Theses and Dissertations (All)

5-2009

Brain-Based Learning: Knowledge, Beliefs, and Practices of College of Education Faculty in the Pennsylvania State System of Higher Education

Shelly R. Klinek
Indiana University of Pennsylvania

Follow this and additional works at: http://knowledge.library.iup.edu/etd

Recommended Citation

Klinek, Shelly R., "Brain-Based Learning: Knowledge, Beliefs, and Practices of College of Education Faculty in the Pennsylvania State System of Higher Education" (2009). *Theses and Dissertations (All)*. 1027.
http://knowledge.library.iup.edu/etd/1027

BRAIN-BASED LEARNING: KNOWLEDGE, BELIEFS, AND PRACTICES OF

COLLEGE OF EDUCATION FACULTY IN THE PENNSYLVANIA STATE

SYSTEM OF HIGHER EDUCATION

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Education

Shelly R. Klinek

Indiana University of Pennsylvania

May 2009

Indiana University of Pennsylvania
The School of Graduate Studies and Research
Department of Professional Studies

We hereby approve the dissertation of

Shelly R. Klinek

Candidate for the degree of Doctor of Education

_____ _____
George R. Bieger, Ph.D.
Professor of Education, Advisor

_____ _____
Cathy Kaufman, Ph.D.
Professor of Education

_____ _____
Jo Holtz, Ph.D.
Professor of Education
Edinboro University of Pennsylvania

ACCEPTED

_____ _____
Michele S. Schwietz, Ph.D.
Assistant Dean for Research
The School of Graduate Studies and
Research

Title: Brain-Based Learning: Knowledge, Beliefs, and Practices of College
          Education Faculty in the Pennsylvania State System of Higher Education

Author: Shelly R. Klinek

Dissertation Chair: Dr. George Bieger

Dissertation Committee Members: Dr. Cathy Kaufman,
                                   Dr. Jo Holtz

The purpose of this descriptive study is to examine brain-based learning within a framework of multiple intelligences, cognitive learning, and planned behavior. Brain-based learning is a strategy to incorporate different styles of learning to enhance student achievement. The primary purpose is to gain an understanding of higher education teacher education faculties' knowledge, beliefs, and practices of their experiences with brain-based learning and if they incorporate it in their classroom.

With the publication of "The Universe Within: A New Science Explores the Human Mind" by Morton Hunt in 1982, shows how cognitive science relates to many other fields and describes how the mind works. Howard Gardner's Multiple Intelligences theory will also relate the mind and the use of brain-based learning in the classroom. The examination of background information will correlate medical and educational links to brain-based learning.

The method used was a survey, designed by the researcher and distributed to teacher education faculty in the Pennsylvania State System of Higher Education by e-mail. The survey research report aggregated data only, so confidentiality was maintained.   A quantitative approach was used with the information gathered from the teacher education faculty.

ACKNOWLEDGEMENTS

This project is dedicated to my whole family. First and foremost, to my lifelong partner, Tina, whose insight, inspiration, and patience were instrumental to its completion. To Catherine Rose, my daughter, who helped me realize what life is all about and my new son, Daniel, who was born weighing 3 pounds and 11 ounces. I always knew at the end of my day I would come home to my wonderful family and that made all the difference in the world to me. To my parents and in-laws for instilling in me the importance of hard work and family: I could not have done this without your support. I would also like to thank my cohort, Dr. Debbie Ciesielka, for her great insight and help when I needed it the most, and a big thank you for Dr. Jo Holtz and Dr. George Bieger for stepping in at the last minute and saving me. It actually worked out better than I planned. And lastly to my good friend Charlie Reed-Mundell, I thank you for your help in countless times you edited my writing and helped me through.

A special thanks to my dissertation committee: Dr. George Bieger for his kindness and wisdom; Dr. Cathy Kaufman for her sincerity; and Dr. Jo Holtz for her friendship. Thanks for everything. Also thanks to Dana Reed at the Student Voice, Christoph Maier and Brian Lawrence at the IUP Lab, Gail McCauley, and a big thank you to Jane Thompson.

This work would not have been possible without teacher education faculty who dedicate their lives each day to help their students become better teachers. Your responses to the survey provided the foundation for the study, and I thank you.

Finally, thank you Lord, for getting me through emotionally and financially and becoming a better person in the process. There is a reason for everything!

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

THE PROBLEM

Changing demographics and kindergarten though 12 school reform initiatives, such as the *No Child Left Behind* (NCLB) Act of 2001), have reinforced the need to better understand the process of learning and how best to teach a variety of learners. One issue that continues to resurface is how best to deliver information and facilitate learning for the student (Bolliger & Martindale, 2004).

Guarino, Hamilton, Lockwood, and Rathbun (2006) looked at the effect of teacher qualifications and practices on achievement in reading and mathematics among kindergarten students. They found that engaging students in activities such as reading aloud or showing how to solve a problem were among the teaching strategies associated with improved test scores. Furthermore, taking four or six or more courses in teaching methods was associated with greater use of student-centered instructional practices. Yet in a 1998 survey of teaching practices of faculty teaching undergraduates, 83% indicated lecture/discussion as their primary teaching strategy (Chen, 2002). Now in question is whether college of education faculty are role-modeling the most effective instructional methods for future kindergarten through 12th grade teachers.

Best practices in education have emerged from numerous theories: cognitive learning theory (Gagne, 1978; Perkins, 1999), metacognition (Flavell, 1971), multiple intelligences (Gardner, 1983), and adult learning theory (Arygis, 1974). The field of cognitive psychology has formed the majority of these theories early and they eventually evolved into neurobiology, biology of cognition, education and behavioral theories, and

theories of learning. This study evaluates a theory-based process of elements from Ajzen's Theory of Planned Behavior (TPB). TPB has been successfully used in many contexts, especially in healthcare. Ajzen created a step-by-step process to choose human-subject characteristics to use in his studies. This process was used in this study as an eight-step process for higher education elements to focus on in brain-based learning (Ajzen & Fishbein, 1980). According to Greve (2001), Ajzen's theory has become the most widely applied in his field.

However, in the real world of higher education, resources are very scarce to allow certain elements of investigation. There are not many studies on brain-based learning and attitudes of teachers in brain-based learning in higher education. Even if researchers with enough time were found to conduct these studies, the cost of changing education and lack of completeness of analyzing teaching techniques in higher education classes would be prohibitive. This lack of completeness is not itself, a problem; an analysis of a larger sample can yield valuable information. In drawing samples from classroom elements (i.e., lectures, discussions, interactions, temperature, environment, seating, charts, mind-maps, field trips, role plays, and experiences within classes and the quality of other supports that impact students' experience of their learning), some faculty may make instructional choices based on convenience, academic politics, personal preferences, past experiences, and other influences that may, or my not, result in the best form of learning for each individual.

Other faculty may take a more reasoned approach, and turn to the research literature for a better understanding of brain-based learning. In doing so, they will find a multitude of learning strategies and styles, each with its own methodology, its own

processes and suggestions, and its own ideas about what the key elements of learning are. In education, the bottom line is student learning and student achievement (Wong & Wong, 1998).

Ajzen's eight-step process goes beyond other methods and theories because it is easy to tailor to individual needs and resources. It is "unique to institutional needs" and it benefits many stakeholders alike.

Intended Audiences

There are many educational professionals who could benefit from this study on brain-based learning; those with a practical interest in teaching and learning styles, and those with a theoretical or scholarly interest in learning itself. More specifically, these professionals include, but are not limited to, college deans and department chairs in charge of curricular design; pre-service teachers who plan to teach in the future; and accrediting agencies wishing to perform evaluations. These professionals may be able to apply the eight-step process in actual practice.

In addition, these professionals could actually apply the process based on the findings of this study, and there are others who would be interested in its design and possibly even in studying its application. These professionals may not use the eight-step process, but may be very interested in its design and possibility in studying its application. This study may also attract those with an interest in the general topic of the application of theoretical frameworks to practical problems.

Finally, the last section of this study discusses more specifically the ways in which these professionals might use both this research study and the eight-step process.

They may also, find ways to alter the eight-step process to make it work to their own study or situation.

Brain-Based Learning

Among current learning theories, one learning theory is called brain-based learning. This theory offers an alternative understanding of learning by bridging educational practices to the rapidly emerging field of neurobiology. Jensen (2008) describes the resulting concept of brain-based education in these terms:

> The brain is intimately involved in and connected with everything educators and students do at school. Any disconnect is a recipe for frustration and potential disaster. Brain-based education is best understood in three words: engagement, strategies, and principles. Brain-based education is the "engagement of strategies based on principles derived from an understanding of the brain." (p. 410)

Proponents of brain-based learning use strategies that include teaching visualization techniques, goal-setting, decision-making scenarios, case studies, and exercises that require brainstorming, logical thinking, and mind mapping (Jensen, 1995). Adding movement as a teaching strategy is a logical extension of brain based learning. Jensen (1995) notes that the process of learning involves the whole body. "Learning physically changes the brain. Every new experience we encounter actually alters our electrochemical wiring" (Jensen, 1995, p. 30). Issacs (1992) reported that rats increased blood flow to the brain with vigorous physical activity. In addition, moving certain ways, and using cross-lateral body motions can enhance brain functions, and therefore, enhance learning (Hannaford, in Jensen, 1985). Hannaford suggests "problems in learning, in

4

some cases, might be a result of lateralization" (p. 44). Performing cross-lateral movements stimulates both sides of the brain and energizes thinking.

