAN AND SUBURBAN SCHOOL TEACHERS
TRAINED IN A BRAIN-BASED MODEL OF INSTRUCTION

BY

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CHAPTER I

INTRODUCTION

All depends upon a breaking free, a leap and then a question. I would like to claim that this is how learning happens and that the educative task is to create situations in which the young are moved to begin to ask, in all the tones of voice there are, Why? (Green, 1995).

As we approach the Twenty-first Century, the mission of educators remains the same as it has for over a century: the improvement of student learning. On the national, state, and local levels, educational reforms are being implemented and enforced to meet the demanding needs of an increasingly complex and global society.

Although much research has been conducted and volumes written on maximizing student learning, no definitive answers have been derived. The traditional instructional model, which focuses upon memorization and recall with a teacher-directed delivery system, is being challenged for not optimizing the learning potential for all students. This is especially true where higher levels of critical thinking and problem solving skills are involved.

Many of the alternative theories, replacing the traditional model, are still fragmented and limited to
supporting specific approaches (Caine & Caine, 1991). With an increasing awareness of the relationship between the quality of education that an individual receives and its impact on one’s future quality of life, it is an economic and moral imperative that the teaching/learning paradigm be improved.

One area receiving heightened attention from educators and policy makers is the research in brain-based learning. The neurosciences, biology, and pedagogic research are enlightening us on how the brain works, and its implications for teaching and learning (Abbott, 1997).

Due to advanced technologies, dramatic developments in brain research have advanced our understanding of the human brain. Teachers, administrators, and educational practitioners have become increasingly interested in brain-based learning because their work requires an understanding of how the brain receives, processes and produces information (Bucko, 1997).

Until recently, theories of how people learn have been based on behavioral observation. Understanding the role of the brain and how it processes information may have substantial implication for improving the educational process. Caine and Caine (1991) recognize the fact that all learning is brain-based to some degree; they state that brain-based learning involves acknowledging the brain’s rules for meaningful learning and organizing teaching with those rules in mind.
President Bush, in July 1980, officially proclaimed the 1990s the "Decade of the Brain." Certainly during the past nine years, our knowledge of brain functioning has been revolutionized and there has been an unprecedented amount of information on how the brain works (Wolfe & Brandt, 1998).

The challenge before today’s educators is to harness this explosion of neuroscientific research, and to determine how this information is applicable to the field of education and classroom practice.

Paul Messier, of the United States Department of Education, said "The general thrust of the neuroscience implications is to open education to the possibilities of a greater range of human mental, intellectual and learning capabilities" (McCarthy, 1996, p.162).

Educators must acknowledge the relationship between the human brain and learning, and integrate the information discovered during the past decade to restructure their teaching behaviors and develop contemporary educational models to lead us into the next century.

Statement of the Problem

The purpose of this study was to compare the efficacy beliefs of urban and suburban teachers who had been trained in a brain-based model of instruction. The relationship between efficacy beliefs and personal and organizational variables were also investigated to determine if these
factors impacted a teacher's sense of personal and general teaching efficacy.

Research Questions

Two major research questions and three subsidiary questions guided this investigation:

1. Are there differences in teacher efficacy beliefs between teachers in an urban and suburban school district who have been trained in a brain-based model of instruction?

2. Are personal and organizational factors related to teacher efficacy beliefs in an urban and suburban school district?

2a. Is there a significant relationship between teacher efficacy beliefs and years of teaching experience in an urban and suburban school district?

2b. Is there a significant relationship between teacher efficacy beliefs and class size in an urban and suburban school district?

2c. Is there a significant relationship between teacher efficacy beliefs and grade level in an urban and suburban school district?

Significance of the Study

Despite the calls from various corners of the business and education worlds for educational reform, much still remains the same. As stated by Fullan and Stiegelbauer (1991),
One of the most fundamental problems of education today is that people do not have a clear, coherent sense of meaning about what educational change is for and how it proceeds... What we need is a more coherent picture that people who are involved in or affected by educational change can use to make sense of what they and others are doing... Solutions must come through the development of shared meaning. (pp.4,5)

Research in the brain sciences is presenting educators with the challenge of adapting their profession to this rapidly expanding knowledge base and its application to the teaching and learning process. Brain-based theory provides a "sharper and deeper concept of what learning is and how it occurs in humans" (Neve, Hart, & Thomas, 1986, p. 146).

Although educators will not need to become neurobiologists, they should possess a "functional understanding of these significant developments to be able to comprehend the growing scientific and professional writing in this field" (Sylwester, 1995, p. vii).

Applications of brain-based learning theories have already been introduced into classroom practices. These include: (a) cooperative learning activities, (b) incorporation of multiple intelligences and learning styles into lesson planning, and (c) awareness of metacognition. Some of these strategies have validated what successful teachers have always done, while others are
causing educators to take a closer look (Caine & Caine, 1997).

This study examined an area that has not been extensively researched: the relationship between brain-based learning theories and teacher efficacy in both an urban and suburban school district. During the past twenty years, considerable research has been conducted to examine the relationship between a teacher's sense of efficacy to school reform efforts and instructional effectiveness. There is general agreement that teacher efficacy is one motivational aspect important to classroom effectiveness (Ashton & Webb, 1986; Gibson & Dembo, 1984; Greenwood, Olejnik & Parkay, 1990; Ross, 1994).

Teacher self-efficacy has also been identified as an important factor in predicting student achievement, and as a sense of competence (Fritz, Miller-Heyl, Kreutzer, & MacPhee, 1995). Though often used interchangeably, the terms efficacy, sense of efficacy, and self-efficacy can be defined as the extent to which teachers believe they can effect student learning (Dembo & Gibson, 1985).

Ashton (1984) asserts that no other teacher characteristic has demonstrated such a consistent relationship to student achievement. Sufficient research supports the belief that a teacher's sense of efficacy is related to student achievement gains. If this is true, it is therefore important to ascertain if personal and
organizational factors impact a teacher's sense of efficacy in both an urban and suburban school district.

This study explored the relationship between the attitudes and perceptions of teachers in an urban and suburban school district who have been trained in a brain-based model of instruction, and its relationship to teacher efficacy. The two school districts examined are located in Northern New Jersey and have been involved in on-going staff development opportunities in the area of brain-based learning theory for at least five years.

Both districts have implemented extensive training for their teaching staffs in the 4MAT System developed by educational researcher, Bernice McCarthy (1980). The 4MAT System is a teaching model, which combines principles of several long-standing theories of personal development with current research on human brain functioning and learning (McCarthy & Germaine, 1998). It is derived from the works of John Dewey, Carl Jung, and David Kolb, with the fundamental assumption that "humans learn and develop through continuous, personal adaptations as they construct meaning in their lives" (McCarthy & Germaine, 1998 p.1.3).

The two school districts involved in this study have dedicated tremendous time, money, and resources to implement this training program. The significance of this study is to determine if the research can: (a) determine if there is a difference between teacher efficacy beliefs in an urban and suburban school district for teachers trained in a brain-
based model of instruction, (b) determine if there is a relationship between personal teaching efficacy beliefs in an urban and suburban school district, with identified personal and organizational characteristics, and (c) determine if there is a relationship between general teaching efficacy beliefs in an urban and suburban school district, with specified personal and organizational characteristics.

Limitations of the Study

This study has the following limitations:

1. The population sample was limited to one urban and one suburban school district in Northern New Jersey during the 1998 - 1999 school year.

2. The study was limited to 145 classroom teachers in grades kindergarten through eight who had voluntarily participated in the intermediate or advanced levels of the 4MAT training program.

3. The study was limited to a specific selection of organizational and personal variables that may effect a teacher's sense of efficacy. These included class size, grade level, and years of teaching experience.

4. A causal relationship could not be inferred between brain-based teaching and teacher efficacy. The majority of teachers in both districts had been trained in the 4MAT model, previous to the study, which precluded the availability of pre-post data collection.
Definition of Terms

For the purpose of the study the following terms were defined:

1. Brain-based learning theory: In this study, brain-based learning reflects current neuroscience research which addresses the structures and functions of the human brain and its relationship to the learning process (Jensen, 1998).

2. 4MAT System: In this study, the 4MAT system refers to a teaching model developed by Bernice McCarthy (1980) that is based on the principles of brain research and personal development. It is an eight-step model (see Figure 1) that broadens the delivery system of instruction to include diverse approaches to student learning through fundamental, intermediate, and advanced training levels.

3. Hemispheric Lateralization: In this study, hemispheric lateralization refers to the predominance of one brain hemisphere, right or left, in differentiation of tasks (McCarthy and Germain, 1996).

4. Learning Styles: In this study, learning styles refers to an approach to learning which emphasizes the belief that individuals perceive and process information in more than one way (McCarthy, 1996).

5. Multiple Intelligences: In this study, multiple intelligences relates to a theory of human intelligence developed by Howard Gardner (1983) which identifies eight specific intelligences: (a) linguistic, (b) logical, (c)
spatial, (d) kinesthetic, (e) rhythmic, (f) interpersonal, (g) intrapersonal, and (h) naturalistic.

6. Neurosciences: In this study, the neurosciences refers to the study of the human nervous system and the brain, which are the physical foundation of the process of learning (Slywester, 1995).

7. Teacher’s sense of efficacy: In this study, a teacher’s sense of efficacy refers to a teacher’s belief in his/her ability to affect student learning (Ashton, 1984). The Gibson and Dembo (1984) Teacher Efficacy Scale, which has two separate scales, was used to measure teacher efficacy, in this study. The first is a general teaching efficacy scale which measures the belief that external factors influence the teacher’s ability to bring about change, and the second is a personal teacher efficacy scale that measures the belief in one’s personal ability to bring about changes in student learning.

8. Organizational characteristics: In this study, organizational characteristics include grade level assignments (K-2, 3-5, 6-8), classroom grouping practices (heterogeneous, homogeneous, multi-age), and class size (1-12, 13-20, 21-27, 27-over).

9. Personal characteristics: In this study, personal characteristics include years of teaching experience (1-5, 6-10, 11-16, 17 or more), and levels of 4MAT training completed (intermediate or advanced).
Overview of the Study

The sample population of the study included 145 classroom teachers from an urban and suburban school district. The participating teachers completed a Personal Data Sheet and the Gibson and Dembo Teacher Efficacy Scale (1984). Next, data was analyzed for personal teaching efficacy scores and general teaching efficacy scores for both school districts, as well as salient personal and organizational factors related to a teacher's sense of efficacy.

Chapter II of this study presents a review of related literature. The review includes an examination of brain-based research, knowledge acquisition, and learning styles methodology. It also provides historical background into the construct of self-efficacy, and describes antecedent factors related to this study.

Chapter III includes a discussion of the design of the study, as well as descriptions of the sample populations, instrumentation, methodology, and data analysis. Chapter IV provides a presentation and interpretation of the data. Lastly, Chapter V is a summary of the study, which includes findings, conclusions, and recommendations for further research.
CHAPTER II

A REVIEW OF RELATED LITERATURE

The reform and restructuring movement in education in recent years is in direct response to educators rethinking the teaching and learning paradigm. Often, traditional instruction has focused on memorization and recall with a delivery system which is teacher-directed. Traditional assessment has focused on multiple-choice and true-false tests which are designed to measure whether students can answer the information disseminated by the teacher or textbook. This traditional model is being challenged for not maximizing the learning potential for all students, especially where higher levels of thinking skills are involved.

Although much research has been conducted and volumes written on maximizing student learning, no definitive answers have been derived. Many of the alternative theories that are replacing the traditional model are still fragmented and limited to supporting specific approaches (Caine & Caine, 1991). The traditional or "factory model" of schooling was developed as a result of the Industrial Revolution, emphasizing skills which
addressed obedience, orderliness, respect for authority, and a standardized curriculum. This paradigm of schooling created a "one-size-fits-all" model of education.

As we approach the Twenty-first Century, national leaders, educators, and the public are calling for changes in schooling to meet the demanding needs of a technologically changing, competitive, and global society. As a result, we are seeing an interest in charter schools, state and national curricula, magnet schools, and the voucher system to meet the growing demand for quality education.

One area receiving heightened attention from educators and policy makers is the research in brain-based learning and its application to teaching and learning. The neurosciences, biology, and pedagogic research are enlightening us on how the brain works, and its implications for the classroom (Abbott, 1997).

Researchers in brain-based learning believe that traditional instruction may be at odds with how the brain learns, and that a typical classroom environment may actually inhibit the brain from learning. In light of this information, teachers, administrators and other practitioners in the field of education have become interested in brain-based learning because their work
requires an understanding of how the brain receives, processes, and produces information (Bucko, 1997).

Due to advanced technologies, dramatic developments in brain research have advanced our understanding of the human brain. Many educators believe that brain-based learning will have a significant impact and substantial implication for the teaching and learning process (Sylwester, 1994).

The purpose of this review was to examine the literature on brain research and knowledge acquisition, and its implications for education. The relationship between brain-based learning and learning styles was examined with emphasis on four identified models currently in use. These models were: Anthony Gregorc's Model of Mind Styles, David Kolb's Experiential Learning Model, Bernice McCarthy's 4MAT System, and Howard Gardner's Theory of Multiple Intelligences. The implications for teaching of brain-based learning and its applications in education were also considered.

Additionally, the review of the literature presents an historical overview of the construct of teacher efficacy and its relationship to increased student achievement and motivation for teachers. Variables known to be significantly related to teacher efficacy were also reviewed, along with the related research.
Brain Research and Knowledge Acquisition

The human brain is the most complex living organ. Through the study of neuroscience and advanced technological innovations, researchers have a better understanding of how the brain works (Abbot, 1997). Weighing only about three pounds, the brain is composed of a billion neurons or nerve cells. The possible number of interconnections between these cells is greater than the number of atoms in the universe (Ornstein & Thompson, 1984).

The brain's capacity to learn is infinite. Caine and Caine (1991, 1997) report that each healthy brain is equipped with a set of extraordinary features: (a) an enormous capacity for memory, (b) the ability to self-correct and learn from experience, and (c) an inexhaustible capacity to create. The brain is predominately composed of 78% water, followed by 10% fat and 8% protein (Jensen, 1988).

As diagramed by Jensen (1998) in Teaching with the Brain in Mind, the brain has two cerebral hemispheres, the left and the right, which are connected by bundles of nerve fibers. The corpus callosum is the largest with approximately 250 million nerve fibers.
Scientists have divided the brain into four areas or lobes. They are the occipital, frontal, parietal, and temporal (Jensen, 1998). The occipital lobe is primarily responsible for vision, and is in the middle back of the brain. The frontal lobe is involved with purposeful acts, including creativity, problem solving, and judgment. This lobe is located in the area around the forehead. The parietal lobe processes higher sensory and language functions, and is located in the top back area of the brain. The temporal lobes are located around the ears on both the left and right sides. This area is responsible for meaning, hearing, memory, and language. Although each lobe is primarily responsible for specific tasks, there is some overlap in their functioning.

The mid-brain region, known as the limbic system, represents 20% of the brain's volume. It is responsible for sleep, emotions, attention, body regulation, hormones, sexuality, smell, and production of most of the brain's chemicals (Jensen, 1998).

The cerebellum, in the lower back of the brain, is responsible for balance, motor movement, and some areas of cognition. As a result of recent experiments, there is strong evidence to support the theory that essential long-
term memory traces for motor learning are located in the cerebellum (Thompson, 1993).

There are two types of brain cells: neurons and glia. Ninety percent of the brain cells are glia, but it is the remaining 10% of neurons that make the brain a thinking and learning organ (Jensen, 1998). The human brain contains approximately 100 billion neurons. They consist of a compact cell body, dendrites, and axons which are responsible for information processing and converting electrical and chemical signals back and forth. Through attrition and disuse, brain cells are lost every day. Scientists differ on the amount, but estimates vary from 10,000 to 100,000 per day (Howard, 1994).

Neurons serve to pass information along. Information is carried inside a neuron by electrical impulses which are transmitted from one neuron to another by chemicals called neurotransmitters. Groups of neurons must work together in groups, not individually, to complete the critical function of learning (Greenfield, 1995).

Recent technological innovations are enabling neuroscientists, through neural imaging, to observe and analyze various areas of the brain at work (Bucko, 1997). Position emission tomography (PET) and magnetic resonance images (MRI) allow researchers to observe participants completing
a task, while watching on a computer screen the parts of the brain that are actively engaged (Brandt, 1997). Computers have also enabled researchers to analyze information processing by identifying how processing is localized in different regions of the brain. This allows them to identify where different concepts are stored, and how these regions are joined together in thought and consciousness (Hilts, 1995).

Although modern science has greatly improved the study of brain research, brain theory can be traced to the early Greeks and Egyptians. The Greeks believed that the mind was in their heart. Aristotle saw the brain as the cooling system for the heart, while ancient Egyptians thought it was unimportant, and did not embalm it along with the other organs (Restak, 1984). Hippocrates was the first to view the brain as the organ of the mind, and the first to discover the dual nature of the hemispheres (Hart, 1983, Restak).

In the late 1700s, Franz Gall, a German scientist, equated bumps on the head with certain traits and personality characteristics. This theory was later refuted, along with the theories linking physical traits to intelligence (Grady, 1984).
Springer and Deutsch (1985) report that Paul Broca in the mid-1800s proposed the classic hemispheric dominance theory, which associated particular characteristics with each side of the brain. It was initially believed that the left hemisphere had the higher facilities, and was more dominant. By the late 1800s, John Jackson questioned this theory. He asserted that the human brain had two distinct, but anatomically symmetrical parts. During the late 1900s, Wilder pioneered the use of direct electrical stimulation on certain areas of the brain to support the theory that brain functions could be localized across hemispheres (Restak, 1984, Springer & Deutsch).

It was not until the 1950s that significant advances were made in modern brain research. Roger Sperry (1964) conducted historic brain investigations by severing the corpus callosum, the nerve fibers between the two cerebral hemispheres, isolating each of the hemispheres for study. He initially worked with animals and found that, whereas their habits seemed to remain the same, when trained, they had two independent minds with recognition, memory and vision systems.

He also worked with dozens of epileptic patients, and found that the two hemispheres in the brain of humans are specialized for quite different functions. His split-brain
theory established the fact that the two hemispheres of the brain process information differently. Individuals, however, do not learn with only one hemisphere, but they may have a preference for one or the other processing strategies (Levy, 1983). Both hemispheres are equally important, and need to be considered to reach optimum potential. Characteristics of the left hemisphere are global, holistic, and visual spatial. Right hemisphere characteristics are intuition, spatial memory, and synthesis. Each hemisphere contributes its specialized functions to all cognitive abilities (Restak, 1984).

Continued advancement of technology has ignited new brain theories. Sylwester (1994, 1995) discusses new biologically brain-based theories which focus on the nature-nurture issue. He states that the previously held belief that nurture is more dominant is being increasingly challenged. New theories argue that nature plays a more significant role than previously believed. Jensen (1998) states heredity provides about 30% to 60% of our brain's wiring, and 40% to 70% is the environmental impact, with the variation depending on the specific trait or behavior being considered.

Sylwester (1994) cites Gerald Edelman's Theory of Neural Darwinism as one of the most completely developed

Neural Darwinism argues that "our brain does operate on the basis of natural selection - or at least that natural selection is the process which explains instruction and learning" (Sylwester, 1994, p.47). Edelman (1992, as cited in Sylwester, 1994) states, "Our brain is powerfully shaped by genetics, development and experience, but it also then actively shapes the nature of our own experiences and the culture in which we live" (Sylwester, p.49).

During the 1990s, the knowledge explosion on brain research came from the fields of genetics, physics, and pharmacology. This large body of technical knowledge about the brain has developed into a new way of thinking about the organ and its implications for the teaching and learning process (Sylwester, 1995).

Educators are now using brain research to answer the question, "How do children learn?" Although all learning can be considered brain-based, Caine and Caine (1991) define brain-based learning as learning which acknowledges the brain's rules for meaningful learning, and organizes teaching with these rules in mind. They have identified twelve principles, described below, which serve as a
general theoretical foundation for brain-based learning (Caine & Caine, 1997):

1. The brain is a complex adaptive system. The brain is a parallel processor which is always doing many things simultaneously. Our thoughts, emotions, and imagination operate concurrently and interact with other modes of information processing.

2. The brain is a social brain. Throughout our lives, our brains change in response to the engagement we have with others. Our identity is dependent on finding ways to belong and establishing community. Therefore, learning is influenced by the nature of the relationships in which we are involved.

3. The search for meaning is innate. Our search for meaning is driven by our purposes and values, and is dependent upon our making sense of our experiences. The search is survival-oriented and continues as we proceed through various experiences in our lifetime.

4. The search for meaning occurs through "patterning*. Patterning refers to the organization and categorization of meaningful data. The brain registers the familiar while simultaneously searching for new and novel stimuli. It is constantly searching for meaning, and has
difficulty processing meaningless or isolated pieces of information unrelated to what makes sense to a learner.

5. Emotions are critical to patterning. Our attitudes and feelings influence what we learn, and our emotions impact our ability to remember and recall information (Rosenfield, 1988). Therefore, an appropriate emotional climate can significantly impact student learning.

6. Every brain simultaneously receives and creates parts and wholes. This principle addresses brain laterality, which identifies the differences between the right and left hemispheres of the brain. Although there is a distinction in a healthy person, the two hemispheres operate interactively and simultaneously in processing information into parts and wholes.

7. Learning involves both focused attention and peripheral perception. The brain has the capability to absorb information upon which it is focusing, as well as what is beyond its immediate focus or peripheral perception. Most of the information we perceive peripherally enters the brain unconsciously and without our awareness.

8. Learning always involves conscious and unconscious processing. Much of our learning is unconscious
and is processed below the level of awareness. Understanding may occur days or weeks after the initial learning experience has transpired.

9. We have at least two ways of organizing memory. O’Keefe and Nadel (1978) have distinguished them as taxon and locale memories. The taxon system allows for rote learning and recalling relatively unrelated information, which is not related to prior experience or knowledge. The system for locale memories, or the spatial/autobiographical memory system, is motivated by discovery and novelty, and searches for meaning by making sense of our experiences. It is always operating and is inexhaustible. The brain functions more efficiently through the assimilation of meaningful information and experiences, and it remembers best when facts and skills are embedded in the spatial memory.

10. Learning is developmental. Although there is no limit to the growth and capabilities of humans to learn more, there are predetermined sequences in childhood, which establish the basic hardware necessary for later learning. Development is also shaped by people’s experiences throughout life.

11. Complex learning is enhanced by challenge and inhibited by threat. The brain functions most efficiently
when appropriately challenged, and in an environment that encourages risks. Conversely, learning is inhibited by perceived threat or stress, known as "downshifts" (Hart, 1983). Portions of our brain become inaccessible and are less flexible under threat. However, it functions at optimum levels in an environment of relaxed alertness involving low threat and high challenge.

12. Every brain is uniquely organized. All brains are unique and no two are exactly alike. The structure of the brain changes as we continue to learn. Thus, with increased learning, our brains continue to become more unique. Differences in learning are also manifested in various learning styles, talents, and intelligences.

The implications of these principles for educators are significant and will impact on decisions relating to curricula, instructional methodology, school climate, and assessment. These areas will be discussed later in greater detail.

Learning Styles and Cognitive Modalities

Theory on brain research has led to comprehensive, instructional approaches to maximize student learning, and to meet student's individual learning needs. The research on brain hemisphericity acknowledged the fact that there
are differences in styles of learning, and that our definition of intelligence may be too limited.

O'Keefe (1997) defines learning styles as, "characteristic cognitive, affective and physiological traits that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment" (p.16). Messick (1976) states that cognitive style addresses the way a person perceives, remembers, thinks, and solves problems. It addresses the "how" of learning. How do you process and experience knowledge? How do you organize and retain information? Do you approach learning sequentially or randomly?

Affective components of learning styles include personality characteristics related to areas of responsibility, motivation, persistence, and peer interaction (Dunn & Dunn, 1978). Do you prefer to work alone or in groups? Are you more cooperative or competitive?

Dunn and Dunn (1978) define physiological components as being biologically based as they relate to differences in gender, nutrition, and the physical environment. Are you a morning or evening person? Are you bothered by temperature variations in a room where you are working?
There is considerable published research on learning styles. The various theories share the belief that people learn differently. Learning style theorists recognize the many learning capacities or intelligence profiles of individuals.

One widely used model is Bernice McCarthy’s 4MAT System which she wrote and published in the spring of 1980. McCarthy (1997) states that, “The 4MAT System knows the distinctive style that each student brings to the classroom, while helping each student grow by mastering the entire cycle of learning styles” (p.46). It is a constructivist model of pedagogy which holds that effective instruction embraces four essential phases of learning: learner motivation, conceptual mastery, application of ideas and creative synthesis.

The 4MAT System is a model for teaching, based on research of learning styles and brain hemisphericity. The works of John Dewey, Anthony Gregorc, Karl Jung, David Kolb, David Merrill, and Elizabeth Wetzig influenced McCarthy (1980). Although reflective of all of these theorists, the model was primarily influenced by Kolb.

Gregorc’s Mind Styles Model maintains that individuals think either abstractly or concretely, and their thoughts are organized either sequentially or
randomly (Gregorc, 1982, Armstrong, 1987). He outlined four patterns of learning styles: (a) concrete sequential, (b) concrete random, (c) abstract sequential, and (d) abstract random. Although everyone exhibits all four styles, people are generally more comfortable in one or two styles.

As theorized, concrete sequential learners prefer logical sequence and order; concrete random learners are characterized by divergent experimental thinking; abstract sequential learners are logical and analytical; and abstract random learners are emotional and imaginative learners.

David Kolb's Experiential Learning Theory (1975) is the theoretical basis of the 4MAT model. Kolb researched experiential learning and its relationship to cognitive development. His theory is based on the belief that learning is a continual process by which individuals refine and integrate a distinct set of independent systems that give meaning to life's experiences (McCarthy, 1997).

Kolb's model identifies a process through which four modes of human experience are engaged at different levels to create a more complete level of understanding. The interaction between and among the modes of concrete experience (CE), reflective observation (RO), abstract
conceptualization (AC), and active experimentation (AE) is required for learning and personal development (McCarthy, 1980).

Kolb (1975) translated this into a classification system of learning styles based on the particular interaction of the identified modes. Type One learners, Divergers, perceive information concretely and process it reflectively. Type Two learners, Assimilators, perceive information abstractly and process it reflectively. Type Three learners, Convergers, perceive abstractly and process actively. Type Four learners, Accommodators, perceive concretely and process actively.

McCarthy's 4MAT System (1980) expanded on Kolb's theory by combining research on brain hemisphericity. The knowledge about specialization of brain function led McCarthy to the following principles relating to brain hemispheres: (a) that individuals rely on one mode of processing more than the other; (b) the modes of processing can be characterized as right or left hemispheric dominant; and (c) whole brain learning, in which both hemispheres are engaged, is accomplished differently in individuals.

McCarthy (1980) systematically addresses the needs of the four types of learners described by Kolb, with the addition of right and left mode instructional strategies.
for each quadrant. She defines Quadrant One learners as innovative learners who perceive information concretely and process it reflectively. They are imaginative thinkers who view direct experience from many perspectives. They are interested in people and seek harmony and commitment. Their favorite question is, "Why?"

Quadrant Two learners are analytic learners who perceive information abstractly and process by observing. They seek continuity and learn by thinking through ideas. They are thorough and industrious and are more interested in ideas than people. Their favorite question is, "What?"

Quadrant Three learners are common sense learners who think abstractly and process information actively. They are pragmatists and problem solvers who are skill-oriented. Their favorite question is, "How does it work?"

Quadrant Four learners are dynamic learners who perceive through concrete experiences and process actively. They integrate experience and application and learn by trial and error. Their favorite question is, "If?"

Each of the four quadrants is divided into right and left modes to include the principles of brain hemisphericity, making it an eight-step model. Figure 1 represents an adaptation of the 4MAT model. The learner moves through the cycles in sequence to incorporate all
four combinations of characteristics. Through this process, the learner will capitalize on his own strength, as well as experience the uniqueness of others.

The research in learning styles supports the following conclusions: (a) individuals learn in different ways, (b) differences in learning style are related to personal motivation and performance, (c) learning is a continuous process of differentiating and integrating experiences, and (d) learners expand and refine differing modes by experiencing them (McCarthy, 1980).