Brain-based learning is the platform for many of the reform efforts in learning today, but often teachers do not take into account all the learning differences in their classrooms nor understand the importance of applying different brain-based techniques (Dennison, 1981; Hannaford, 1997; Jensen, 2000; Promislow, 1998; Sylwester, 1995). One brain-based learning strategy that is changing learning today is a technique called Brain Gym® developed by Dr. Paul E. Dennison, a pioneer in applied brain research who understood the interdependence of physical development, language acquisition, and academic achievement. Brain Gym is a series of simple movements to enhance the experience of whole-brain learning (Dennison & Dennison, 1989). Brain Gym builds on Hannaford's (1995) contention that learning does not occur without some form of body movement. Through movement re-patterning, whole brain learning enables students to access parts of the brain that previously were not being used. These coordinated series of movements produce more neurotrophins (natural neural growth factors) and a greater number of connections among neurons (Brink, 1995). Teachers, trainers, and therapists in more than 80 countries now use Brain Gym movements to enhance learning (Winkelmann, 2001).

Even though new theories are found to be useful, teacher practices, however, are influenced by two factors: (a) what has been taught--or learned--in teacher education coursework; and, (b) beliefs bout specific educational practices. Perkins (1999) characterizes teaching and learning as a process in which "people learn much of what they have a reasonable opportunity and motivation to learn." According to Perkins,

learning is a consequence of thinking, so schools should be thinking-centered, not knowledge-centered. Perkins research identifies certain variables, such as positive teachers' beliefs and previous practices, as influencing the use of brain-based learning in the classroom (Caine & Caine, 1995; Dennison, 1981; Hannaford, 1995; Jensen, 1998). Consequently, the faculties' perception of brain-based learning may depend on whether brain-based learning is viewed as an opponent, supporter, or powerful assistant in education.

Successful learning of all students may be more likely to occur when teachers have sustained opportunities to study, to practice, and to use specific and various learning techniques (Darling-Hammond, 1997; Meisels, Harrington, McMahon, Dichtelmiller, & Jablon, 2002). Thus, previous knowledge opportunities as students may have an influence on future teachers' attitudes (Bandura, 1986; Darling-Hammond & Fullen, 2000; Joyce & Showers, 1988; King & Newmann, 1999; Little, 1994; McLaughlin, 1996) beliefs (Dennison, 1981; Hannaford, 1995; Jensen, 1998), and practices (Darling-Hammond, 1997; Henderson, 1992). It is the relationship of all these variables that influence whether teachers will implement brain-based learning techniques in their classrooms.

Statement of the Problem

There is a great deal of information in the literature about effective schools using brain-based learning techniques to enhance learning outcomes (e.g., Caine & Caine, 1995; Chan & Petrie, 1998; Donczik, 2001; Freeman, 2000). Effective schools using brain-based learning span the United States and Canada: Dry Creek Elementary School

in Rio Linda, California; Saticoy Elementary School in Ventura, California; Chino Unified School District in California; School District 24, Kamloops, British Columbia, Canada; Brimfield Public Grade School, Brimfield, Illinois; Berkeley, California public school Special Day class; Christies Beach High School, Australia, First Graders in Lionville, Pennsylvania; Westvale Public School in Waterloo, Van Asselt Elementary School in Seattle, Washington; Beaver Creek High School in Ashe County, North Carolina; Lincoln Elementary School in Olympia, Washington; John Marshall High School in Seattle, Washington; Valley Park Elementary School, Blue Valley School District, in Kansas City, Kansas; Westmark School in Encino, California; High School Teachers in Port Washington-Saukville School District, Wisconsin; Principals in the Bulloch County School System, in Georgia; and Bowling Green Elementary School in Hardee County, Florida. Effective was meant in the case of two schools; Dry Creek Elementary and Park View Middle School, which was a five-year plan to embark on a change to brain-based learning and teaching. This was based on research reported in formal journals and observations. The staff met weekly and explored their teaching in relation to brain/mind principles and redesigning their classrooms, school, and collaborating with others. The results were groups began to bond and establish meaningful relationships and a sense of community and stability. These factors led to greater self-efficacy and individuality (Caine & Caine, 1997).

Although there is available research about effective schools using brain-based learning techniques in elementary and secondary schools, however, there is an absence of research specifically focused on brain-based learning techniques in university settings, especially in the college of education departments.

As the research suggests, effective brain-based learning requires teachers to change their thinking and teaching methods to encompass research on learning and the brain. Caine identified three styles of teaching when she and her husband helped teachers design more innovative teaching strategies in a low-income, underachiever Kindergarten through fifth grade elementary school in California (Pool, 1997). In the first one, the teacher was in charge, using traditional strategies like lecturing, memorization, and testing. In the second style, the teacher was comfortable with many innovative learning strategies, but still directed student learning. In the third style (and rarest), brain-based teaching and learning became collaborative; there was much more mutual responsibility between students and teacher. Students knew what was wanted of them by their teachers, times were flexible, and there was coherence. Teachers had an extensive number of strategies and there was ongoing questioning and analysis. Students and teachers learned together (Pool, 1997).

In addition to research in education, new knowledge from such fields as medicine, technology, genetics, and communication lends further support to brain-based teaching as an effective means to improve student achievement, focus, and attention skills. Attention, for example, "is not a single entity but the name given to a finite set of brain processes that can interact, mutually and with other brain processes, in the performance of different perceptual, cognitive, and motor tasks" (Parasuraman, 1998, p. 3). By using some sort of motor act, the attentive process receives stimuli by the body receptors, through the central processing in the brain (Mirsky, 1978). The implication for educators is to develop a teaching schema that understands and utilizes research on learning, attention, movement, and the brain.

Educators of future teachers are in a unique position to bring about a paradigm shift that recognizes brain-based teaching methods as effective educational practices. Brain-based instruction requires instructors to understand ho the brain works and how to design instruction with that information in mind (Stevens & Goldberg, 2001). Instructional design is measured how well the design facilitates and supports the achievement of instructional objectives (Koohang & Du Plessis, 2004). It relies on learning theories and models that encourages learning (Broderick, 2001). Attention is shifting to active learning and constructing new knowledge based on prior knowledge in the real-world setting in real situations (Adler, 1998; Gagne, et al., 1992). The purpose of this study was to determine the level of knowledge, attitudes, and classroom practices in relation to brain-based learning among college of education students in a 14-university state system of higher education. According to the Pennsylvania State System of Higher Education (PASSHE) Faculty Professional Development Council, the purpose of learning is to increase knowledge in one's related discipline or knowledge about how students learn and to develop pedagogical skills and to enhance teaching and learning (PASSHE, 2008).

<center>Purpose of the Study</center>

This research examined the beliefs, knowledge, and practices of college of education faculty in the PASSHE in relationship to brain-based learning and how their knowledge affects their beliefs and practices in their own classrooms. Specifically, this study will investigate the use of brain-based learning in the PASSHE system by identifying: (a) faculty characteristics, past experiences and knowledge, demographic

<center>9</center>

factors, attitudes toward brain-based learning, and the percentage of faculty who actually incorporate brain-based learning in their teaching; and, (b) the relationship between faculty's beliefs and knowledge and the practice of brain-based learning.

This study is a multiple measure about the beliefs, knowledge, and practices of college of education faculties in brain-based learning techniques, taking individual and demographic characteristics into account. This study delineated what characteristics promote faculties' awareness of the need to incorporate a positive attitude toward change. Specifically, this research will determine if faculty characteristics and knowledge, demographic, and attitudes affect their beliefs, knowledge, and practices relating to brain-based learning.

Research Questions

Question 1.   What is the extent of knowledge Pennsylvania State System of Higher Education college of education faculty have about the indicators of brain-based learning and Brain Gym?

Question 2.   To what extent does Pennsylvania State System of Higher Education college of education faculty rate the value of brain-based learning and Brain Gym?

Question 3.   To what extent does the college of education faculty in the Pennsylvania State System of Higher Education practice or utilize indicators of brain-based learning in their teaching?

Question 4.   What is the relationship between the Pennsylvania State System of Higher Education college of education faculties' level of knowledge of brain-based learning and indicators of Brain Gym and their beliefs about brain-based learning?

Question 5.   What is the relationship between among, years of teaching experience, background, and faculties' beliefs, knowledge, and practice in relation to brain-based learning?

Theoretical Perspective

According to Weick (1995), any effort to reform instructional practices involves a change in knowledge, attitudes, and practices of the participants in the change effort. Brain-based learning is rooted in neurobiology and cognitive learning theories. Gardner's theory of multiple intelligences is based on an understanding that processes in the brain are carried out by neural networks, similar to Jensen, (1998) and Hannaford's (1995) observation that body movements effect on neurons is like that of a key inserted into the ignition of a car to fire up spark plugs. Gardner (1999) asserts individuals have a unique blend of the various intelligences that contributes to their abilities. One of the main challenges for an educator is to find students' abilities to help them learn best. Application of Multiple Intelligence Theory in the classroom, Chris Arygis's Theory of Espoused Learning, and Adult Learning Theory will be discussed in Chapter II, along with Icek Ajzen's Theory of Planned Behavior.