Another popular theory, developed by developmental psychologist, Howard Gardner (1983), questioned the traditional definition of intelligence as being too narrow. He suggested that intelligence could not be measured on standardized paper and pencil tests, but had more to do with the capacity to solve problems or create products that are valued in one or more cultural settings.

Gardner's theory of "multiple intelligences" was an outgrowth of accumulated knowledge about the human brain. It can be described as a philosophy of education, rather than as a set program of teaching methodologies (Armstrong, 1994).

In Gardner's book, Frames of Mind (1983), he proposed the existence of at least seven basic intelligences which
Figure 1

THE 4MAT MODEL'S TEACHING AND LEARNING CYCLE

Creating

Integrate
Share and celebrate learning

Refine
Analyze application for relevance, usefulness

4
R
L

Connect
Engage in experience

Experiencing

1
R
L

Examine
Reflect, analyze, experience

Apply to more complex experience

Extend

3
R
L

Try
Practice with content

Define
Learn concepts and skills

2
R
L

Image
Imagine or "picture" the concept

Applying

Conceptualizing
he labeled as (a) linguistic, (b) logical/mathematical, (c) spatial/visual, (d) bodily kinesthetic, (e) musical, (f) interpersonal, and (g) intrapersonal. More specifically, they are described as follows:

1. Linguistic: One who has the capacity to gather, understand and use both oral and written language. This intelligence includes sensitivity to sound, rhymes, meanings of words, and the different functions of language. Examples of individuals with a high degree of linguistic intelligence would be authors, journalists, and politicians.

2. Logical/mathematical: One who has the capacity to use numbers effectively and to visualize relationships between objects and the environment. They have sensitivity to the scientific thinking of categorizing, classifying, and understanding abstract patterns. Examples of individuals with a high degree of logical/mathematical intelligence would be scientists, mathematicians, and computer analysts.

3. Spatial/visual: One who has the capacity to think in pictures and images, and who has the ability to perform transformations on these perceptions without the help of visual stimuli. It involves sensitivity to color, line, shape, form, and space. Examples of individuals with a high
degree of spatial/visual intelligence would be architects, artists, and designers.

4. Bodily/kinesthetic: One who has the capacity to use the whole body to symbolize thoughts and feelings and the ability to produce and work with objects. This includes the fine and gross motor skills involved with coordination, balance, flexibility and strength. Examples of individuals with a high degree of bodily/kinesthetic intelligence would be actors, athletes, sculptors, and dancers.

5. Musical intelligence: One who has the capacity to produce, express, and appreciate musical forms. It includes sensitivity to rhythm, pitch, melody, and tone. Examples of individuals with a high degree of musical intelligence include composers, musicians, and music critics.

6. Interpersonal intelligence: One who has the capacity to understand people's motivations, temperaments, intentions, and feelings. They are sensitive to facial expression, voice, and body language. They have the ability to communicate well and influence and organize others. Examples of individuals with a high degree of interpersonal intelligence would be teachers, counselors, and political leaders.
7. Intrapersonal intelligence: One who has the capacity to access their own feelings including their individual strengths and weaknesses. They have a high degree of self-awareness and are self-reliant, self-confidant, and respond to their intuition. Examples of individuals with a high degree of intrapersonal intelligence would be psychotherapists and religious leaders.

Gardner (1983) believes people can demonstrate different levels of proficiency across the seven intelligences and each person has capacities in all of them. He states that most people, given the appropriate support and instruction, can develop an adequate level of competency in all seven intelligences.

He believes that no intelligence exists by itself and that they are always interacting with each other. They have been taken out of context, in the theory, only for purposes of examination. He emphasizes there are no specific attributes which one must possess to be considered intelligent in a specific area and that there are many ways to be intelligent within each category (Armstrong, 1994).

In "Reflections in Multiple Intelligences", Gardner (1995) discusses the myths which have been promulgated since the original theory was published in 1983. He
states, "the multiple intelligence theory makes no claims whatsoever to deal with issues beyond the intellect. Multiple intelligence theory...is not about personality, will, morality, attention, motivation and other psychological constructs" (p. 206).

Gardner wrote multiple intelligences as a theory, but the educational community quickly put it into practice. Several guides and books have been written about the theory, each with their own particular adaptation to Gardner's model.

Gardner (1995) has also investigated the possibility of additional intelligences. He has proposed an eighth intelligence, the intelligence of the naturalist. He defines this intelligence as a person having the capacity to draw on the features of the natural environment and to use them productively to solve problems and create new products. He cites Charles Darwin as a person characterized by this type of intelligence.

Gardner (1995) hopes that the many applications of his theory currently in use will lead to the "personalization of education," and that the educational community will take seriously the differences in human beings when planning educational curricula, pedagogy, and assessment instruments.
Research Findings on 4MAT

Although limited in number, long-term, independent comparison studies have been conducted using the 4MAT model. Lieberman (1987, 1989) designed a long-range program to study the effect of 4MAT on students' achievement and attitude in the Fairfax County Public Schools in Virginia. During the period of 1986 - 1989, three research projects had been undertaken.

The 1986 - 1987 research was conducted to ascertain the readiness of 4MAT trained teachers to implement the model. The results of teacher surveys found that there were significant advances in the teachers' perceptions of their knowledge, skills, and attitudes towards 4MAT. The study found that teachers were incorporating more right-brain activities into their lessons and were more cognizant of variety in learning styles of their students.

The purpose of the 1987 - 1988 research was to test in a typical classroom setting, the impact of the 4MAT instructional model on student achievement. For this study, pre-tests and post-tests were developed using test items which represented skills and knowledge in the eight octants of the 4MAT instructional model. For one month, 18 sixth grade teachers, nine who were 4MAT trained and nine who were not, participated in the study which tested a
geometry unit. Approximately 400 students were involved in the study. In comparing their pre-test and post-test results, it indicated that the 4MAT group significantly outperformed the control group by an average of 14 additional points. A student attitude survey was also administered which indicated the students instructed using the 4MAT model had increased interest and enjoyment of the geometry unit.

The 1988 - 1989 study was similar to the previous project, but the research was expanded to 18 weeks of a ninth grade pre-algebra course. The study consisted of ten high school mathematics teachers of low-achieving students. Four were 4MAT trained and the other six were not. The results were based on the scores of 173 students who participated in the project for the entire 18 weeks. Consistent with the other study, the 4MAT group outperformed the control groups by a 16% increment in the total score.

Wilkerson and White (1988) evaluated the effects of the 4MAT system on achievement and retention of learning. Students' interest in content, attitudes toward instruction, and behavior were also examined. The subjects were third grade students attending a public school in North Carolina. The participants were randomly assigned to
two groups using different methods of instruction: the 4MAT model and a traditional textbook approach. After completion of the unit, a two-part achievement test was administered. Significant differences were found favoring the 4MAT instructed group on the objective achievement test, Part A, which measured knowledge, comprehension, application, and analysis. No differences were found on Part B, which measured synthesis and evaluation. The test was re-administered after 35 days indicating similar results. The study also found that students' attitudes toward the instruction and their behavior was more positive in the 4MAT group.

Sangster and Shulman (1988) conducted a study in two school systems in Ontario, Canada. They interviewed 572 students and 31 teachers who had used the 4MAT System. Their results indicated that over 90% of the participating teachers demonstrated interest in teaching additional 4MAT units, and 77% would teach the unit designed for the experiment again. Student response was also positive, with 71% reporting that they found the 4MAT unit more enjoyable than their regular instruction. Within the student population, 60% believed that they learned more and 62% indicated they would like to participate in additional classes using the 4MAT System.
A joint study on the effects of 4MAT were conducted by the Northeast Independent School District in San Antonio, Texas and Excel, Incorporated (St. Germain & Lieberman, 1995). The purpose of the study was to determine if there are measurable differences in the gain and retention scores on an academic content measure between students taught using the 4MAT System.

Eight teachers participated in the study. Four teachers were trained in the 4MAT System comprising the experimental group, and four teachers comprised the control group who were not trained, and who utilized a traditional or non-specified teaching methodology.

Comparisons of scores indicated that the overall performance of the 4MAT group exceeded that of the control group. In a comparison of the gain scores on a measure of academic performance, three of the four 4MAT groups outperformed their non-4MAT counterparts. Comparisons of retention scores also favored the 4MAT classes. In all of the paired comparisons, the 4MAT participants outperformed the control groups.

Implications for Teaching

The question to be asked then is, what if anything, does brain-based learning and learning styles mean for education?
The review of the literature presents striking implications for instructional methodology. The traditional mindset of the "factory model" of school, which dominated educational practices for a century, has been redefined. Teaching which emphasizes memorization and the learning of unrelated, isolated facts does not facilitate the transfer of learning or utilize the brain efficiently. Leslie Hart (1983) states,

As the consequences of long evolution, the brain has modes of operation that are natural, effortless, effective in utilizing the tremendous power of the amazing instrument. Coerced to operate in other ways, it functions as a rule reluctantly, slowly and with abundant error. (p.xiv)

The human brain continually seeks meaning and thrives in an environment rich with complex and meaningful challenges. Learners are perceiving and creating meaning all the time. For teaching to be effective, the information should be presented in a way for the brain to extract patterns, rather than impose it (Caine & Caine, 1991).

Educators must redefine their roles and become facilitators of meaningful, connecting, and linking knowledge. Brain development and learning can no longer be
separated from life's experience and prior knowledge. John Dewey identified the difference between knowledge and experience. He explained that we acquire knowledge - we learn by processing experiences (Caine & Caine 1991).

Brain-based teaching supports the assumption that all students do not learn alike. It builds options, increases understanding, and enables students to respect the learning requirements of others. No one method or technique can adequately include the multiple variations of the human brain. Teachers need to develop an abundant array of methods and approaches in which to continually enrich the learning experience.

Several approaches which are compatible with brain-based teaching are currently being utilized in classrooms. Thematic units of instruction, cooperative learning, integrating the curriculum through interdisciplinary teaching, and whole language instruction are a few of these teaching methods. Teachers need to engage the students' interest and enthusiasm through relevant life experiences in an atmosphere of curiosity and self-discovery.

The classroom and school environment conducive to brain-based teaching is reflective of the student's feelings and attitudes. It provides a supportive climate characterized by mutual respect and acceptance. To
effectively maximize student learning, it should be low in threat and high in challenge (Caine & Caine, 1991).

The curriculum must be built around the unique talents, strengths, weaknesses, and learning styles of the students in the classroom. Activities which are meaningful to students, and which enable them to work for balance and wholeness must be organized (McCarthy, 1997).

The goal of brain-based learning is to provide maximum benefit to all students without using a "one-size-fits-all" formula. The more we approach meaningful, challenging, and relevant learning in the classroom, the more responsive learning will be to a diverse student population which must be prepared to meet the challenges of the Twenty-first Century.

Historical Background of the Construct of Efficacy

The construct of teacher efficacy is entering into its third decade and research suggests that it continues to play a powerful role in the field of education. A teacher's sense of efficacy has been demonstrated to be an important variable related to student outcomes, such as achievement (Ashton & Web, 1986; Gibson and Dembo, 1984; Ross, 1994) and motivation (Midgley Feldlaufer & Eccles, 1989). It has also been significantly related to teacher implementation of innovation and experimentation
(Guskey, 1988; Smylie, 1988), and the effort and persistence a teacher will demonstrate in the face of obstacles or difficulty (Gibson & Dembo, 1984).

Although variations differ slightly among researchers, teacher efficacy has been defined as, "the extent to which teachers believe that they have the capacity to affect student performance" (Ashton, 1984, p. 28). More recently, Guskey and Passaro (1994) defined it as "a teacher's belief or conviction that they can influence how well students learn, even those who may be difficult or unmotivated" (p. 4).

The concept that teachers' beliefs about their own capacity as teachers being relevant to student achievement is compelling. By examining teacher efficacy in both an urban and suburban district, for teachers similarly trained in a brain-based model of instruction, the researchers sought to provide insight into the effectiveness of the methodology across diverse populations.

The construct of teacher efficacy was first introduced into educational research by two Rand Corporation Evaluation Studies of projects funded by Title III of the Elementary and Secondary Education (Armor, et al., 1976). Findings of the study demonstrated a significant relationship between teacher efficacy and student
achievement. The studies responded to the work of Rotter's (1966) locus of control or social learning theory, which demonstrated the relationship between an individual's behavior and their perceptions of internal or external causality.

The Rand studies measured a teacher's sense of efficacy by obtaining a composite score from two five-point Likert scale items:

1. When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment, and

2. If I really try hard, I can get through to even the most difficult or unmotivated students, (Berman, McLaughlin, Bass, Pauly, Zellman, 1977, pp.159-160). The sum of the scores was called teacher efficacy (TE), which revealed the extent to which a teacher believed that the consequences of teaching, primarily student achievement and motivation, were in the control of the teacher.

A teacher who expressed strong agreement with the first Rand item believes that environmental factors overpower the influence teachers can exert in schools. Factors including violence; substance abuse in the home or community; the socio-economic realities of class, race and gender; and the physical, emotional and cognitive needs of
individual children all have significant impact on students' motivation and achievement (Tschannen-Moran, Hoy & Hoy, 1998). A teacher's belief that their power over these external factors compared with their influence over students was labeled general teacher efficacy (GTE) (Ashton, Olejnis, Crocker, & McAuliffe, 1982).

If teachers agreed with the second Rand item, it indicates confidence in their own ability to overcome factors which could make learning difficult for a student. This aspect of efficacy is labeled personal teacher efficacy (PTE), and it is more specific and individual than a belief in what teachers in general can accomplish (Ashton, 1984).

The results of the Rand studies encouraged other researchers to further explore the construct of teacher efficacy. Concern over the reliability of a two-item test led others to develop more comprehensive measures. One area of this research continued to rely on Rotter's locus of control theory to elaborate the study on a teacher's belief about whether reinforcement is internally or externally controlled (Rose & Medway, 1981; Gusky, 1981; Ashton et al., 1982, April).

A second conceptual strand developed out of Bandura's (1977) social cognitive theory and his construct of self-
efficacy. He defined self-efficacy as an individual's judgment of his/her ability to complete future actions. According to Bandura, behavior is affected by both outcome and efficacy expectations. Outcome expectations are the individual's judgment, so the likely consequences of performing a task at the expected level of competence and efficacy expectation is the person's belief about his or her capability to achieve the necessary action to perform a given task (Bandura, 1986).