Multiple Intelligences in Adult Learning

Kallenbach (1999) in the first study of applications in Multiple Intelligences (MI) for adult literacy found: (1) educators using an MI framework offered a greater variety of learning activities; (2) adults exposed to MI-based approaches constructed their own meaning through problem-solving and self-directed learning projects were successful; (3) educators using an MI theory broadened their own teaching styles and took more risks; they indicated their lessons became more creative and they were able to teach to various ability levels; (4) educators found that it would be more meaningful if students could indicate their own intelligence levels; and, (5) educators provided students more choices in how they learned.

Cognition

In order to promote cognition and instructional change, educators must have in place the professional knowledge and attitudes which advance their daily practice (Collinson, 1999). According to Perkins (1990), the challenge is in the classroom. The greatest challenge is to find practices that work on a wide scale and that are easy to implement. Cognitive science research has helped educators understand how learners develop a knowledge base as they learn (Bransford, Brown, & Cocking, 2004). Learning requires understanding and building on existing knowledge. Craik and Lockhart were two authors of a cognitive learning theory that proposed memory was enhanced more by depth and that there was an association with physical and sensory characteristics. Also, deeper processing related to stronger memory traces. These physical and sensory depths are similar to what brain based learning and Brain Gym does. They connect neural

pathways to enhance learning. Another cognitive learning theory "Script Theory" was developed by Roger Schank, a strong critic of today's educational system. Schank's approach to learning involves students learning in safe learning environments. His interest is in adult learning and talking or learning in small, coffee shop-like atmospheres or spaces where learners can gather freely in a wide variety of environments, including science labs, gardens, and dance studios (Schank, 1977).

Also, part of cognitive learning is the Neurophysiological Theory of Learning by Donald Hebb, often called the "Father of Cognitive Psychobiology." This theory states that thoughts paired with sensory input determines the number of responses to be made. Repeated transmissions of neural impulses between neurons lead to permanent facilitation of future impulses along the same pathway. That is what Brain Gym exercises do, they create stronger neural impulses which lead to permanent facilitation along the same pathway to help learning occur. Hebb suggests higher learning processes such as problem solving are a combination of cell or closed pathways or sequences. That is what six of the Brain Gym activities do with that information that has been learned or experienced that is stored in the long-term memory center in the brain. Those exercises enhance that part of the brain (Water, Lazy 8's, Earth Buttons, Space Buttons, Hook-Ups and Cross Crawls).

Learning

Learning is what the human brain does best. "Learning changes the brain because it can rewire itself with each new stimulation, experience, and behavior" (Jensen, 1998, p. 13). As educators, the concept of stimulation can give us useful insights into how

13

students learn. Doing something new is stimulation. According to Jensen, mental or motor stimulation produces greater beneficial electrical energy.

Regarding stimulation, in comparison with Brain Gym, movements that produces more neurons and connections, learning is stimulating the brain and creating new connections. There are two kinds of brain cells: neurons and glia. Neurons are responsible for moving chemical and electrical signals back and forth, and processing information (Jensen, 1998). At the Salk Institute in La Jolla California, new research revealed that some areas of the brain can grow neurons (Kempermann, Kuhn, & Gage, 1997).   Learning is a critical function of neurons (Greenfield, 1995). "The key to getting smarter is growing more synaptic connections between brain cells and not losing existing connections" (Jensen, 1998, p. 15). Each neuron has several thousand synapses. A synapse is "the junction communication point where neurons interact" (Jensen, 1998, p. 118).

Knowledge

Educators with prior knowledge of brain-based learning are more likely to make connections with their students and enhance their teaching skills. According to Jensen (1995), the brain is more likely to make connections to new material when prior learning takes place, therefore, increasing comprehension and meaning. An educator must also have credibility with the students. Extensive research was done by Lozanov in 1979 on the power of "teacher authority." His studies revealed that a great deal of learning took place because of the authority and prestige of the teacher. The more appropriate approach today for students is recognizing their rights, offering them choices, and

embedding in them the desire to cooperate (Jensen, 1995). "The more knowledge a person has, the more the person is able to accomplish" (Wong & Wong, 1998, p. 297). Knowledge gives a person power and options. More knowledge educators have in brain-based learning, more learning opportunities can occur. More learning takes place when knowledge is added and more options are available (Kempermann, Kuhn, & Gage, 1997). Learning is a critical function of neurons (Greenfield, 1995). "The key to getting smarter is growing more synaptic connections between brain cells and not losing existing connections" (Jensen, 1998, p. 15). Each neuron has several thousand synapses. A synapse is "the junction communication point where neurons interact" (Jensen, 1998, p. 118).

That is what Brain Gym does. It is movement that helps fire up connections between brain cells. Like a spark plug in an engine, jump starts the motor and keeps it energized.

In conclusion, knowledge is very important for a teacher to have. Similarly, a teacher should know how to jump start students brains to keep them energized throughout the day.

<center>Summary</center>

Children are born with certain capacities to learn. The environment surrounds us with information and provides structure to that information. Thus, developmental processes involve interactions between the environment and interpersonal information. Learning is promoted and regulated by the child's surroundings and knowledge. Cognition is due to processes involved in conceptual reorganization and the ability that

<center>15</center>

relates to learning. Knowledge that is taught in a variety of ways is more likely to be learned and developed into understanding concepts that can be used more generally. Students develop the understanding of when, where, why and how to solve problems if they learn underlying themes and principles from their learning experiences (Bransford, Brown, & Cocking, 2004). Gardner (1983) asserts that the brain is designed to process certain distinctive forms of intelligence. Cognitive abilities focus on important problem areas in the brain. Consequently, the brain has to effectively process factors and problems we face so that we can effectively learn new things (Sylwester, 1995).

In conclusion, multiple intelligences, cognition, learning, and knowledge are all related to brain-based learning. Educators now know to provide learners with brain-compatible environments and curricula that support their natural ability to learn (Jensen, 1995). The key is to get educators on the same page and to have a positive attitude about brain-based learning and new techniques to use in the classroom.

Definition of Terms

Brain-based learning--is a learning approach that is aligned with how the brain naturally learns best. "Brain-based learning is a way of thinking about the learning process. It is a set of principles; and a base of knowledge and skills upon which we can make better decisions about the learning process" (Jensen, 1995, p. xiv).

Brain Gym--"A coordinated set of integrative movements that enhance learning for everyone" (Hannaford, 1995, p. 13).

Magnetic Resonance Imaging (MRI)--"Brain imaging technique using a large magnetic field to map the structure of the brain" (Sprenger,1999, p. 104).

16

Neuron--"Brain cell associated with learning and memory" (Sprenger, 1999, p. 104).

Positron Emission Tomography (PET)--"Brain imaging technique that measures the amount of glucose consumed by areas of the brain while subjects perform various activities" (Sprenger, 1999, p. 104).

Delimitations

This survey study will be confined to college of education faculty in the PASSHE. The participants were selected from the following Universities in Pennsylvania: Bloomsburg; California; Cheyney; Clarion; East Stroudsburg; Edinboro; Indiana; Kutztown; Lock Haven; Millersville; Shippensburg; Slippery Rock; and West Chester. Mansfield decided not to participate in this study due to extra duties being added to the College of Education Department and not having the time.

Limitations

Restricting analysis to college of education faculty who were servicing students in a university setting in one state system limits the ability to generalize results. Furthermore, this study will investigate: (a) faculties' knowledge regarding brain-based learning; (b) faculties' beliefs regarding indicators of brain-based learning; (c) faculties' practices regarding brain-based learning; and, (d) the relationship among faculties' knowledge, beliefs and practice of brain-based learning. Limitations of the study include the definition of brain-based learning, scope of the instrument, and choice of statistical techniques used for data analysis. Following an extensive search to locate appropriate instruments, no instruments were found. "Since the instrument has been developed by

17

the researcher, validity and reliability data have not been determined." We are not sure if it does lack validity-we just do not know at this point.

Significance of the Study

A comprehensive review of the literature in the area of brain-based learning argues for its use in schools and the need for a shift in the way schools approach learning today. Despite ongoing discussions concerning the importance of learning, little attention had been devoted to understanding how much faculty comprehend the process of brain-based learning, and how both faculty knowledge and attitudes actually affect instructional practices. In addition to each of these factors, little was known about the relationship of knowledge, attitudes, and practices in the classroom setting. These perspectives are imperative, however, if changes in teaching are to occur.

As the issue of brain-based learning was analyzed and evaluated through the Review of Literature, several gaps in the research which provided the need for further study in the area of brain-based learning emerged. Factors that influenced knowledge, beliefs and practices were: (a) the need for a deeper knowledge and understanding of the process of brain-based learning; (b) the need for ongoing collaboration with other professionals; and, (c) the need for sustained professional development of educators to support and encourage greater knowledge, beliefs, and effective practice.