Although interrelated, Bandura argued that outcome and expectancy expectations are distinct conceptually. He viewed self-efficacy as having more to do with self-perception of competence, rather than actual competency levels. People often either over or under estimate their actual ability. This may have an impact on their course of action or the effort they exert in particular situations. In many cases, slight overestimation of one's actual capabilities has been found to have a positive effect on performance (Bouffard-Bouchard, Parent, & Larivee, 1991). As Bandura (1986) stated, "The types of outcomes people anticipate depend largely on their judgment of how well they will perform in given situations" (p. 392).

Bandura (1997) clarifies the distinction between self-efficacy and Rotter's (1966) locus of control theory. He
provided data which demonstrated that an individual's beliefs about whether they can produce certain actions (perceived self-efficacy) were not the same as beliefs about whether actions affect outcomes (locus of control). The data supported perceived self-efficacy as a stronger predictor of behavior than locus of control.

Bandura (1986) theorized that an individual who perceived themselves to be high in both outcome expectancy and self-efficacy, will respond in an assured, active manner. An individual with low outcome expectancy and high self-efficacy will increase their efforts. A person low in both variables will more readily become frustrated if he/she does not obtain the desired results (Dembo & Gibson, 1985).

Extending Bandura's social cognitive theory, Ashton, Webb & Doda (1983) were among the first researchers to develop a multi-dimensional model of teacher efficacy using a combination of qualitative and quantitative measures. They theorized that Bandura's outcome expectancy and self-efficacy expectations were reflected in dimensions they labeled as teaching efficacy (TE) and personal teaching efficacy (PTE).

According to Ashton, Webb and Doda (1983), these two dimensions could operate independently and were not
significantly correlated. They defined teaching efficacy as the way teachers view the general relationship between teaching and learning, and defined personal teaching efficacy by an integration of teaching efficacy and personal efficacy.

They attributed different cognitive and affective outcomes depending on whether a low sense of efficacy was attributed to a teacher’s general belief in his/her ability or to their personal sense of ability in motivating students.

A low sense of efficacy in general teaching efficacy leads to a negative expectation and doubt that teachers can motivate certain students. The researchers believed such low efficacy did not produce high levels of stress or dissatisfaction, in that they were likely to believe all teachers would have the same difficulties.

The second type of efficacy, personal teaching efficacy, was more related to a personal sense of helplessness and was more likely to produce high stress or guilt in teachers unable to motivate their students. This distinction was important in influencing a teacher’s sense of efficacy. As stated by Ashton et al. (1983), “a teacher convinced of her ability to teach, but doubtful of her students’ ability to learn would require different
interventions from a teacher who is convinced of her students' ability to learn, but doubtful of her competence to teach" (p. 5).

Building on the work of Ashton and Webb (1982), Gibson and Dembo (1984) developed a questionnaire to measure the two dimensions of teacher efficacy which corresponded to Bandura's social cognitive theory. Factor analysis of their "Teacher Efficacy Scale" confirmed the existence of two factors. Utilizing the Gibson and Dembo Scale (1984), other researchers have also confirmed the existence of two independent factors (Hoy & Woolfolk, 1993; Soodak & Podell, 1993).

Further research with Gibson and Dembo's (1984) instrument indicated that only sixteen of the original thirty items in the scale had acceptable reliability coefficients. Nine items reflected personal teaching efficacy or "the teacher's sense of personal responsibility for student learning and behavior, and correspond to Bandura's self-efficacy dimension" (p. 573).

Seven items loaded most heavily on the second factor which was interpreted as "a teacher's sense of teaching efficacy or belief that any teacher's ability to bring about change is significantly limited by factors external
to the teacher, which corresponds to Bandura's outcome expectancy dimension" (p. 574).

In later investigation, Woolfolk and Hoy (1990) utilized a revised version of the Gibson and Dembo (1984) instrument to include the sixteen items with acceptable reliability coefficients, plus four others that referred to the adequacy of the teacher's preservice preparation. In addition, they also included the two original Rand survey items bringing the total number to 22 items.

Woolfolk and Hoy (1990) attained results closely matched to those of Gibson and Dembo (1984), with the two factors of personal efficacy and teaching efficacy emerging. Drawing on the research of Gibson and Dembo as well as Woolfolk and Hoy, Guskey and Passaro (1994) further examined the factor structure of teaching efficacy. They administered an altered form of the Teacher Efficacy Scale (Gibson and Dembo), which also included three items from the Woolfolk and Hoy Scale, plus the two Rand study items, to 342 experienced and prospective teachers. Their results supported the idea that teacher efficacy was a multi-dimensional construct consistent with Ashton and Webb (1986), Gibson and Dembo, and Woolfolk and Hoy. Their research confirmed two relatively independent efficacy dimensions.
They could not, however, find evidence to confirm the distinction between personal efficacy and teaching efficacy. Rather, their results corresponded more directly to an internal vs. external distinction more similar to locus of control measure of causal attribution (Guskey and Passaro, 1994).

Bandura (1997) has recently added to the various measures of teacher efficacy by providing his own Teacher Self-Efficacy Scale. Bandura indicated that a teacher's sense of efficacy is not necessarily consistent across different types of tasks and across different subject areas. In response, he constructed a thirty-item scale with seven sub-scales. Each item was measured on a nine-point scale and attempted to provide a multi-faceted picture of teacher efficacy beliefs without becoming too narrow or specific (Tschannen-Moran, et al., 1998).

In summary, the controversy about how to best measure teacher efficacy will continue as researchers develop more sophisticated measures. Improved quantitative, as well as qualitative measures, are needed to better understand the role of efficacy in the teaching and learning process. As stated by Tschannen-Moran, et al. (1998), "a construct that is related to teachers' motivation to persist in the face
of setbacks and their willingness to work to overcome difficulties is worth the effort* (p. 242).

Variables Linked to Teacher Efficacy

Student Achievement and Motivation

The first Rand study published in 1976 found that teacher efficacy was strongly linked to variations in reading achievement among minority students (Armor et al., 1976). In a second study, Rand researchers found that a teacher’s sense of efficacy not only had a strong positive effect on student performance, but also found it to be a strong predictor of the continued use of Title III Elementary and Secondary Education Act (ESEA) projects (Berman et al., 1977).

Ashton and Webb (1986) conducted a study of basic skills teachers at four secondary schools and reported that general teaching efficacy (GTE) had a substantial impact on math achievement. A high sense of personal teaching efficacy (PTE) had a positive impact on language arts scores as measured by the Metropolitan Achievement Tests.

Additional studies by Moore and Esselman (1992, April) cited similar results, using the Gibson and Dembo (1984) instrument to assess teachers’ beliefs. Students in the second and fifth grades with high GTE teachers outperformed
their peers in math on the Iowa Test of Basic Skills. Similarly, among third graders, the PTE of their teachers was significantly related to student achievement on the Canadian Achievement Test (Anderson, Greene, & Loewen, 1988).

Watson (1991) found that higher PTE was significantly related to increased reading scores and higher GTE to improved math scores in predominately African American, Caucasian or rural schools while in suburban schools there was a link between GTE and reading achievement.

Teachers' sense of efficacy was also found to predict a teacher's willingness to work with students experiencing academic difficulty, rather than referring the students to the Child Study Team for special education evaluation (Podell & Soodak, 1993). General education teachers with higher PTE were more likely to consider general education classes as a more appropriate placement for a second grade student described as having either a learning problem, behavior problem, or both. Researchers also found a significant interaction between teachers' PTE and the implied socio-economic status of the student. The higher the teacher's PTE, the more the teacher agreed that a student from a low socioeconomic background having difficulty would be appropriately placed in a general
education class (Meijer & Foster, 1988; Podell & Soodak, 1993; Soodak and Podell, 1993).

In another study, Ashton (1984) found several dimensions which distinguished high from low efficacy teachers that have an impact on student achievement: (a) high efficacy teachers have a heightened sense of personal accomplishment and believe that their work with students is important and meaningful; (b) high efficacy teachers have high positive expectations for student achievement and behavior; (c) high efficacy teachers assume a personal responsibility for student learning and do not blame student failure for learning on students’ ability, family background, or attitude; (d) high efficacy teachers set goals and plan strategies for achieving objectives; and (e) teachers with a high sense of efficacy involve students in the decision making process.

Ashton’s (1984) work underscored the importance of recognizing the human potential for learning and development in all children. She stated that, “A teacher’s belief in intelligence as a stable trait is one of the most serious obstacles to increasing their sense of efficacy” (p. 29). If teachers attribute low achieving students’ problems to lack of ability or poor family background, than they are less likely to exert effort to raise student
achievement levels. Many theorists have recognized the pervasiveness of this belief among educators and its negative impact on equalizing educational opportunities (Bloom, 1978; Brookover & Erickson, 1969; Webb, 1982; Ross, 1995).

**Implementation of Innovative Programs**

In the second Rand evaluation, the Change Agent Study, (Berman et al., 1977) researchers found several areas in which teacher efficacy proved to be a strong predictor of the successful implementation and continuation of staff development projects: (a) the percentage of project goals achieved, (b) the amount of teacher change, (c) the extent of teacher growth, and (d) the continued use of teacher methods and materials after the project ended.

Studies found that teacher efficacy leads to a greater willingness to implement new methods and instructional strategies (Ashton & Webb, 1986; Sparks, 1988). This factor may result in higher student achievement, which increases teachers' sense of efficacy, thereby supporting their willingness to expend greater efforts to help students learn.

They found that enhanced perceptions of efficacy supported the development of greater interest and commitment to implement and maintain the innovations
provided. Sparks (1988) found that teachers who were high in self-efficacy viewed staff development as important, and were more likely to use these practices which resulted in improved teaching.

Researchers found, however, that simply providing staff development opportunities emphasizing new knowledge or skills was not successful, if they were not responsive to the needs surrounding a teacher's sense of support and efficacy (Ohlhausen, Meyerson & Sexton, 1992; Stein & Wang, 1988). Stein and Wang argued that, "If the values and goals implicit in the project's design were not congruent with those of the project's participants, the innovation was likely to be either symbolically implemented or not implemented at all" (p. 171).

A longitudinal study of implementation of a new instructional program over the course of a school year demonstrated a curvilinear effect (Ross, 1994; Stein & Wang, 1988). Initially, there was a lag in efficacy beliefs, as teachers attempted to implement a new practice. Teachers, however, who successfully implemented the new program exhibited marked gains in self-efficacy, whereas teachers who learned about the new method, but were unsuccessful in implementation saw a decrease in their level of self-efficacy.
Guskey (1986, 1989) suggested that change is a difficult process which must be undertaken gradually, and that teachers require encouragement, support, and feedback after training in a new method to support them in initiating their new learning. He also found that among teachers exposed to staff development, the more efficacious teachers tended to rate the new method as more important, more aligned with their current teaching practices and less difficult to implement.

**Personal Characteristics and Teacher Efficacy**

A review of literature indicated that researchers have increasingly studied characteristics influencing teacher efficacy. In examining gender and years of teaching experience, they found each influences teacher efficacy in varying degrees.

In studying gender, females frequently have scored higher on personal teaching efficacy than males on measures of teacher efficacy (Garrett, 1977; Raudenbush, Rowen & Cheong, 1992; Lee, Buck & Midgley, 1992). Due to the higher percentage of females in the teaching profession, predominately at the elementary level, they have been overwhelmingly represented in studies (Smylie, 1988; Hoy & Woolfolk, 1993; Stein and Wang, 1988). Smylie’s sample included 89% females, Hoy and Woolfolk’s sample of
elementary teachers listed 83% females, and Stein and Wang's study was comprised of only females in kindergarten through fourth grade.

There was evidence that teachers' sense of efficacy varied with years of teaching experience (Gibson & Brown, 1982; Hoy & Woolfolk, 1993; Chester & Beaudin, 1996). Gibson and Brown analyzed differences in teaching and personal efficacy patterns in relation to teaching experience and professional training. They found pre-service teachers with the least amount of training demonstrated lower personal teaching efficacy scores than experienced teachers. Beginning teachers had higher personal efficacy scores than the pre-service teachers. They found, however, that these scores increased after five to ten years of experience, but then declined with more time spent in the profession.

Although the pre-service teachers demonstrate the least confidence in their teaching skills, Gibson and Brown (1982) found they had the highest teaching efficacy scores among all teachers, indicating their strong idealistic belief that through effective teaching, they could overcome external factors. Teaching efficacy scores generally declined with years of experience across all groups.
indicating increased knowledge in teaching skills did not result in increased confidence.

A study conducted by Woolfolk and Hoy (1993) supported the position that teaching experience was positively related to personal teaching efficacy but negatively correlated to general teaching efficacy. They stated, "experience improved the likelihood that teachers would believe that they could motivate difficult students and at the same time, promoted a sense of powerlessness to overcome the negative constraints of the home environment" (p. 368).

Chester and Boudin (1996) examined the efficacy beliefs on novice and experienced teachers beginning work in an urban district. They found that during the first year of teaching, experienced teachers generally saw a decrease in their sense of efficacy. However, among newly hired teachers, efficacy increased when certain school practices were in place. The greater the opportunity for collaboration among adults and the more observations and feedback received, the greater the teachers' sense of efficacy.

Organizational Characteristics and Teacher Efficacy

Few studies were found in the research examining the effects grade level or class size has on teacher efficacy
beliefs to be conclusive. There is general agreement, however, that elementary teachers have higher efficacy scores than do middle or high school teachers (Guskey, 1982; Midgley et al., 1989).

Guskey's (1982) study in two metropolitan school districts found grade level to be a significant variable in examining teacher responsibility for positive versus negative student learning outcomes. Elementary teachers, to a greater degree, than secondary teachers, attributed their inability to teach students to their own effort. As a result of the findings, it was assumed secondary teachers felt less control in their ability to change the learning patterns of their students, when compared with elementary teachers who work with younger, less experienced students. Guskey also postulated that elementary teachers have smaller class sizes and can observe the impact of their efforts more directly.