Need for Deeper Knowledge

Teachers as learners present a number of questions for those involved in strategies and learning techniques. Learning how to make thoughtful, reasoned decisions is an ongoing process of professional practice (Meisels, Harrington, McMahon, Dichtelmiller,

& Jablon, 2002). Teachers who plan with regard to students' abilities and needs and who are more flexible while teaching are more effective (Darling-Hammond, 1997).

Because the traditional classroom is often teacher-centered and primarily dependent on rote learning, the use of brain-based learning strategies may require a shift in paradigm for instructional faculty. This study will provide insight into the relationship and influence certain variables have on the faculties' practices of implementing brain-based learning techniques into their classrooms.

Despite ongoing discussions concerning the importance of learning in schools, little attention has been devoted to understanding how much teachers comprehend the process of brain-based learning, how educators perceive Brain Gym, and how both teacher knowledge and beliefs actually affect the instructional practices of teacher education faculty. In addition to each of these factors, little is known about the relationship of knowledge, beliefs, and practices in teacher education faculty in a university setting.

The Need for Ongoing Collaboration

Staff support is very important to improve one another's professional competence and to ensure growth. To help implement success, educators need to form support groups (Wong & Wong, 1998). Cooperation is also very important for educators. Cooperate with each other, learn from each other, and acquire knowledge from each other. According to a study in 1992 at Stanford University seven school districts in California and Michigan found that the most effective educators were the ones who worked together with other like-minded colleagues, addressed problems and found solutions together

19

(Wong & Wong, 1998). This relates to the study because faculty that acquires new knowledge in brain-based learning strategies can work together with other faculty members and help teach pre-service student teachers the value of different brain-based learning techniques in order to enhance student learning. According to researcher Karen Ellen Martin 2006, leaders in education need training and resources to expand their knowledge in brain-based learning and develop their skills so they can share that information with other colleagues.

The Need for Professional Development

The effective professional is constantly learning and growing. Educators with knowledge have more options and are more effective. Educators, who read literature, attend conferences and conventions are likely to solve problems and accomplish more. Some professionals believe development in education is lacking today. Mary Atkinson, a social studies teacher at the High School for Health Careers and Sciences in Manhattan, recalls that the professional development that she attended always focused on such basic topics as writing lessons plans. More professional development needs to be centered on topics like research-based instruction. "New knowledge should come from intensive professional development that helps teachers and principals understand what works" (Jacobson, 2007, p. 14).

This study helps show professional development is needed in the area of brain-based learning in higher education. New knowledge about teaching strategies should be the focus of all pre-service student teachers and teacher education faculty should be the ones to successfully implement this in their own classroom.

Summary

In order to promote cognition and instructional change, teachers must have in place the professional knowledge and attitudes which advance their daily practice (Collinson, 1999). In order for brain-based learning to become the tool that it can be, in order for students to have learning experiences which lead them to achieve higher goals and standards, and in order for school systems to reach their missions for improved student performance, an investment in developing the capacity of teachers to develop teaching strategies which align instructional goals with brain-based learning is essential. Becoming more knowledgeable about the implications of brain-based learning and the ways it can be successfully implemented by education faculties can serve to enhance teaching strategies to learners to better serve students, and ultimately our future teachers.

A study of the factors which influence brain-based learning is important for several reasons. First, assessing the current status of teacher education faculties' knowledge, beliefs, and practices in brain-based learning can lead to an increased understanding of where educators stand in relation to educational reform and in preparing highly qualified professionals, and help provide direction for the future of brain-based learning as a classroom practice. Second, understanding the relationships between knowledge, beliefs, and practices may help reveal to teachers and administrators, how to best implement curricular decisions to provide for all three areas. Third, determining what factors influence teacher faculties' knowledge of, beliefs in, and practices in brain-based learning can help to pinpoint specific professional development opportunities which may contribute to the future success of learning. Many areas of brain-based

learning still need more research, "but dozens of studies are clear and solid enough to be transformed into classroom practice" (Jensen, 1998, p. 16).

CHAPTER II

REVIEW OF THE LITERATURE

The literature review presented in this chapter consists of an overview of existing

research related to brain-based learning and show the specific research used by the study

to develop the theoretical framework of factors that influence the knowledge, beliefs, and

practices of college of education faculty in the PASSHE in relationship to brain-based

learning. Next, it defines the theories regarding multiple intelligences, cognitive

learning, including metacognition, adult learning theory, and the theory of planned

behavior which will provide further research support for the use of brain-based learning.

In order to optimize the quality of educators attitudes, two tasks were performed. First, a

theoretical framework on which to base the process was sought. Second, research on

what constitutes the characteristics of teaching and learning. Appropriately, Ajzen's

Theory of Planned Behavior was chosen as the theoretical framework (this choice was

supported by much research suggesting the theory was a sound and useful one), and

recommendations for characteristics or elements that would be incorporated were found.

Furthermore, the literature review discusses the importance of choosing a

theoretical model, along with why Ajzen's model is such an appropriate choice.

Justification for this choice can be found in the literature discussing the credibility, and

its uses for research.

Necessity of a Theoretical Framework on Which to Base Brain-Based Learning

Guiding principles are needed to help faculty create an appropriate learning strategy. There cannot be an accomplishment without taking some risks. Risks are necessary. Wong and Wong (1998) explain that before educators take risks in their class they should:

> Identify what you need to resolve. Read to see what technique is available. Observe other teachers using the technique. Ask questions about the technique. Discover that many others are using the technique, and determine that the technique is a commonsense approach supported by research. (p.304)

In addition to the explanation offered by Wong and Wong (1998), Johnson and Ryan (2000) add that because so many stakeholders are involved, there will be a variety of interest and need for information, so it is useful to evaluate as many actors as possible by multiple approaches. Thus, a systematic framework for setting priorities is a key. The current teaching and learning styles in the literature prescribe certain steps based on what each researcher deems important, not based on what each faculty might choose to be important for his/her own teaching style. Ajzen's model, the eight-step process, offers a way for educators to set priorities that fit his/her own situation. The theoretical model that was chosen as the foundation for using brain-based learning is a conceptual framework that served to focus on the individual needs of the teachers and learners. This frequently used and well researched model was created by Icek Ajzen. This model is called the Theory of Planned Behavior (TPB). The TPB suggests in seeking to create an effective model (bringing about a certain behavior in population), one needs to focus on the most dominant attitudes that the subject or population holds pertaining to that

24

behavior. Users of the TPB model typically perform exploratory research to discover

attitudes that may possibly be related to the behavior, and then discover more research to

find which of those attitudes are most influential to the subject or population (Figure 1).

Table 1 shows how steps in the TPB protocol provide the basis for the eight-step process

studied in this dissertation.

Multiple Intelligence Approach

Educators who address the diversity of learners through differentiation of

instruction using a multiple intelligences approach, allows for a variety of strategies that

could enable various ways for students to learn. The more strategies the better.

Cognitive Learning

Cognitive psychology examines the mental processes such as memory, language,

and problem solving. This was first noted in the work of Jean Piaget, who discovered

stages/phases that described the cognitive development of children. Jean Piaget's

Developmental Psychology (Flavell, 1963) has had a tremendous impact on how

practitioners and researchers conceptualize cognitive development. Cognitive

psychologists are interested in how people solve problems, understand, and diagnose

mental processes. The contention of cognitive theory is that solutions to problems are not

necessarily understood but promise a solution or rules that can be found through insight,

a sudden awareness of relationships. Cognitive psychology explicitly acknowledges the

existence of mental states (belief, motivation, and desire) unlike behaviorist psychology.

25

Behavioral   Attitude
Beliefs   →Toward the
            Behavior

Normative   Subjective   Intention   Behavior
Beliefs   Norm

Control   Perceived
Beliefs   Behavioral
          Control

                               Actual
                            Behavioral
                             Control
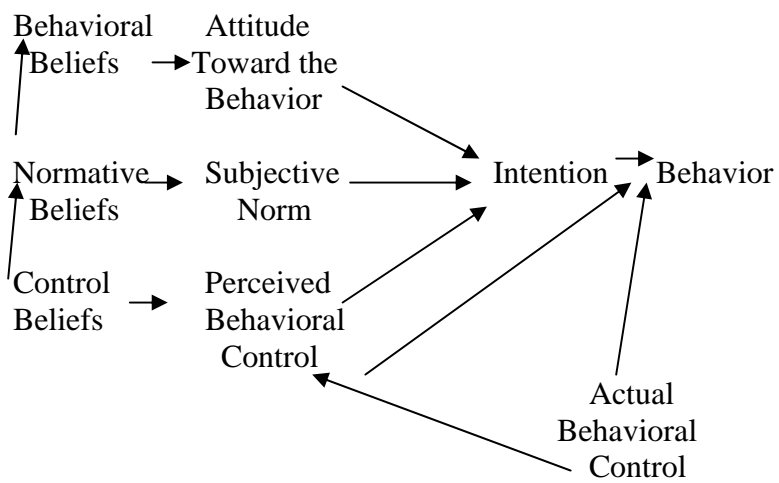
Figure 1. Theory of Planned Behavior Model (Ajzen, 2006).

Table 1

Icek Ajzen's Eight Step Procedure of Theory of Planned Behavior

STEPS	TPB PROCEDURES
1	Perform exploratory research (surveys of people and literature) to find which attitudes about a behavior are likely to be most salient.
2	Decide on ways in which to define measure and evaluate those attitudes.
3	Carry out the questioning of subjects regarding these attitudes.
4	Analyze the findings produced by the evaluation, and check to see that these findings are valid and that the most important elements decided upon in Step One really did turn out to be the most salient elements.
5	Correct for any problems found in Step Four by examining any elements that needed to be assessed or re-assessed.
6	Take all of the findings and translate them into a list of possible interventions that can be implemented to change subjects' behaviors.
7	Use a decision process similar to that in Step One, in order to find which possible actions are most cost-effective in terms of feasibility and effectiveness given the resources available to implement them.
8	Consider the chosen actions and create an action plan for approval and implementation by the institution.

Albert Bandara (Driscoll, 2000), explored the roles in motivation and students'
cognitions about learning. He noted that self-efficacy was a belief system that is causally
related to behaviors and outcomes. People make judgments about certain actions then
based on those judgments; they follow through in those actions.   According to Bandura
(1977), people develop self-efficacy beliefs in different ways and to different degrees,
that is what makes individuals perform differently under certain circumstances and in a
variety of ways. Bandara (1997), suggested four principals by which people gain
information to persuade their self-efficacy beliefs:

1) Enactive mastery experiences that provide feedback on learners' own
   capabilities.

2) Vicarious experiences that provide comparative information about the
   attainment of others.

3) Verbal persuasion, which provides the learner with information about others
   believe he or she is capable of doing.

4) Physiological states, internal feelings by which learners judge their ability to
   engage in the task at hand.

Another theorist, Lev Vygotsky (1978), emphasized the role of social interactions
in knowledge. He introduced the zone of proximal development, which is the difference
that a student can cope independently, and learning and development can take place with
the help of others. Once they are aware of the current theories, if faculty members can
learn to shift their pedagogical strategies from teacher-oriented to learner-centered,
students will become more actively involved in the learning and teaching process.
Higher education faculty also needs to be educated in the process of human cognition.

Biology of Cognition

The biology of cognition according to the "Biological Theory of Cognition" of Dr. Humberto Maturana, attempts to show how the processes of human cognition arise from the operation of human beings as living systems (Maturana, 2002). The biology of cognition understands living systems, their history of evolution, language, the nature of explanations, and the origin of humanness. What we do as observers is a study in knowledge epistemology.

Cognitive vs. Behavioral Psychology

In American psychology from 1920 to 1970 the behaviorist movement dominated what happened in the traditional classroom (Hofstetter, 2008). B. F. Skinner indicated that psychology was exclusively about behavior and that behavior was mostly determined by its outcomes. This was effective for learning how to help humans modify their behavior and train animals, but not effective in education for educators. According to Bruning (1995), an educator must help the student learn how to develop strategies for learning.

Learning and Planned Behavior: Theory and Practice

The American system of education is woefully outdated when it comes to advanced learning techniques (Linksman, 2001). "Both national and international studies consistently show that the large majority of U.S. schools emphasize rote learning with heavy doses of lecture, drill and practice, memorization, and multiple-choice and short-answer testing" (Darling-Hammond, 1977, p. 9). Some schools are using new teaching strategies involving the use of multiple intelligences in the classroom and are becoming

highly effective. A recent study published in 2007 indicating that MIT or Multiple Intelligences Theory based instruction had a statistically significant effect upon the academic success of students and the permanence of the teaching process (Köksal & Yel, 2007).   The purpose of the study was to investigate the effects of multiple intelligence-based biology education upon the academic success of high school students, their attitudes toward the course, and the permanence of the teaching process compared to the classical approach. Results showed that multiple intelligence-based instruction had a statistically significant effect upon the academic success of the students and the permanence of the teaching process compared to the more traditional approach where there was no significant difference on the attitudes of the students toward the course. This study was conducted with 10th grade high school students who were enrolled in classes in Ankara Anatolian High School during the 2004-2005 spring semester. Classes were randomly assigned the "control" and "experimental" groups. The study took nine weeks, four weeks for the instruction, two weeks for the application of the pre- and post-tests, and one week for the application of permanence test after two weeks from the application of the post test. The data instruments were the Respiratory Systems Test to measure academic achievement, the Multiple Intelligence Inventory (MI) to determine intelligence fields of students, and the Biology Attitude Scale to measure attitudes toward the course. The data obtained from the test, scale, and inventory was analyzed by SPSS. Statisitical evaluations were carried out by t-tests for the independent variables and MANCOVA. Results for both tests were evaluated at .05 significance. New and innovative strategies are starting to occur as a way to promote higher levels of learning among students (Abruscato, 1993; Newmann & Wehlage, 1995; Wiggins, 1993).

In their study, Ucak, Bag, and Usak (2006), investigated whether there was a difference between multiple intelligence instruction and traditionally designed science instruction on seventh grade students' understanding the concept of multiple intelligences. Two classes with 27 students were randomly selected. The experimental group was instructed using MI strategies, and the control group was taught with traditional methods. Two scales were used to collect data, a chemistry achievement test (CACT) and a science attitude scale (SAS). The results were that MI instruction, when compared to the traditional learning method, created positive effects on students' success and attitudes toward science. The MI group participated actively in practices like writing poetry, listening to stories, composing songs, drawing schemas, and providing feedback. Achievement levels (according to the CACT) of the students using the MI instruction were higher than the students taught through a traditional method. The data collected in this study was analyzed using SPSS 11.5. Two t-tests were performed: paired samples t-test to determine if there was a significant difference between pre-test and post-test results and independent sample t-test to identify knowledge levels of all students and to find out whether a significant change occurs between groups as a result of the method used.

Science attitude pre- and post-scale results were analyzed separately. Differences in students' attitudes to science between pre- and post-test results are presented in

Table 2

Pre- and Post-Test Results of SAT

	Group	N	$^-$X	SD	t	p
CG	Pre-test	27	3.80	0.56	0.59	0.55
	Post-test	27	3.72	0.57		
EG	Pre-test	27	3.87	0.50	1.53	0.13
	Post-test	27	4.11	0.49		

There were not statistically significant differences between pre- and post-test results of CG and EGs for SAT. The science attitudes of EGs increased after the experimental process of using lessons in MI theory. Portfolios were also used that reflected classroom activities and held by EGs during their study. The portfolios were divided into three groups: the aim of studying, reflecting, and evaluation. At the end of this study, the experimental group had significantly gained achievement in the understanding of diversity of living things concept. It was seen that the instruction using the multiple intelligences theory, got positive feedback both from parents and students.

Approaches to Brain-Based Learning

Because of the growing concern about learning and the brain, these attempts to synthesize current research in the area of brain-based learning from both a theoretical and practical basis will: (1) define and describe the major characteristics of brain-based learning; (2) identify new trends that are instrumental in the development of today's classroom learning; (3) provide a theoretical framework which supports the use of brain-based learning as a process; and, (4) identify factors which contribute to faculty change in reform efforts such as using brain-based techniques in the training of new teachers.

Brain-based learning accommodates the learning style of individual students. It is learning with the brain in mind (Jensen, 1995). This is not a new approach. According to educational leader Eric Jensen, "Brain-based learning is a reality check" (p. 77). People might say that good teachers have always been doing this. Jensen questions this. Thirty-five years ago, good teaching was defined as lecture, content-laden classes, and quiet students sitting still at their desks. Do students really learn best this way? Educators

need to combine the findings of brain research and other fields to strengthen their

teaching techniques. "The brain is what we have; the mind is how we use it" (Jensen, p.

77). According to Jensen, we now know that incorporating intense emotions associated

with celebration, competition, or drama can stimulate the release of adrenaline which

strongly enhances memory in learning. "Challenge, feedback, novelty, coherence, and

time are crucial ingredients for rewiring the brain" (Jensen, p. 79). For connections to

strengthen, students need time to think about, digest, and act on their learning.

Caine, author of *Unleashing the Power of Perceptual Change: The Potential of

Brain-Based Teaching* notes that good learning engages feelings. Attention, meaning,

and memory are forms of learning that involve emotion (Weiss, 2000). By synthesizing

educational and scientific research, Caine and Caine (1990, 1994) established a brain-

based theory of learning with 12 basic principles that apply to classroom instruction. The

principles constitute a strong connection between the neurosciences and education, as

well as introducing the human learning process.