Research studies regarding the relation of teacher efficacy to students with academic and behavioral needs were fairly consistent (Ashton, Webb & Doda, 1983; Newmann, Rutter & Smith, 1989, Smylie, 1988). Smylie (1988) found that a concentration of low-achieving students had a negative effect on teacher efficacy. The study also found that teachers of students grouped heterogeneously found it
more difficult to meet the learning needs of all of their students and to maintain behavioral control.

Ashton, Webb & Doda (1983) found similar results in interviewing teachers regarding the impact of student ability. Teachers who instructed in heterogeneous, rather than homogeneous classroom settings, had a lower sense of efficacy and lower expectations for student success.

In a study of 353 public high schools, Newmann, Rutter, and Smith (1989) explored ten organizational features and five demographic characteristics impacting efficacy, community and expectations within a school setting.

The organizational characteristics studied were:
(a) orderly student behavior, (b) administrator responsiveness, (c) teachers' influence in decision making, (d) encouragement of innovation, (e) teachers' knowledge of other teachers' courses, (f) peer coaching, (g) principal leadership, (h) in-service programs specific to staff needs, (i) collaboration time, and (j) staff development allotments. The demographic or background variables studied were: (a) school size, (b) urbanicity, (c) percentage of white students, (d) percentage of disadvantaged students, and (e) students' abilities on entering school.
Newmann, Rutter, and Smith (1989) found that when background variables were controlled, school organizational features had a significant influence on efficacy, community and expectations. The most powerful organizational effects were students' orderly behavior, the encouragement of innovation, teachers' knowledge of one another's courses, the responsiveness of administrators, and teachers helping one another, or peer coaching.

When background variables were considered alone, however, efficacy and expectations were associated with students' ability, race, and urban-suburban context. Their research also indicated that the percentage of disadvantaged students had no relationship to efficacy, community or expectations when other background variables were controlled.

Newmann, Rutter, and Smith (1989) stated that, with other background variables controlled, the relationship of race to efficacy and expectations is reversed from the first-order correlations in which the percentage of white students had a positive effect. Here, schools with lower percentages of whites showed a higher sense of efficacy, community and expectations. This suggests that when schools that are similar in background features are compared,
teachers in schools with high minority enrollments may make special efforts that pay off in a greater sense of efficacy and higher expectations for students (pp. 232-233).

The researchers also discovered that when teachers within a school vary considerably in their sense of efficacy, these differences created divisiveness that may negatively impact on reducing efficacy in the school as a whole. If teachers, however, perceived similar levels of efficacy, this perception may have supported a sense of community that tended to increase the overall sense of efficacy.

This consensus, or extent to which perceptions of efficacy are shared among teachers in a school building, is called collective efficacy (Tschannen-Moran, Hoy, & Hoy, 1998). Bandura (1993,1997) found that teachers' beliefs in the school's efficacy as a whole were just as predictive of school performance as teachers' belief in their own efficacy. He believed that a low sense of efficacy could be contagious among staff, creating a self-defeating cycle of failure. Low teacher efficacy could lead to low student efficacy and low academic achievement, which furthers the decline in teacher efficacy.
In a study to evaluate the role of perceived collective efficacy, Bandura (1993) measured collective efficacy in terms of summed beliefs of teachers in their schools' capacity to promote different levels of academic achievement. He stated that,

The adverse characteristics of student body populations that largely reflect socioeconomic disadvantage reduces a school's sense of instructional efficacy. Thus, the higher the proportion of students from low socioeconomic levels and the higher the student turnover and absenteeism, the weaker are the faculties' beliefs in their collective efficacy to achieve academic progress and the poorer the schools fare academically (p. 250).

Bandura (1997) also believed that a staff's collective sense of efficacy could promote high levels of academic progress, which contributes positively to their schools' level of academic achievement. If a staff firmly believes that by their determined efforts, students are motivatable and teachable, regardless of their background, schools populated with disadvantaged and minority students achieved at the highest percentile ranks, based on national norms of language and math competencies.
In summary, there is limited evidence that a causal relationship exists between personal and organizational characteristics and a teacher’s sense of efficacy. The limited number of studies and the varying measures and definitions of efficacy preclude making any definitive conclusions at this time. Findings of researchers, however, validated the importance of exploring specific relationships between teacher efficacy and improved student and teacher performance in both an urban and suburban school district.
CHAPTER III

DESIGN OF THE STUDY

The purpose of this study was to compare the efficacy beliefs of urban and suburban teachers who had been trained in a brain-based model of instruction. The relationship between teacher efficacy beliefs and personal and organizational factors were also examined. This chapter presents the methods and procedures utilized to: (a) determine the differences between teacher efficacy beliefs in an urban and suburban school district, (b) examine the relationship between personal characteristics and teachers' sense of efficacy, and (c) examine the relationship between organizational characteristics and teachers' sense of efficacy.

This presentation includes the description of the district profiles, population samples, the instrumentation used in the study, the process of data collection, and data analysis.

District Profiles

"Upper Urban" School District

The Upper Urban School District covers an eight square mile area and is located in heavily urbanized Passaic County. It has a population exceeding 140,000 and is one of the
largest cities in New Jersey. It was founded in the late
1700s and was one of America's first planned industrial city.
It was the birthplace of the first locomotive and cotton-
spinning mill and was known for its vast production of silk
and rayon textiles.

The school system is comprised of thirty-two elementary
schools which include: one primary school (K-1), seven
elementary schools (K-4), two middle schools (5-8), twenty-
two (K-8) schools and three high schools. There is a student
population of approximately 25,000 served by a staff of 1700
teachers.

In 1991, the Commissioner of Education and the State
Board of Education rescinded the operation of the local
school district and the governance of the school system was
taken over by the state. This was due, in part, to poor
academic achievement levels and fiscal mismanagement. To
date, the three largest school districts in the state, are
state operated.

Upper Urban has a District Factor Grouping (DFG) of "A".
The designation denotes districts which are similar in
factors such as size, community socio-economic status, racial
composition of the student population, and school funding
sources. The DFG classification ranges from A to J, with "A"
representing the lowest per capita district category and "J"
representing the highest per capita district category. A
compilation of demographics for the school system is provided
(see Appendix A).
The district has been identified by the courts, in *Abbott v. Burke*, as one of twenty-eight Special Needs Districts in the State. The New Jersey Constitution mandates that the State provide a thorough and efficient education to all students in its public schools. To meet this constitutional obligation, the State must assure: (a) parity between the most wealthy and poorest school districts in per pupil expenditures for regular education; (b) supplemental programs addressing special needs of students in poorer districts; and (c) safe learning facilities (*Abbott v. Burke*, 149 N.J. 145 (1997) (*Abbott IV*).

For over two decades, a series of legislative acts failed to satisfy these obligations. The New Jersey Supreme Court, in *Abbott IV*, issued an interim order to remedy the constitutional violations. The court directed the State to increase funding for regular education in the Special Needs Districts to achieve equity and to research supplemental programs and facilities needs.

"Upper Suburban" School District

Upper Suburban is a six square mile district in northeast Bergen County, New Jersey. It was originally the home of the Lenni Lenape Indians, followed by the Dutch settlers. It was incorporated as a township in the late 1800s and became the Village of Upper Suburban in 1895. Wealthy New Yorkers looking for summer recreation built estates in the area, which eventually became year round residences. Today, this town has a population of approximately of 24,000.
The Upper Suburban School system is comprised of six elementary schools (K-5), two middle schools (6-8) and one high school. The school system serves approximately 5,000 students with a teaching staff of 400 teachers.

It has a District Factor Grouping (DFG) of "I". A compilation of demographics (see Appendix A) for the school district is provided.

Population and Sample

The total sample population for this study included 145 classroom teachers who taught in grades kindergarten through eight, in an urban and suburban school district in northeastern New Jersey. Each teacher selected to participate had completed either intermediate or advanced training in the 4MAT Learning System.

A total of 192 questionnaires were distributed to classroom teachers in both districts. Of this total, 102 were distributed to the urban teachers and 90 to the suburban teachers. In the urban district, 90 surveys were returned, indicating an 88% rate of return. In the suburban district, 63 surveys were returned indicating a return rate of 70%. Seven of the surveys in the urban district and one survey in the suburban district could not be included due to incomplete information. This resulted in a total of 145 participants.

The Upper Urban School System began staff development in the 4MAT Model in 1992, following the state takeover of the school district. The Upper Suburban district introduced 4MAT
training in 1995. The intention of both districts was to introduce teachers to a brain-based teaching model which emphasized individual learning styles as a vehicle for maximizing student learning and improving student achievement (McCarthy, 1990).

Each stage of the training (fundamental, intermediate, and advanced) was designed to increase the teachers’ knowledge base of learning styles and brain-based theories. Both districts utilized district personnel to conduct the training for small groups of teachers. Each level required a three-day training period in which teachers were released from their regular classroom schedules. Those teachers who completed advanced training functioned as facilitators within their own building to provide support and assistance to those less trained in the model.

The sample population in this study voluntarily completed a Personal Data Sheet (see Appendix B) and an adapted version of the Gibson and Dembo (1984) Teacher Efficacy Scale (see Appendix C). This scale measured both general teacher efficacy and personal teaching efficacy. General teaching efficacy is the belief that a teacher’s ability to bring about change is limited by factors external to the teacher, such as parental influence, family background, and home environment. Personal teaching efficacy is the belief that the teacher has the skills or abilities necessary to bring about change in student learning (Dembo & Gibson, 1985).
The author of the survey was initially contacted by phone, followed by a written letter of request to utilize the instrument (see Appendix D). Permission was granted, by the author, to implement the survey (see Appendix D).

Instrumentation

The primary measure of data collection was the administration of the modified version of the Gibson and Dembo Teacher Efficacy Scale (1984). Variables of general and personal teaching efficacy were measured by the teachers' responses to the sixteen-item instrument using a Likert scale. A factor analysis conducted by Gibson and Dembo of their original thirty-item scale yielded acceptable reliability coefficients in only sixteen items, specifically, .78 for the personal teaching efficacy and .75 for the general teaching factor. Consequently, the analysis of their study was based on responses to the sixteen items which yielded significant loadings on either of the two factors.

For the present study, dimensions of efficacy were assessed on teachers' responses to seven items measuring general teaching efficacy, and nine items measuring personal teaching efficacy. Convergent and discriminate validity were assured by Gibson and Dembo (1984) who completed a multitrait-multimethod analysis using three traits (teacher efficacy, verbal ability, and flexibility) analyzed across two methods of measurement (cross-ended and open-ended). The data supported teacher efficacy as a construct distinctly
different from other constructs found to affect student achievement.

A Personal Data Sheet was also developed to be completed by participating teachers. The purpose of the Data Sheet was to gather personal characteristics of the individual teachers and organizational characteristics of their classrooms. The information requested included: (a) grade level assignment, (b) years of teaching experience, (c) level of 4MAT training completed, (d) type of school district in which employed, (e) class size, and (f) grouping procedures of the students in the classes.

Data Collection

Prior to data collection, permission of the Internal Review Board of Seton Hall University in South Orange, New Jersey was obtained.

The district superintendents of Upper Urban and Upper Suburban were contacted by phone, and received follow-up letters requesting permission to complete the research study in their respective districts (see Appendix E). The letters included a personal introduction, a description of the study, anticipated involvement of district personnel, intended participants, and an offer to share the research results upon completion.

Principals in the participating schools were notified by phone, and follow-up letter (see Appendix F) to discuss dates, times, and procedures for data collection. The
letters contained a description of the study, expectations for participants, plans for data collection, an assurance of confidentiality, and an offer to share the results of the study after completion.

Following site approval, an individual staff member from each school was randomly contacted and designated to distribute and collect the survey data. The designee from each site received a packet that included:

1. A cover letter, explaining the purpose of the study and necessary instructions for the proper distribution and collection of the instrument (see Appendix G).

2. A cover letter for each participating teacher with instructions for completing the Teacher Efficacy Scale and Personal Data Sheet (see Appendix H).

3. An appropriate number of Teacher Efficacy Scales and Personal Data Sheets, one for each participant.

4. One large brown envelope, self-addressed with this researcher's home address.

The designees from each school were then asked to return the completed instruments in the envelope provided and mail to this researcher's home by the requested date.

Data Analysis

Data obtained by the Teacher Efficacy Scale and Personal Data Sheet were analyzed for purposes of interpretation. To examine the difference between attitudes and perceptions of urban and suburban teachers trained in brain-based learning
theory as it relates to personal and general teaching efficacy, a (2x2) one-way analysis of variance (ANOVA) was performed.

In examining the differences between organizational and personal characteristics and teacher efficacy, a (2x3) one-way analysis of variance was completed. Statistical analyses were computed and interpreted at the .05 level of significance.

A correlation matrix using Spearman's Rho was conducted to calculate for significant relationships between personal and general teaching efficacy with the organizational and personal characteristics being considered.

A test of between subject effects, two-way ANOVA, was conducted to confirm any statistically significant relationships discovered as a result of the ANOVA and Spearman's Rho.
The chapter is divided into three sections. The first section presents descriptive data for the sample of 145 respondents from the urban and suburban districts represented in the study. The second section presents a statistical analysis of the quantitative data related to each of the primary research questions. The third section provides a summary of the findings.

Descriptive Data Analysis

The total sample population consisted of 145 teachers in an urban and suburban district. Of this number, 62 teachers were represented in the suburban sample and 83 were represented in the urban population, as indicated in Table 1. All of the respondents had been trained in the 4MAT System, a brain-based model of instruction. Of the suburban respondents, 73\% (n = 45) completed intermediate training, and 27\% (n = 17) completed advanced training. In the urban district, 71\% (n = 59) of the participants completed intermediate training, with the remaining 29\% (n = 24) completing advanced training.

The teachers in the study completed a sixteen-item survey of teacher efficacy, comprised of statements related to personal teaching efficacy and general teaching efficacy. The responses were ranked on a six-point Likert
scale with (1) representing strongly disagree to (6) representing strongly agree. High personal efficacy scores are typically related to low general teaching efficacy scores, in that, confidence in one's own abilities relates to fewer perceived external impediments to influencing student achievement (Fritz et al., 1995).