Table 3

The Principles of Brain-Based Learning and Related Educational Applications

12 Principles	Related Educational Applications	Brain-Based Learning Indicators
(1) "The brain is a parallel processor" (p. 80).	Teachers need to select from a wide variety of methods and approaches.	Offer learning activities that incude Auditory, visual & kinesthetic components..
(2) "Learning engages the entire physiology"(p.81).	Give students choices and opportunities to make decisions for problem solving.	See how they like to learn best. Students engage in their own learning rather than teacher telling them.
(3) "The search for meaning is innate" (p. 81).	Teachers should provide a rich environment that is meaningful and challenges every learner.	BBL variables should include: lighting music, temperature, furniture design, seating, noise level, & people.
(4) "The search for meaning occurs through patterning" (p.82).	For teachers to be effective, learners must create meaningful and personally relevant patterns.	Encourage questions and use pictures, symbols, icons & themes.
(5) "Emotions and cognition cannot be separated" (p. 82).	Teachers should understand student's feelings. Cooperative learning and metacognition are utilized.. positive environment.	Interact daily with learner. Emphasize cooperative learning.
(6) "The brain processes parts and wholes simultaneously" (p. 83).	Teachers s acknowledge the brain's tendencies.. Effective teaching builds understanding & skills…	Use comparing & contrasting. Provide frequent feedback.
(7) "Learning involves both focused att. and peripheral perception" (p84).	Teachers should organize learner's attention & focus to facilitate learning	Use charts, mind-maps, music, art exhibits, illustrations, field trips exper.
8) "Learning always involves conscious and unconscious processes" (p. 84).	Teachers should design encouraging instruction. Active rather than passive learners.	Provide visual aids, partner learning & audio books.
9) "Humans have 2 different types of memory systems: one system for rote memory & another for spatial memory" (p. 85).	An effective teacher will utilize the brain's natural, spatial memory system. It should be enriched over time and procedures internalized & activated by relevant experiences.	Use real-life situations & bring in guest speakers.

Table 3 (continued)

The Principles of Brain-Based Learning and Related Educational Applications

12 Principles	Related Educational Applications	Brain-Based Learning Indicators
(10) "Humans understand and remember best when facts & skills are embedded in natural, spatial memory" (p. 86).	**Teachers use real-life sit. & encourage active participation. Instructional activity include: hands-on demonstrations, projects, field trips, visual imagery and an integration of different subjects.**	**Use mental maps, encourage mental imagery, use handouts & overheads, use role play, Encourage field trips and community projects.**
(11) "Learning is enhanced by challenge and inhibited by threat" (p. 87).	**Teachers should create a relaxed and comfortable learning environment that is challenging.**	**Use relaxation & calming techniques, low calming music, comfortable: seating, lighting & temperature.**
(12) "Each brain is unique" (p. 87).	**Teachers should allow students to express in different ways.**	**Provide learners with options and choices, & allow time for questioning & reflection. Use journal writing.**

In conclusion, although scientific information about the brain cannot indicate exactly how to proceed, "the educational road map ought at least to be so charted" (Gardner, 1989, p. 153) that it is consistent with what is now known about the brain and learning. Educators need to take a look at the uncharted waters and test the currents to become better navigators.

The Need for Brain-Based Learning

By knowing more about the brain, teachers can make better decisions and reach more learners. According to Wagmeister and Shifrin (2000), recent advances in brain-based learning helped their program meet diverse student learning needs. Under the current standards of NCLB lawmakers are now finding out teaching only bare academics is not enough. Students are now facing personal problems at home, and not being able to focus when confronted with the daily challenges of life. Brain-based learning strategies can be implemented through careful management and planning (Kaufeldt, 1999). All teacher education programs would benefit greatly by learning about brain-based teaching strategies so they can incorporate them into their own style of teaching and meet all the needs of their students. A program in Encino, California, helps children with dyslexia, dysgraphia, and dyscalculia.

> Dyslexia is difficulties in learning to read, write, or spell; understanding oral language. Dysgraphia is a difficulty in automatically remembering and mastering the sequence of muscle motor movements needed in writing letters and numbers. Dyscalculia is a difficulty in understanding symbols or functions needed for success in math. (Wagmeister & Shifrin, p. 45)

For the past two years, the staff has begun to study the concept of how the brain works and started using more technology in the classroom. "The result is an atmosphere where children thrive" (Wagmeister & Shifrin, p. 45). This approach brings excitement to learning and challenges the students. According to Wagmeister and Shifrin (2000), "A brain-based program creates a safe, nurturing environment where children expand their knowledge, find patterns, make connections, and take risks" (p. 45). Staff development for teachers and the entire school community is a very important part of a stimulating program.

In another school, after using a brain-based learning approach for three years, Dry Creek Elementary, a K-6 school in Rio Linda, California, showed a steady improvement in standardized test scores. The entire school community discovered its own strengths and reinvented itself with a brain-based theory of meaningful learning. Teachers here used all available strategies and community resources, and orchestrated a dynamic learning environment (Caine & Caine, 1995).

Brain-based instruction was also used at Valley Park, a high performing elementary school in Kansas City, Kansas. Brain-based instruction was emphasized in which the staff set out to discover if school improvement based on brain research would affect student learning (Caulfield, Kidd, & Kocher, 1999). A significant gain in reading was evident after implementation of a year of brain-based instruction. "In fall 1994, when these students were in grade 1, the average Normal Curve Equivalency (NCE) was 48. In the fall of their 4th grade year the average stood at 66--a gain of nearly one full standard deviation" (Caulfield, Kidd, & Kocher, 1999, p. 64).

As it has been noted, brain based instruction has been effective. However, implementing innovative changes in education is not easy. Collaborative and continuous study of brain-based research, involving all members of the faculty, is only one approach to developing a process that sustains university-wide understanding and implements brain-based learning strategies. It is important that the system undertake regular assessments of the current system and university policies and practices to ensure that the education consistently reflects how students actually learn best. Faculty with knowledge about brain-based learning can provide other instructors, professors, students and administrators with useful information about brain research and brain-compatible strategies that may be useful in improving the success of all learners.

Trends in Brain-Based Learning

After three years of using brain-based learning techniques and practices, the Dry Creek educators and administrators have a better understanding of how teachers and students learn (Caine & Caine, 1995). "In brain-based learning, students use stories and complex themes to link information and understanding" (p. 43). Before, the school had traditional resources, such as textbooks, lectures, videos, or films. Traditional assessment was based on quantitative data with multiple-choice and true-false tests. Now with the brain in mind, learning takes a holistic approach, looking at teaching developmentally and socioculturally. Teachers use approaches such as thematic instruction, cooperative learning, and meaning-centered curriculum. The goal was for instruction to shift from memorizing information to meaningful learning. They wanted to see teachers and

students use stories and complex themes to link information and understanding. Students are responsible for both their own behavior and group progress.

In another study in 1994, a school staff set out to discover how brain research would affect student learning (Caulfield, Kidd, & Kocher, 2006). The Valley Park staff members used the following findings as a foundation for their work:

1. The brain changes physiologically as a result of experience.

   One's environment determines to a large extent the function and ability of the brain. Teachers must provide an environment that is challenging yet nurturing.

2. Emotion influences learning.

   Positive emotion facilitates learning; people retain more when the brain recognizes a useful experience. In contrast, learning shuts down when a student perceives an experience as threatening.

3. Intelligence is multiple.

   Multiple intelligences can provide a foundation for better instruction and deeper emotions in the learner.

The staff developed year-long themes to give students more meaningful and connected learning opportunities. This made learning exciting and made sense to students. "When students see the connections and the practical applications, they will remember the knowledge or skill" (Caulfield, Kidd, & Kocher, 2006, p. 64).

A study by Hannaford (1995) noted that the use of cross-lateral repatterning motions can have dramatic effects on learning. Hannaford realized this when she was asked in 1986 to become part of a Hawaiian intermediate school as a Comprehensive

Student Alienation Program (CSAP) tutor and counselor. The students she worked with had emotional and learning difficulties. This is where she learned the concept of Brain Gym. Her son was labeled learning disabled and although the family spent thousands of dollars on learning programs, he still could not read as a sophomore in high school. The whole family decided to do Cross Crawls every morning. Within six weeks her son was reading at grade level. Cross-lateral movements are movements that cross over the midline of the body from one half to the other, which activates the brain.

Cross-Crawls are one of the movements in a series called Brain Gym. Another trend in brain-based learning Brain Gym, was developed in the 1970s at the Valley Remedial Group Learning Center in California by a man named Paul Dennison. His discoveries were based on an understanding of the interdependence of physical development, language acquisition, and academic achievement (Hannaford, 1985). "A few minutes of doing something correctly, can transform a lifetime of doing it incorrectly" (Dennison & Dennison, 1985). Brain Gym is a "coordinated series of movements that produces increased neurotrophins (natural neural growth factors) and a greater number of connections among neurons" (Hannaford, 1985, p. 112). According to educational researcher, Eric Jensen, educators can and might better manage the influences that prepare students' minds and brains for learning readiness (Jensen, 1991).

Brain Gym

The use of Brain Gym brings active whole brain functioning that enhances learning. According to Hannaford, "Brain Gym appears to contribute the minor adjustments necessary to enable the system to proceed with the learning process"

41

(Hannaford, p. 110). Brain Gym facilitates the process of waking up the mind/body system, and learning readiness. Through simple integrative movements that focus on specific sensory aspects, Brain Gym activates the full mind/body function across the body midline. According to Dennison, Brain Gym is based on three simple premises:

1. Learning is a natural, joyous activity that continues throughout life.

2. Learning blocks are the inability to move through the stress and uncertainty of a new task.

3. We are all "learning-blocked" to the extent that we have learned not to move.

These Brain Gym activities were discovered to relax (centering dimension), stimulate (laterality dimension), or release (focusing dimension) students in certain types of learning situations (Dennison & Dennison, 1985).

There are 26 movements that stimulate the midline, lengthening, or help with energy and relaxation. The midline movements are necessary for left-right movements across the midline of the body. The development of these movement skills is essential for crawling, walking, or seeing depth (which helps with vision and hearing). The midline movement helps build on concrete operations that are already established. These particular movements are: Cross Crawl, Lazy 8s, Double Doodle, Alphabet 8s, The Elephant, Neck Rolls, The Rocker, Belly Breathing, Cross Crawl Sit-ups, The Energizer, and Think of an X. Dennison's discoveries were based on an understanding of the interdependence of language acquisition, physical development, and academic achievement. His research focused on beginning reading achievement and its relationship to covert speech skills. With his background in curriculum development and experimental psychology he developed Brain Gym. He also provided statistical research

relating to the effects of movement and learning. His first research experiment with

Brain Gym was in 1989 with 19 fifth grade Special Education students. After they were

tested using the Brigance Inventory of Basic Skills, they were repatterened and used

Brain Gym for 5 to 10 minutes a day. The results showed a one to two year average gain

for all students on the reading and reading comprehension test and an average gain of at

least a year for more than 50% of the students on math. The greatest results were in the

improvements of focusing on a task and self-esteem.

Another segment of movements deals with lengthening activities. The lengthening

activities help students develop and reinforce neural pathways that help make

connections between what is known in the back of the brain and the ability to express and

process information that is in front of the brain. These movements are extremely

important in the communication skills of reading, writing, listening, and speaking and are

similar to athletes and dancers stretching or warming up their muscles before an event

(Dennison & Dennison, 1985). Lengthening activities are: The Owl, Arm Activation,

The Footflex, The Calf Pump, The Gravity Glider, and The Grounder.

Additionally, energy exercises and deepening attitudes help re-establish neural

connections between the brain and body, thus creating the flow of electromagnetic energy

throughout the body (Dennison & Dennison, 1985). This supports directionality,

sidedness, centeredness, and focus as well as our awareness of where we are in space and

in relation to objects around us. The energy exercises and deepening attitudes are:

Water, Brain Buttons, Earth Buttons, Balance Buttons, Space Buttons, The Energy Yawn,

The Thinking Cap, Hook-ups, and Positive Points. The following three matrices puts into

Midline Movements	Explanation	Brain or body area affected	Brain Gym indicators
1. Cross the midline of the body	Arms moves alternately w/opp. leg	Simultaneously accesses both brain hem & stim. The expr. & recept.	Cross overs-exercise for the use of enhancing both sides of the brain
2. Lazy 8s	Drawing a continuous figure 8 that enables the reader to cross the visual midline	Activates both eyes and integrates peripheral vision	Comprehension & understanding
3. Double Doodle	Move both hands & arms together mirroring each easily & simultan.	Establishes direction in space relatively to the body	Helps with following directions
4. Alphabet 8's	The letter A-Z fit on a midline & is printed on one side or the other	Enables the writer to cross the visual midline Improves eye-hand coor	Fine motor & creative writing skills
5. The Elephant	Lazy 8 motion with your eyes focusing beyond the hand. Whole body moves w/ arm movement	Activates the inner ear & improves balance, equilibrium & integrates the brain for listening w/ both ears	Listening, comprehension & memory for sequences
6. Neck Rolls	Roll head in the forward position & rotate side to side	Relaxes the neck & releases tension to encourage binocular vision & binaural hearing	Relaxation for reading and writing
7. The Rocker	Releases tension one hip at a time in a rocking motion while sitting	Stimulation of spinal column & circulation of cerebrospinal fluid	Relaxation for sitting and back

Figure 2. Matrix one.

8. Belly Breathing	Breathe by expanding rib cage front to back, left to right & top to bottom	Relaxes the central nervous system	Relaxation for reading and speaking
9. Cross Crawl Sit-ups	Sit-ups on back. Knees & head up & hands clasped behind head. Touch one elbow to opp. knee, then altern.	Strengthens abs, activates integration of both sides of the brain centering the body	Listening & reading
10. The Energizer	Sit comfortably. Place hands on desk (fingers pointed inwardly) In hale & lift head slowly then upper back	Increases circulation to the frontal lobe for greater rational thinking & comprehension	Comprehension and eye-hand coordination
11. Think of an X	Picture & think of an X. The center of the X is the central point of your focus	Activates left & right sides of brain hemispheres & activates both eyes for binocular vision	Crossing the mid line and organization

Figure 2 (continued). Matrix one.

Midline Movements	Explanation	Brain or body area affected	Brain Gym indicators
12. The Owl	Grasp one shoulder & move head smoothly across midfield	Releases neck tension Lengthens neck & shoulder muscles	Listening& comprehension
13. Arm Activation	Lift arm keeping head relaxed. Lift away from head, front, back & toward ear	Lengthens muscles of upper chest & shoulders	creative writing
14. The FootFlex	Sit w/one ankle resting on the other knee & flex foot	Restores natural length of tendons in feet & lower legs. Back-front brain integration	Comprehension in listening & reading. Ability to follow thru To complete assignm.
15. The Calf Pump	Support self w/hands on a wall. Place one leg behind & lean forward	Lengthens muscle of upper leg. Back brain-front integration	Listening & reading comprehension
16. The Gravity Glider	Bend forward & let gravity take over. Sit comfortably, crossing one foot over ankles & reach forward	Restores the integrity of hamstrings, hips & pelvis. Deeper respiration & increased energy	Reading comprehension abstract thinking
17. The Grounder	Legs apart & point right foot toward the right, bending knees and glide	Relaxes the ileopsoas muscle group	Comprehension & self-expression

Figure 3. Matrix two.

Midline Movements	Explanation	Brain or body area affected	Brain Gym Indicators
18. Water	Drink small amounts Improves concentration	All electrical & chem. actions of brain &nerv. system are activated	Improves all academic areas
19. Brain Buttons	Touching naval while rubbing deeply below collarbone	Sends messages from right brain hemisphere to left side of body	Crossing midline for reading
20. Earth Buttons	Fingertips of one hand rest under lower lip, other fingertips rest upper edge of pelvis	Centering, grounding	Organization skills, near-to-far visual skills
21. Balance Buttons	Hold area where skull rests over neck, press head gently back	Restores balance to occipital & inner ear	Comprehension for reading, perception, critical judgment & decision-making,
22. Space Buttons	Two fingers on upper lip on front midline, & other on back midline just above tailbone	Centering, grounding, relaxes central nervous system, depth perception	Organization skills & focus
23. The Energy Yawn	Yawn while holding tense points on jaw & massage	Increases circulation to brain	public speaking
24. The Thinking Cap	Use thumbs & index fingers to pull ears gently back & unroll	Increases ranges of hearing & voice resonance, improves breathing & energy, enhances focus & attention	Listening comprehension, public speaking
25. Hook-ups	Cross feet & legs, cross arms & hands (l/ wrist over rt) Interlace fingers & draw hands toward chest	Grounding, stimulates reticular formation, improves balance & coordination, relaxation	Relaxation & Calming

Figure 4. Matrix three.

26. Positive Points	Lightly touch the point above the eye	Accesses frontal lobes	Release of memory blocks

Figure 4 (continued). Matrix three.

perspective the 26 movements of Brain Gym, an explanation of the movement, what brain area or body area is affected, and what academic area it helps.

In conclusion, the educator must be an expert in identifying students' needs if they are having trouble with processing, articulating, or receiving information through integration (Dennison & Dennison, 1989). Brain Gym can be a very valuable tool in brain-based learning; the more educators learn about various methods to help learning, the more students can be successful. Peter Strick (1995) at the Veterans Affairs Medical Center in Syracuse, New York, discovered a very important link. He and his staff linked a pathway that involved the back of the brain to memory, attention, and spatial perception. The area of the brain that processes movement is the same area of the brain that processes learning. So these movements in Brain Gym can be a key to improved learning.

Brain Gym Research Around the World

Since its development by Dennison, Brain Gym is now being used throughout the world. Currently, there are 15 major cities in Russia using Brain Gym with great success (Hannaford, 1995).

Canada is another country where brain-based gym is being used. McGoven (1991) investigated a pilot program in school district 24, in British Columbia, Canada. The purpose of the study was to determine the possible inclusion of Brain Gym movements into the curriculum for student's labeled "learning disabled." Approximately 600 total students in 10 schools were involved. The following list is a summary of the

observation by 13 of the 30 teachers surveyed. The following were changes noted in 12

key students:

1) Improvement in printing and spacing of work.

2) Increased focus during group times.

3) Increased self-awareness.

4) Calmer, happier, less moody.

5) Increased confidence in spelling, math, writing.

6) Improvement in reading.

7) Improved organization and productivity in seat-work assignments.