Table 1

Survey Distribution

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<thead>
<tr>
<th>District</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid</th>
<th>Cumulative</th>
</tr>
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<tr>
<td></td>
<td></td>
<td>Percent</td>
<td>Percent</td>
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</tr>
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<td>57.2</td>
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Table 2 indicates the cumulative frequency distribution of the combined urban and suburban scores for personal teaching efficacy, revealing a range of scores between twenty-eight for the low and a high of fifty-four.
Table 2

**Frequency Distribution - Combined Personal Efficacy Scores**

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<th>Combined Urban &amp; Suburban Personal Efficacy Score</th>
<th>Frequency</th>
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<th>Valid</th>
<th>Percent</th>
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<th>Percent</th>
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<td>9.0</td>
<td>11.0</td>
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</table>
Table 3 displays the cumulative frequency distribution of the personal efficacy scores for the urban teachers represented in the study. As indicated, the high and low scores match those of the combined district scores.

Table 3

**Frequency Distribution - Urban Personal Efficacy Scores**

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<th>Urban District Personal Efficacy Score</th>
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<th>Valid Percent</th>
<th>Cumulative Percent</th>
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**Total** 83 100.0 100.0
Table 4
Frequency Distribution - Suburban Personal Efficacy Scores

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<th>Suburban District Personal Efficacy Score</th>
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<th>Percent</th>
<th>Cumulative</th>
<th>Percent</th>
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Table 4 represents the cumulative frequency distribution of the personal efficacy scores for the suburban district. In comparing the data in Table 3 and Table 4, the percentage of personal efficacy scores below forty represents 42.2% of the urban population, while it only represents 12.9% of the scores in the suburban district.

In comparing the scores of the two districts, higher personal efficacy scores, above fifty, represented 14.4% of the urban teachers and 24.2% of the suburban teachers.
indicating a greater sense of personal efficacy among the suburban teachers.

Table 5

**Frequency Distribution - Combined Teaching Efficacy Scores**

<table>
<thead>
<tr>
<th>Combined Urban &amp; Suburban Teaching Efficacy Score</th>
<th>Frequency</th>
<th>Percent</th>
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<th>Cumulative Percent</th>
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</table>

Total 145 100.0 100.0

Table 5 represents the cumulative frequency distribution for the combined urban and suburban general teaching efficacy scores. As indicated in the data, the range of scores falls between eight and forty, with only
five individual scores, or 3.5%, representing the extreme scores at the high and low ends of the scale.

Table 6 represents the cumulative frequency distribution of general teaching efficacy scores in the urban district, with a range of scores between eight and forty matching the high and low scores found on the combined teaching efficacy scores.

Table 6

**Frequency Distribution — Urban Teaching Efficacy Scores**

<table>
<thead>
<tr>
<th>Urban District Teaching Efficacy Score</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
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</table>
Table 7 represents the cumulative frequency distribution for general teaching efficacy for suburban teachers with a range of scores between 13 and 37.

Table 7
**Frequency Distribution - Suburban Teaching Efficacy Scores**

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<th>Cumulative Percent</th>
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</table>

In comparing the data on Table 6 and Table 7, lower general teaching efficacy scores, below the score of 20, represent 8.4% of the urban sample and 25.8% of the suburban sample. Higher general teaching efficacy scores, indicating the belief that external factors constrain a
teacher’s ability to influence student achievement, are more pronounced in the urban district. Efficacy scores above 30, in the suburban district, represent 14.4% of the total population with a high score of 37. Using this same comparison, 30% of the urban respondents scored at 30 or above with a high recorded score of 40. This tends to indicate that the urban teachers believe that external factors more strongly influence their ability to bring about positive change in student learning than their suburban counterparts.

The next fifteen tables represent the cumulative frequency distributions of the personal and organizational factors considered in the study: grade level, years of teaching experience and class size. Tables 8 through 10 indicate the percentage of teachers in both the urban and suburban districts, as clustered in grades K-2, 3-5, and 6-8.

Table 8

**Survey Distribution - Combined Grade Level**

<table>
<thead>
<tr>
<th>Combined Urban &amp; Suburban Grade Level</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
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<td>33.8</td>
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</table>
Table 9
Survey Distribution - Urban Grade Level

<table>
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<th>Urban District Grade Level</th>
<th>Frequency</th>
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Table 10
Survey Distribution - Suburban Grade Level

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<td>100.0</td>
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</table>

As indicated in Table 8, the total number of 145 respondents were similarly divided between each of the grade categories; 30.3% in grades K-2, 33.8% in grades 3-5 and 35.9% in grades 6-8.

Table 9 and Table 10 indicate the frequency distribution by grade level for the urban and suburban districts, respectively. As the tables demonstrate, the teachers in grades 6-8 represent the majority (42.2%) of the teachers participating in the urban district, compared to 27.4% in the suburban district. The other two
categories, K-2 and 3-5, are more closely aligned between districts.

Table 11
Survey Distribution - Combined Years of Teaching Experience

<table>
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<tr>
<th>Combined Urban &amp; Suburban Years of Teaching</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid</th>
<th>Percent</th>
<th>Cumulative</th>
<th>Percent</th>
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</thead>
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<tr>
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<td>17+</td>
<td>80</td>
<td>55.2</td>
<td>55.2</td>
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<td>100.0</td>
<td>100.0</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table 11 displays the combined cumulative frequency distribution for years of teaching experience in both the urban and suburban school districts. Although, a wide range of teaching experience exists, the majority of teachers had taught seventeen years or longer, representing 55.2% of the total sample population. This was followed by 28.3% having taught between eleven and sixteen with the remaining 16.6% representing the teachers with ten years or less teaching experience.

Table 12
Survey Distribution - Urban Years of Teaching Experience

<table>
<thead>
<tr>
<th>Urban District Years of Teaching</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid</th>
<th>Percent</th>
<th>Cumulative</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>1-10</td>
<td>13</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11-16</td>
<td>19</td>
<td>22.9</td>
<td>22.9</td>
<td>38.6</td>
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</tr>
<tr>
<td></td>
<td>17+</td>
<td>51</td>
<td>61.4</td>
<td>61.4</td>
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</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As demonstrated in Table 12, the teachers with seventeen or more years of experience represent the majority of participants in the urban district, or 61.4% of the sample. This was followed by 22.9% having taught between eleven and sixteen years with the smallest percentage, 15.7% representing the teachers with ten years or less.

Table 13
Survey Distribution - Suburban Years of Teaching Experience

<table>
<thead>
<tr>
<th>Suburban District Years of Teaching</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid 1-10</td>
<td>11</td>
<td>17.7</td>
<td>17.7</td>
<td>17.7</td>
</tr>
<tr>
<td>11-16</td>
<td>22</td>
<td>35.5</td>
<td>35.5</td>
<td>53.2</td>
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<tr>
<td>17+</td>
<td>29</td>
<td>46.8</td>
<td>46.8</td>
<td>100.0</td>
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<tr>
<td>Total</td>
<td>62</td>
<td>100.0</td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>

Similarly, the suburban district, in Table 13, had the highest percentage of participating teachers in the above seventeen years of experience category, representing 46.8% of the population sample. This was followed by 35.5% in the eleven to sixteen year category and 17.7% of participants having taught ten years or less.

In considering the organizational factor of class size differences, in the urban and suburban school districts, it was found that class size above twenty-seven did not exist
in the suburban district. As a result of these findings, the levels were compressed into two categories: class sizes of 1-20 and 21 and above.

Table 14
Survey Distribution - Combined Class Size

<table>
<thead>
<tr>
<th>Combined Urban &amp; Suburban Class Size</th>
<th>Valid</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Valid</td>
<td>26</td>
<td>17.9</td>
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<tr>
<td>21+</td>
<td>119</td>
<td>82.1</td>
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<tr>
<td>Total</td>
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<td>100.0</td>
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</table>

As indicated in Table 14, the majority of classes in both districts, 82.1%, reflects class sizes over twenty-one, with only 17.9% representing class sizes less than twenty-one students.

Table 15
Survey Distribution - Urban Class Size

<table>
<thead>
<tr>
<th>Urban District Class Size</th>
<th>Valid</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Valid</td>
<td>10</td>
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<td>73</td>
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<tr>
<td>Total</td>
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<td>100.0</td>
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</tbody>
</table>

Table 16
Survey Distribution - Suburban Class Size

<table>
<thead>
<tr>
<th>Suburban District Class Size</th>
<th>Valid</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Valid</td>
<td>16</td>
<td>25.8</td>
</tr>
<tr>
<td>21+</td>
<td>46</td>
<td>74.2</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>100.0</td>
</tr>
</tbody>
</table>
However, in comparing the data in Tables 15 and 16, this researcher noted that class sizes tended to be higher in the urban district. Only 12% of the sample population in the urban district had class sizes below twenty-one, compared to 25.8% in the suburban district. Also, as indicated previously, class sizes above twenty-seven only existed in the urban school district.

Quantitative Data Analysis

To answer the primary research questions, quantitative data was analyzed with the assistance of SPSS, Statistical Product and Service Solutions, Version 8.0, which is a computer based statistical software package.

Findings Related to Research Questions

Data was analyzed using the following techniques: one-way and two-way analysis of variance (ANOVA); Spearman’s Rho, a correlational matrix; and tests of between subject effects.

To answer the first research question, Are there differences in personal and general teacher efficacy beliefs between teachers in an urban and suburban school district who have been trained in a brain-based model of instruction?, a table of means for personal and general teaching efficacy for the suburban and urban district were analyzed.
As indicated in Table 17, representing the urban district, a mean score of 41.61 was generated for personal teaching efficacy with a mean score of 26.29 for general teaching efficacy.

Comparing this data with the suburban district, in Table 18, the mean score for personal efficacy was 45.19 representing a difference of 3.58 between districts. This indicated that teachers in the suburban district tended to have higher personal efficacy scores than their urban counterparts.

<table>
<thead>
<tr>
<th>Table 17</th>
<th>Table of Means - Urban Efficacy Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban District Descriptive Statistics</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Personal Efficacy Score</td>
<td>83</td>
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<tr>
<td>Teaching Efficacy Score</td>
<td>83</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 18</th>
<th>Table of Means - Suburban Efficacy Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Suburban District Descriptive Statistics</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Personal Efficacy Score</td>
<td>62</td>
</tr>
<tr>
<td>Teaching Efficacy Score</td>
<td>62</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>62</td>
</tr>
</tbody>
</table>

In comparing the scores for general teaching efficacy, the data suggested that teachers in the suburban district
scored lower on general teaching efficacy by a difference of -3.63 than the corresponding sample population of urban teachers.

Next, analysis of variance was used to determine the relationship between personal and general teaching efficacy in both the urban and suburban districts. The results, as indicated in Table 19, demonstrated a significant difference between scores for personal and general teaching efficacy at a .000 level of significance with F values of 13.563 for personal efficacy and 13.486 for general teaching efficacy.

Table 19
Analysis of Variance

<table>
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<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Efficacy</td>
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<td></td>
</tr>
<tr>
<td>Score</td>
<td>Between Groups</td>
<td>454.619</td>
<td>1</td>
<td>454.619</td>
<td>13.563</td>
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<tr>
<td></td>
<td>Within Groups</td>
<td>4793.340</td>
<td>143</td>
<td>33.520</td>
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<tr>
<td></td>
<td>Total</td>
<td>5247.959</td>
<td>144</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Score</td>
<td>Between Groups</td>
<td>467.094</td>
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<td>467.094</td>
<td>13.486</td>
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<td>Within Groups</td>
<td>4952.947</td>
<td>143</td>
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<td>Total</td>
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<tr>
<td>Grade Level</td>
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<td>1.552</td>
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<td>Within Groups</td>
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<td>Class Size</td>
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</tr>
<tr>
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<td>Between Groups</td>
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<td>.672</td>
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<td>Within Groups</td>
<td>20.666</td>
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<td>Total</td>
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</tr>
</tbody>
</table>

To answer the second research question, "Are personal and organizational factors related to teacher efficacy
beliefs in an urban and suburban school district?", and the subsidiary questions comparing grade level, years of teaching experience, and class size, a one way analysis of variance was computed.

Table 19 reports that the only significant factor was class size with a \( p < .033 \), and an \( F \) value of 4.648. Statistical significance was not indicated for grade level or class size in the urban or suburban district at the .05 level.

A correlational matrix, Spearman’s Rho, was then used to determine relationships between organizational and personal characteristics for urban and suburban teacher and personal and general teaching efficacy. The results, as indicated in Table 20, confirmed the previous finding that there was a significant relationship between personal teaching efficacy, general teaching efficacy and class size in an urban and suburban school district.

As indicated, a correlational coefficient of .292 was found for personal efficacy, -.314 for general teaching efficacy, and -.177 for class size at the .05 level of significance.

Based on the results of the ANOVA and Spearman’s Rho, a test of between subject effects was conducted, using
personal efficacy and general teaching efficacy as additional dependent variables.

Table 20 - Spearman’s Rho Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Personal Efficacy</th>
<th>Teaching Efficacy</th>
<th>Grade Level</th>
<th>Years of Teaching</th>
<th>Class Size</th>
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</thead>
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<td></td>
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<td>145</td>
<td>145</td>
<td>145</td>
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</tr>
</tbody>
</table>

** Correlation is significant at the .01 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).

The results, as indicated in Table 21, supported the previous findings, which indicated a relationship between personal efficacy, class size, and districts with an
F value of 4.714, p < .004 and an R squared calculation of .091.

Table 21 - Personal Efficacy Scores

Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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<td>478.398</td>
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<td>159.466</td>
<td>4.714</td>
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<td>3</td>
<td>159.466</td>
<td>4.714</td>
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<td>Corrected Total</td>
<td>5247.959</td>
<td>144</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* R Squared = .091 Adjusted R Squared = .072

The associated table of the means, Table 22, demonstrated the class size difference between urban and suburban teachers as related to personal teaching efficacy. Based on the results of the data, personal efficacy tended to be more positive in the suburban district when the interaction of class size was introduced.

Table 22

Table of Means

Class Size * District

<table>
<thead>
<tr>
<th>Class Size</th>
<th>District</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-20</td>
<td>Urban</td>
<td>41.200</td>
<td>1.839</td>
<td>37.564</td>
<td>44.836</td>
</tr>
<tr>
<td></td>
<td>Suburban</td>
<td>44.188</td>
<td>1.454</td>
<td>41.313</td>
<td>47.062</td>
</tr>
<tr>
<td>21+</td>
<td>Urban</td>
<td>41.671</td>
<td>.681</td>
<td>40.325</td>
<td>43.017</td>
</tr>
<tr>
<td></td>
<td>Suburban</td>
<td>45.543</td>
<td>.858</td>
<td>43.848</td>
<td>47.239</td>
</tr>
</tbody>
</table>
A test of between subject effects was also conducted for general teaching efficacy, class size, and district. The results, as indicated in Table 23, supported the previous data, which found class size to be a significant factor with an $F$ value of 5.096, $p<0.002$ and a $R$ squared calculation of .098.

Table 23

Teaching Efficacy Scores

Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>530.146</td>
<td>3</td>
<td>176.715</td>
<td></td>
<td>5.096</td>
<td>.002</td>
</tr>
<tr>
<td>Intercept</td>
<td>46741.637</td>
<td>1</td>
<td>46741.637</td>
<td>1347.794</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>DIST * CLASS</td>
<td>530.146</td>
<td>3</td>
<td>176.715</td>
<td></td>
<td>5.096</td>
<td>.002</td>
</tr>
<tr>
<td>Error</td>
<td>4889.895</td>
<td>141</td>
<td>34.680</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>94155.000</td>
<td>145</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>5420.041</td>
<td>144</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: $R$ Squared = .098 (Adjusted $R$ Squared = .079)

The associated table of means, Table 24, reflecting the class size differences between urban and suburban teachers, related to general teaching efficacy, indicated that it appeared that class size over twenty-one negatively affected teacher efficacy in an urban setting.
Table 24

Table of Means

Class Size x District

Dependent Variable: Teaching Efficacy Score

<table>
<thead>
<tr>
<th>Class Size</th>
<th>District</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-20</td>
<td>Urban</td>
<td>24.000</td>
<td>1.862</td>
<td>20.518</td>
<td>27.482</td>
</tr>
<tr>
<td></td>
<td>Suburban</td>
<td>23.063</td>
<td>1.472</td>
<td>20.512</td>
<td>25.615</td>
</tr>
<tr>
<td>21+</td>
<td>Urban</td>
<td>26.603</td>
<td>.899</td>
<td>25.204</td>
<td>27.965</td>
</tr>
<tr>
<td></td>
<td>Suburban</td>
<td>22.522</td>
<td>.868</td>
<td>20.805</td>
<td>24.238</td>
</tr>
</tbody>
</table>

Data Summary

The findings of this study indicated that there was a significant difference in personal efficacy and general teaching efficacy beliefs of teachers in an urban and suburban school district who had been trained in a brain-based model of instruction.

The data demonstrated that suburban teachers considered themselves to be more efficacious than their urban counterparts in both personal and general teaching efficacy, as indicated by the results of the Gibson and Dembo (1984) Teacher Efficacy Scale.

In considering the relationship between identified personal and organizational factors and teacher efficacy in an urban and suburban school district, this researcher
found that the only significant relationship existed between personal and general teaching efficacy beliefs and class size. The variables of grade level and years of teaching experience did not significantly influence results.

Based on the research findings, personal teaching efficacy tended to be more positive in the suburban district when the interaction of class size was introduced. However, in considering general teaching efficacy beliefs, this researcher found that class size of over twenty-one students tended to negatively affect teacher efficacy in the urban district.
CHAPTER V

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter is divided into three sections. The first section presents a summary of the study, the second section discusses the findings and conclusions, and the final section addresses implications for practice and recommendations for future research.

Summary of the Study

The primary purpose of the study was to compare the efficacy beliefs of urban and suburban teachers who had been trained in a brain-based model of instruction. The relationships between teacher efficacy beliefs and personal and organizational factors were also examined.

Two major research questions and three subsidiary questions were asked:

1. Are there differences in teacher efficacy beliefs between teachers in an urban and suburban school district who have been trained in a brain-based model of instruction?
2. Are personal and organizational factors related to teacher efficacy beliefs in an urban and suburban school district?

2a. Is there a significant relationship between teacher efficacy beliefs and years of teaching experience?

2b. Is there a significant relationship between teacher efficacy beliefs and class size?

2c. Is there a significant relationship between teacher efficacy beliefs and grade level?

The sample used in this study included 145 classroom teachers, representing grades kindergarten through eight, who taught in an urban or suburban school district located in Northern New Jersey. A total of 62 teachers participated from the suburban district and 83 from the urban district.

Teachers completed a personal data sheet and the Gibson and Dembo Teacher Efficacy Scale (1984), which measured both personal teaching efficacy and general teaching efficacy.

Quantitative methods of inquiry were utilized to analyze the data. The methods included analyses of descriptive data, one way analysis of variance, two-way analysis of variance, and Spearman’s Rho correlation matrix.
Several limitations of the study were included. First, the sample size was limited to one urban and one suburban school district in Northern New Jersey during the 1998 - 1999 school year. Second, the study was limited to classroom teachers in grades kindergarten through eight, who had completed either intermediate or advanced 4MAT training. Third, the study examined the relationship between teacher efficacy beliefs and selected personal and organizational factors. Other factors which might influence teacher efficacy were not included in this study.

Findings and Conclusions

This section will present a summary of the findings and conclusions, based upon analyses of the data related to the research questions.

Research Question One

Question One examined whether or not there were differences in teacher efficacy beliefs in an urban and suburban district for teachers trained in a brain-based model of instruction.

As indicated by the descriptive data and quantitative analyses, teachers in the suburban district perceived themselves to be more efficacious than their urban
counterparts. Statistical significance was found at the p<.000 level with F values of 13.563 for personal teaching efficacy, and 13.486 for general teaching efficacy.

The mean personal teaching efficacy score, which represents perceptions of personal influence and power to impact student learning, was 45.19, compared to 41.61 in the urban district.

The mean scores for general teaching efficacy in the suburban and urban school district was 22.66 and 26.29, respectively. General teaching efficacy is related to perceptions of the influence, power and impact of factors, which lie outside the classroom, and may therefore be beyond the direct control of the individual teachers.

The comparison of mean scores representing each district supported the findings of Fritz et al., (1995), who stated that high personal efficacy scores are related to low general teaching efficacy scores, in that confidence in one's own abilities relates to fewer perceived external impediments to influencing student achievement.

Although direct causality could not be inferred, the results suggested the following possible explanations. First, although both groups of teachers received training in 4MAT, a brain-based model of instruction, effective training and transfer of that training into a teacher's
repertoire is contingent upon several factors. As postulated by Joyce, Hersh and Mc Kibbin (1983), transfer of skills will only occur when the training includes the following five components: (a) presentation of theory, (b) demonstration of the new skills and strategies, (c) initial practice during staff development, (d) prompt feedback to teachers concerning their efforts, and (e) a coaching component.

It is possible that each of these components were not evidenced equally in both districts. During the 1998-1999 school year, for example, the suburban district provided a teacher on sabbatical for purposes of training and follow-up. This type of additional support was not found in the urban district, which found itself facing the additional challenges of Whole School Reform as mandated by the Abbott v. Burke decision.

Guskey (1986, 1989) also supported the need for encouragement, support, and feedback after training in a new method. Initially, implementation of change may have a negative effect on teachers' personal efficacy beliefs until they witness improved student learning. Also, improvements which occur in personal teaching efficacy due to increased skill, may be offset by the rising challenges
facing teachers in meeting the demands of the New Jersey Core Content Curriculum Standards.

Additionally, the training in intermediate or advanced 4MAT would have had a greater impact on perceptions of personal teaching efficacy than general teaching efficacy. The content of the workshops focused on theories of brain-based research and learning styles, and their interaction with instructional techniques. The discussion of external factors, which affect school success, was not an integral part of the training process.

Secondly, additional factors outside of implementation of innovation may have also impacted teacher perception of efficacy beliefs. As stated by Ashton (1984),

current conditions in the schools — the isolation, the difficulty in assessing one’s effectiveness as a teacher, the lack of collegial and administrative support, and the sense of powerlessness that comes from limited collegial decision-making — make it difficult for teachers to maintain a strong sense of efficacy. (p. 28)

In urban school districts, schools tend to be larger and more impersonal, due to higher student enrollment and increased student to teacher ratios. Facilities tend to be older and in greater need of repair. Often, materials and
supplies are outdated and technological innovations are limited. These conditions may impact on teachers’ attitudes, which influence behaviors and beliefs regarding self-efficacy.

Thirdly, as stated by Ross (1995), teachers’ beliefs about intelligence as a fixed, rather than a mutable characteristic, may also have an impact on their efficacy beliefs. Teachers with a high sense of efficacy believe it is their responsibility to see that children learn, and when their students experience difficulty, they will examine their own practices to improve performance.

However, teachers with a low sense of efficacy place the responsibility for learning on their students and when they fail, they place the blame on external factors including family background, environmental conditions, and student ability. The results of this study may support the findings of Webb (1982), who noted that low efficacy is a means by which teachers handle the frustration and difficulty low achieving students pose to their feelings of adequacy. If teachers believe there is little they, or any other teacher can do to prevent failure, they can maintain their sense of competence and self-esteem.

The findings also supported Bandura’s (1997) theory on collective efficacy, which states that the higher
proportion of students from low socio-economic levels, and the greater the number of student turnovers and the higher the absenteeism rate, the weaker are the teachers' beliefs in their collective efficacy, which impacts individual efficacy beliefs.

The research also found that a major source of teachers' low efficacy is their relationship with parents (Ashton et al., 1983). Often, teachers of low-achieving students believe parents do not appear to take an interest in school programs, or appreciate their effectiveness. As a result, teachers may reduce their communication with parents, which may perpetuate the myth that parents of low-achieving students are not concerned about their children's education.

Challenging these beliefs is critical if teachers are to see themselves as responsible for providing experiences, which promote intellectual growth, rather than absolving themselves of their responsibilities to educate all children to their fullest potential.

Research Question Two

Question Two examined the relationship between personal and organizational characteristics and teacher efficacy beliefs. Specifically, years of teaching
experience, class size, and grade level were considered. Although data were collected on grouping procedures, less than 3% of the sample population utilized either multi-age or homogeneous grouping practices.

Correlational analysis indicated statistically significant relationships between personal teaching efficacy, general teaching efficacy, and class size in an urban and suburban school district. A correlation coefficient of .292 was found for personal efficacy, -.314 for general teaching efficacy and -.177 for class size at the .05 level of significance.

In addition, a test of between subject effects supported the previous findings, which indicated a relationship between personal teaching efficacy and class size with an F value of 4.714, p<.004 and an R squared calculation of .091.

Based on the results of this data, personal teaching efficacy tends to be more positive in the suburban district when the interaction of class size is introduced.

A test of between subject effects was also completed for general teaching efficacy, class size, and district. The results showed that class size was a significant factor with an F value of 5.096, p<.002 and an R squared calculation of .098. The results indicated that class size
above twenty-one negatively impacts general teaching efficacy in an urban setting.

It is important to note that this research study does not attempt to yield information about causal relationships among variables, and is only correlational in nature. Although limited research exists on the relationship between class size and teacher efficacy, it is possible that increased class size may reduce a teacher's ability to reach all students and plan teaching strategies to meet individual student needs. This loss of confidence in their ability to affect pupil performance may result in increased frustration, which would negatively impact their efficacy beliefs.

This finding supports Guskey's (1992) theory that elementary teachers have an increased sense of personal teaching efficacy, due to smaller class size, which enables them to observe the impact of their effects more directly.

Implications for Practice

Based on the findings and conclusions of this study, the following suggestions are offered for implications for practice.

1. In this study, perceptions of personal and general teaching efficacy were significantly different for teachers
in the urban and suburban school district who had been trained in a brain-based model of instruction. The suburban teachers perceived themselves to be more efficacious than their urban counterparts.

The review of the literature demonstrated that a teacher's sense of efficacy is an important variable related to student achievement. This is particularly relevant in the urban areas, where student achievement is often below that of the suburban districts. Therefore, conditions within the schools which may negatively impact teacher efficacy beliefs need to be identified and strategies developed to improve and maintain a strong sense of efficacy among all staff members.

2. Glickman and Tamashiro (1982) indicated that teacher efficacy is important to the survival of the teaching profession. They found that teachers who left the profession were significantly lower in their sense of efficacy than first or fifth year teachers. It is therefore recommended that institutions of higher learning develop teacher education training programs to develop self-efficacy beliefs. Pre-service training should provide information on the construct of efficacy including methods of self-study, and goal-setting procedures regarding personal and general teaching efficacy. School districts
must work collaboratively with these institutions to develop support mechanisms within the schools to maintain a strong sense of efficacy and professional competence.

Mentoring programs should also be developed, with the assistance of colleges and universities, to assist beginning teachers in transitioning from pre-service teaching to full-time classroom instruction.

3. As schools continue to address reform and restructuring efforts within their districts, it is important to consider the importance of an extensive support network after any initial training program. This should include follow-up training, specific feedback opportunities, and a coaching component, if the transfer and application of the new knowledge is to occur.

Often, considerable time and expense is expended in school districts on staff development initiatives without the necessary support and commitment from the administration. This minimizes the long-term benefits of the training program, and may ultimately reduce a teacher's sense of personal efficacy.

Recommendations for Further Research

The findings and conclusions of this study generate the following recommendations for further research.
1. This study yielded data on teacher efficacy beliefs, which were limited to kindergarten through eighth grade teachers in one urban and suburban school district in Northern New Jersey. Additional studies utilizing a larger sample would add further knowledge to the study of efficacy.

2. This study yielded research on teacher efficacy beliefs in an urban district that is currently under state takeover. Additional studies in urban districts, not under state takeover, should be conducted to ascertain if similar results would be found.


4. The findings in this study supported the relationship between teacher efficacy beliefs and class size. Further research is needed to confirm this finding. Additional research may influence future policy decisions in school districts regarding the significance of reduced class size on teacher and student performance.
5. Further research is needed to examine additional organizational and personal characteristics not considered in this study. Suggestions include: (a) principal leadership styles, (b) staff development opportunities, (c) school climate, (d) decision-making structures, (e) collective efficacy beliefs, (f) gender differences, and (g) school size.

6. Additional research might benefit from the utilization of a different type of efficacy instrument, which explores the events and influences teachers attribute to the development of their efficacy beliefs. Bandura’s Teacher Efficacy Scale (1997) consists of 30 items on a 9-point scale which identifies seven subscales: (a) influence on decision making, (b) influence on school resources, (c) instructional efficacy, (d) disciplinary efficacy, (e) enlisting parental involvement, (f) enlisting community involvement, and (g) creating a positive school climate. This measure attempts to provide a multi-dimensional view of teacher efficacy beliefs without becoming overly specific (Tschannen-Moran, et al., 1998).

Summary

The purpose of this research was to compare the teacher efficacy beliefs of urban and suburban teachers
trained in a brain-based model of instruction. The relationships between teacher efficacy beliefs and personal and organizational characteristics were also examined.

The findings indicated that there were significant differences in personal and general teaching efficacy beliefs between the teachers in both districts. The research also revealed that the organizational characteristic of class size significantly impacted teacher efficacy beliefs in both the urban and suburban school settings. Specifically, general teaching efficacy was negatively influenced in the urban district when class size exceeded twenty-one students, and personal efficacy beliefs tended to be more positive in the suburban district when class size was introduced.

This study provided additional insight into the construct of teacher efficacy. However, if a strong sense of efficacy is related to increased motivation and heightened levels of competence and student success, further investigation into this teacher attribute is needed.

As we enter into the Twenty-first Century, school leaders must take an active role in finding and improving the environmental conditions that increase a teacher's sense of personal and general teaching efficacy. We owe it
to our children and to the future generation of teachers
who will succeed us in this critical endeavor.
References

Abbott v. Burke, 149 N.J. 145 (1997) *Abbott IV.*


Paper presented at the Annual Meeting of the Canadian Association for Curriculum Studies, Calgary, Canada.


Appendix A

Demographics of Participating Districts
Demographics of Participating Districts

<table>
<thead>
<tr>
<th>District</th>
<th>Upper Urban</th>
<th>Upper Suburban</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFG Group Per Pupil Expenditure</td>
<td>$8,379</td>
<td>$9,604</td>
</tr>
<tr>
<td>Enrollment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>4,617</td>
<td>1,436</td>
</tr>
<tr>
<td>Middle</td>
<td>15,621</td>
<td>1,143</td>
</tr>
<tr>
<td>Elementary</td>
<td>3,731</td>
<td>2,462</td>
</tr>
<tr>
<td>Average Class Size</td>
<td>24.8</td>
<td>20.9</td>
</tr>
<tr>
<td>Language Diversity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albanian</td>
<td>95</td>
<td>0</td>
</tr>
<tr>
<td>Arabic</td>
<td>513</td>
<td>0</td>
</tr>
<tr>
<td>Bengali</td>
<td>474</td>
<td>0</td>
</tr>
<tr>
<td>Creole (Cajun)</td>
<td>79</td>
<td>0</td>
</tr>
<tr>
<td>Italian</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>Japanese</td>
<td>0</td>
<td>111</td>
</tr>
<tr>
<td>English</td>
<td>11,261</td>
<td>4,502</td>
</tr>
<tr>
<td>Korean</td>
<td>1</td>
<td>156</td>
</tr>
<tr>
<td>Patois (Jamaican)</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Spanish</td>
<td>10,995</td>
<td>70</td>
</tr>
<tr>
<td>Turkish</td>
<td>120</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>370</td>
<td>202</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>5.9%</td>
<td>82.8%</td>
</tr>
<tr>
<td>Black</td>
<td>40.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Asian / Pacific Island</td>
<td>2.4%</td>
<td>12.7%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>51.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>American Indian</td>
<td>0.1%</td>
<td>.0%</td>
</tr>
<tr>
<td>Student Attendance Rate</td>
<td>96.2%</td>
<td>93.0%</td>
</tr>
<tr>
<td>Students Eligible for Free/Reduced Meals</td>
<td>20,850</td>
<td>97</td>
</tr>
</tbody>
</table>

Data Gathered From the 1997 - 1998 School Report Cards
Appendix B

Teacher Personal Data Sheet
Personal Data Sheet

For each question, select the most appropriate answer.

1) What grade level do you currently teach?
   - Primary  K - 2
   - Elementary  3 - 5
   - Middle grades  6 - 8

2) Indicate the type of district that you are currently working in
   - Urban district
   - Suburban district

3) How are the students grouped in your classroom?
   - Heterogeneous
   - Homogeneous
   - Multi-age grouping (more than one grade together)

4) Not including this school year, how many years of teaching experience do you have?
   - 1 - 5 years
   - 6 - 10 years
   - 11 - 16 years
   - 17 or more years

5) Indicate the level of 4MAT training that you have completed
   - Intermediate
   - Advanced

6) What is your average class size?
   - 1 - 12 students
   - 13 - 20 students
   - 21 - 27 students
   - 27 or more students
Appendix C

Gibson and Dembo Teacher Efficacy Scale
### Teacher Efficacy Scale
1983, Sheri Gibson and Myron Dembo
(Short Form)

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Disagree Slightly More Than Agree</th>
<th>Agree Slightly More Than Disagree</th>
<th>Moderately Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O 6</td>
</tr>
</tbody>
</table>

1. When a student does better than usual, many times it is because I exerted a little extra effort.

2. The hours in my class have little influence on students compared to the influence of their home environment.

3. The amount that a student can learn is primarily related to family background.

4. If students aren’t disciplined at home, they aren’t likely to accept any discipline.

5. When a student is having difficulty with an assignment, I am usually able to adjust it to his/her level.

6. When a student gets a better grade, than he usually gets, it is usually because I found better ways of teaching that student.

7. When I really try, I can get through to even the most difficult students.

8. A teacher is very limited in what he/she can achieve because a student’s home environment is a large influence on his/her achievement.

9. When the grades of my students improve it is usually because I found more effective teaching approaches.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Disagree slightly more than agree</th>
<th>Agree slightly more than disagree</th>
<th>Moderately agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. If a student masters a new concept quickly, this might be because I know the necessary steps in teaching that concept.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
<tr>
<td>11. If parents would do more for their children, I could do more.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
<tr>
<td>12. If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
<tr>
<td>13. If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to direct him quickly.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
<tr>
<td>14. The influences of a student’s home experiences can be overcome by good teaching.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
<tr>
<td>15. If one of my students couldn’t do a class assignment, I would be able to accurately assess whether the assignment was at the correct level of difficulty.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
<tr>
<td>16. Even a teacher with good teaching abilities may not reach many students.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
<td>0 6</td>
</tr>
</tbody>
</table>
Appendix D

Letter of Permission from Survey Author
August 31, 1998

Myron Dembo, Ph. D.
18120 Bromley Street
Tarzana, CA 91356

Dear Professor Dembo:

I appreciated your time and interest in my dissertation study which examines the attitudes and perceptions of urban and suburban teachers who have been trained in the use of the 4MAT Model and its impact on teacher efficacy.

As I shared in our phone conversation, I am requesting the use of your Teacher Efficacy Survey to complete the first phase of data collection. This will include the administration of the survey to those teachers who have received Intermediate and Advanced Training in Bernice McCarthy’s 4MAT Model. I am interested in using your survey for my dissertation only.

I appreciate your consideration of my request and ask that you sign your name and date if you approve. Please return a copy of this signed letter in the enclosed self-addressed stamped envelope. If you have questions or would like further information, please call me at my home (201) ______. I wait your prompt response to my request so that I can continue the next phase of my dissertation study. Thank you.

Name: __________________________ Date: 9/7/98

Respectfully,

Linda Crescione
Linda Crescione
Appendix E

Letters to Chief School Administrators
Linda Crescione  
Principal  

December 23, 1998  

Dear Dr.  

Thank you for your approval to conduct research in the district for the following:  

DISQUETATION TOPIC: Brain-Based Teaching and Learning: A Study of the Attitudes and Perceptions of Urban and Suburban Teachers about the Impact of Brain-Based Instruction on Teacher Efficacy.  

The purpose of the study is to investigate the relationship between urban and suburban teachers who have been trained in a brain-based learning model (4MAT) and its effect on teacher efficacy.  

Randomly selected teachers in the district who have been trained in either intermediate or advanced levels of the 4MAT System, will voluntarily complete a brief survey that will remain anonymous and confidential. Administration of the survey will be conducted per your directive following appropriate guidelines for ensuring the integrity of the instrument. I anticipate administering the survey during the month of February, 1999.  

Currently, I am preparing to present my dissertation proposal to Seton Hall University's Institutional Review Board (IRB) for final approval in January, 1999. As part of the IRB process, I must submit written approval from the district. Therefore, I respectfully request your written approval to complete the necessary research.  

Upon completion of the research, results of the project will be willingly shared if desired. I would be happy to meet with you should you have any questions or require further clarification.  

I look forward to your response.  

Sincerely,  

Linda Crescione
TO: Dr. Deborah Pearce, Duty Superintendent
FROM: Linda Crescione, Principal
DATE: June 5, 1998
RE: Doctoral Dissertation

I am currently completing my doctoral dissertation at Seton Hall University. For my research proposal, I will be studying the relationship between 4MAT instruction and teacher efficacy in the and school districts.

In completing this project, I am requesting access to current educational data related to staff members who have received 4MAT instruction at the intermediate and advanced levels. During the fall semester, I will distribute a survey to the identified staff members, in both school districts, on the impact of 4MAT training as it relates to teacher efficacy.

Thank you for your assistance, and I look forward to hearing from you. If you have any further questions or require additional information, please do not hesitate to call.
Appendix F

Letters to Participating Principals
Linda Crescione  
Principal

February, 1999

Dear Fellow Principal:

I am currently a doctoral candidate at Seton Hall University in South Orange, New Jersey. The anticipated title of my dissertation is: Brain-Based Teaching and Learning: A Study of Urban and Suburban Teachers' Attitudes and Perceptions about the Impact of Brain-Based Instruction on Teacher Efficacy.

The focus of the study is to investigate the relationship between the attitudes and perceptions of urban and suburban teachers who have been trained in a brain-based model of instruction (the 4MAT System) and its impact on teacher efficacy.

With approval from the District Superintendent, I am requesting that teachers in your building, who have been trained in either intermediate or advanced 4MAT training, complete a brief survey on teacher efficacy. Completion of the Teacher Efficacy Scale will take approximately 10-15 minutes. Teacher participation is totally voluntary and all information will be kept completely anonymous and confidential. The identity of each teacher will be unknown.

A non-administrative teacher in each building will be responsible for data collection. I am requesting that the designee distribute the survey to each identified staff member in your building either, at a scheduled faculty meeting or during the school day. The completed surveys will be returned to the facilitator in a sealed envelope who will then forward the data to me in the envelope provided.

Your anticipated cooperation in the completion of this study is greatly appreciated. Please contact me if you have additional questions or require further information. Thank you.

Sincerely,

Linda Crescione
Linda Crescione  
Principal  

January, 1999

Dear Fellow Principal:

I am currently a doctoral candidate at Seton Hall University in South Orange, New Jersey. The anticipated title of my dissertation is: **Brain-Based Teaching and Learning: A Study of Urban and Suburban Teachers' Attitudes and Perceptions about the Impact of Brain-Based Instruction on Teacher Efficacy.**

The focus of the study is to investigate the relationship between the attitudes and perceptions of urban and suburban teachers who have been trained in a brain-based model of instruction (the 4MAT System) and its impact on teacher efficacy.

With Dr.'s permission, I am requesting that randomly selected teachers in your building, who have been trained in either intermediate or advanced 4MAT training, complete a brief survey on teacher efficacy. Completion of the Teacher Efficacy Scale will take approximately 10-15 minutes. Teacher participation is totally voluntary and all information will be kept completely anonymous and confidential. The identity of each teacher will be unknown.

A non-administrative teacher in each building will be responsible for data collection. I am requesting that the designee distribute the survey to each identified staff member in your building either, at a scheduled faculty meeting or during the school day. The completed surveys will be returned to the facilitator in a sealed envelope who will then forward the data to the researcher in the envelope provided.

Your anticipated cooperation in the completion of this study is greatly appreciated. Please contact me if you have additional questions or require further information. Thank you.

Sincerely,

Linda Crescione
Appendix G

Letter of Introduction to Participants
March, 1999

Dear Teacher,

I would like to take this opportunity to invite you to participate in a study of teacher efficacy and its relationship to training in the brain-based model of instruction, the 4MAT System. The attitudes and perceptions of both urban and suburban teachers will be considered in this research project. I am conducting this study for my doctoral dissertation at Seton Hall University in South Orange, New Jersey.

The focus of the study is to investigate if a relationship exists between urban and suburban teachers who have been trained in 4MAT and teacher efficacy.

The completion of the Teacher Efficacy Scale and Personal Data Sheet will take approximately 10-15 minutes. Principals have agreed to designate time at a faculty meeting or during the school day for those interested in participating. A non-administrative teacher will facilitate the process of data collection. When finished with the questionnaire, please place it in the envelope provided and seal. The sealed envelopes will be collected by the facilitator who will return the completed surveys to the researcher in a sealed envelope. All information will be kept completely confidential and anonymous. The identity of each respondent will be unknown. Results of the study will be reported in aggregate data only. Your participation in this activity is completely voluntary and you may choose not to participate or withdraw from the research study without prejudice at any time.

This project has been reviewed and approved by the Seton Hall University Institutional Review Board for Human Subjects Research. The IRB believes that the research procedures adequately safeguard the subject’s privacy, welfare, civil liberties and rights. The Chairperson of the IRB may be reached through the Office of Grants and Research Services. The telephone number of the office is (973) 378-9809.

Once, again I invite you to participate in what I believe is an important study. If you wish additional information about the project, please contact me at (973) . Thank you.

Sincerely,

Linda Crescione
Appendix H

Letter of Instruction to Participants
Instructions for Completion of the Personal Data Sheet and Teacher Efficacy Scale

Your time and effort in giving careful thought to the questions on the enclosed surveys are very much appreciated. The surveys are designed to collect information regarding the attitudes and perceptions of urban and suburban teachers who have completed intermediate or advanced training in 4MAT and its impact on teacher efficacy.

The Personal Data Sheet requests demographic information which will be used to determine relationships that may be common to various groups of people. Participation is voluntary and all individual responses will remain anonymous and confidential.

After completion of the survey instruments, please place in the envelope provided and seal. Completed surveys will then be collected by the building facilitator and will be returned to the researcher in a sealed envelope.

Thank you for your cooperation!