In the Canadian study all teachers reported an interest in using these strategies in the

future. The researcher drew the following conclusions:

1) Students are more accepting of this program at the primary age level.

2) Teachers need and want strategies such as these to help meet the diverse

   learning requirements of students.

3) This program can teach children life long learning skills.

4) All students can benefit, thereby avoiding the singling out of specific students

   where this situation is undesirable.

5) Any aged student has the ability to benefit if there is a willingness to change.

6) Teachers report benefits to their own lives.

7) Some children may not be allowed to participate due to their parents' personal

   beliefs about acupressure.

8) The name "Brain Gym" bothered some teenagers who were in intervention

classes.

Another field study was done from 1986-1987 on the "Longitudinal Perspective on Edu-K; Outcomes with Special Education Students," in Australia. Whetton, Senior Special Education instructor at Christies Beach High School, Australia, implemented this project during three terms. His purpose was to determine whether the inclusion of Brain Gym movements would have an effect on the attention span and academic skills of high school students in a special education classroom.

In part one of the study, 12 students were divided equally and assigned to four groups: Group A--yoga exercises; Group B--aerobic exercises; Group C--Brain Gym exercises; and, Group D--no exercise program (control group).

The results were:

Group A--Yoga group--These students showed a small level of progress in reading comprehension with a considerable improvement in reduction of hyperactive behavior.

Group B--Aerobic group--These students showed a small level of progress in reading comprehension, but no other change.

Group C--Brain Gym group--These students showed remarkable changes in all areas measured and also in other observable areas. Reading fluency showed a marked improvement with sentences flowing rather than word-by-word as shown before Brain Gym. Reading comprehension showed a substantial 60% improvement. Time on task improved from 30% average to 60% each day following Brain Gym. Hyperactivity was also reduced in the students.

Group D--Control group--This group showed no observable change in any area checked. The second term in 1987 all students in the adaptive education class

51

participated in the Brain Gym study. All students improved in the six tested areas: reading fluency, reading comprehension, time on task, hyperactive behavior, positive relationships with other students, and self-esteem.

According to parent interviews, four of nine parents indicated dramatic changes at home in the students' attitudes. All parents noticed the difference in academic areas with homework. Other teachers noticed the changes and asked for Brain Gym instruction so they could use it.

The final stage was used for the withdrawal of Brain Gym activities. No Brain Gym was introduced for eight weeks. No change was obvious in the first four weeks. In weeks five and six, changes in all areas began to occur. In six of the students, hyperactive and negative behaviors increased and reading fluency fell back drastically. By week eight, six of the students decreased their time on tasks from 85% to 60%. Brain Gym was quickly reintroduced at the students' request and, within six sessions, all their previous reading abilities and behaviors were regained.

Using Brain Gym is risk taking because it is not widely accepted or known. According to Jensen (1995), "schools have not kept up with the research that links physical movement with thinking processes." Jensen goes on to make the following suggestions:

- Use slow stretching and breathing exercises to increase circulation and oxygen to the brain.

- Incorporate energizers every 20 minutes or so.

- Make sure that some of your planned activities have a built-in component of physical movement.

- Give learners permission to move around, stretch, or change postures, so they can monitor and manage their own energy levels.

- Offer novel activities, learning locations, and choices that require moving.

In conclusion, what we learn from these studies is that positive changes can occur in learning. Further it can occur with all students, regardless of abilities.

Theoretical Framework

In order to place the issue of brain-based learning within a theoretical framework, a multiple intelligences theory, a cognitive learning theory (including metacognition), adult learning theory, and planned behavior theory will be introduced. With this in mind, theoretical perspectives, which guide and help to organize current research in the field of brain-based learning, will be included.

Traditionally, intelligence is equated to math and verbal abilities scored on paper and pencil standardized evaluations. In contrast, brain-based learning (Hart, 1975, 1983) encourages teachers to view intelligence in a variety of ways.

The two intelligences that are most honored in schools and hold significant value on most standardized achievement tests are linguistic and logical mathematical. It is essential for educators to recognize that intelligence has many more components that are not measurable in verbal or mathematical assessments. Researchers note students' performance improved in reading, writing, and arithmetic skills as a result of their developing visual, auditory and kinesthetic skills. Brain-based learning and brain-based strategies help increase and improve all of these areas and different regions of the brain. The mind-brain system is designed to express what it knows in many ways (Samples,

1987). A principal assumption of the multiple intelligences theory (Gardner, 1983) is

that individuals are not the same in cognitive and intellectual learning styles. It is

recommended for educators to devise methods for teaching students intellectually in

order to provide meaningful instruction to meet individual student abilities (Gardner,

1983).

Review of Multiple Intelligences Theory

Multiple Intelligences Theory is an approach to make the vision of successful

student achievement a reality. Not all students achieve the standards at the same time

throughout the world (Burke, 1999). The theory of multiple intelligences (Gardner,

1983) indicates that "intelligence profiles" (p. 73) can be detected in life early; while not

inflexible, it is educationally imperative to accent the profile in instructional areas rather

than to ignore it. The assumptions are that more than one form of intelligence exists,

these intelligences are relatively independent of one another, and they can be combined in

a multiplicity of ways by individuals (Gardner, 1983).

According to Howard Gardner (1995), "My own view is that a well-trained and

effective teacher is still preferable to the most advanced technology, and that even

excellent hardware and software are too little avail in the absence of appropriate

curricula, pedagogy, and assessment" (p. 223). Howard Gardner proposed his multiple

intelligences theory in 1983 and since then, one additional intelligence has been added,

thus making eight intelligences. His theory, according to Willingham (2004), rests on

three core claims:

1. Gardner says that those who devise and interpret tests conceive of intelligence as unitary.

2. There are multiple, independent intelligences. Gardner expands intelligence to include effective use of the body and thinking skills that are relevant to the social world.

3. The multiple intelligences theory has applications to education.

Gardner believes that many possible methods and curricula could be consistent with the theory. He notes that all minds are different and an educational system should take account of all those differences. Gardner's claim was that individuals possess at least eight independent types of intelligences (Willingham, 2004).

1) Linguistic: facility with verbal materials (writer, attorney).

2) Logical-mathematical: the ability to use logical methods and to solve mathematical problems (mathematician, scientist).

3) Spatial: the ability to use and manipulate space (sculptor, architect).

4) Musical: the ability to create, perform and appreciate music (performer, composer).

5) Bodily-Kinesthetic: the ability to use one's body (athlete, dancer).

6) Interpersonal: the ability to understand other's needs, intentions, and motivations (salesperson, politician).

7) Intrapersonal: the ability to understand one's own motivations and emotions (novelist, therapist with self-insight).

8) Naturalist: the ability to recognize, identify, and classify flora and fauna or other classes of objects (naturalist, cook).

Gardner also claims everyone has all eight intelligences to some degree, but each has his or her own particular style. He also argues that more than one intelligence is used for most tasks. Adding to and changing our view about learning is very important as an educator. Gardner notes in his *Frames of Mind*, that "only if we expand and reformulate our view of what counts as human intellect will we be able to devise more appropriate ways of assessing it and more effective ways of educating it" (Gardner, 1983, p. 4). There are many educators today who teach new methods. According to Gardner, "There is interest in new programs which seek to develop human intelligence for a whole culture to train individuals in such general skills as 'anticipatory learning,' to help individuals to realize their human potential" (p. 5).

According to Armstrong (2003), major areas of the brain that are associated with each of the eight intelligences are:

1) Linguistic: left temporal;

2) Logical-mathematical: left frontal and right parietal lobes;

3) Spatial: occipital and parietal regions (especially right hemisphere);

4) Bodily-kinesthetic: cerebellum, basal ganglia, motor cortex;

5) Musical: right temporal lobe;

6) Interpersonal: frontal lobes, temporal lobe (especially right hemisphere) limbic system;

7) Intrapersonal: frontal lobes, parietal lobes, limbic system; and,

8) Naturalist: left parietal lobe (important for discriminating "living" from "non living things").

Finally, educators who address the diversity of students through differentiation of instruction using multiple intelligences, allow for a variety of learners' needs. This research addresses the need for various strategies to be used in order to enhance the success of the learners and their needs.

Review of Cognitive Learning Theory

Brain-based learning is a cognitive process. Cognitive and cognition refer to both brain and mind (Howard, 2000). The nature of changes attained in a model situation provides a much better estimate of learning (Reschly & Wilson, 1990). If teachers are effective facilitators of the learning process in students, then it is essential that teachers gain specific knowledge regarding the new cognitive brain-based learning theories (Gardner, 1983; Hart, 1975, 1983), and that they understand the theoretical rationale on which new cognitive theories (Hart, 1975, 1983; MacLean, 1973, 1978, 1990) are used in order to promote application in the classroom.

In recent years, research for measuring intelligence and learning abilities has improved significantly. This research established important principles in developmental levels and certain patterns associated with different kinds of learning. Cognitive abilities can be broken down into separate pieces of knowledge, and those pieces are strengthened based on their use, practice, and learning. The more learners engage in processing that requires them to break down certain pieces of knowledge, the more they will learn (Lovett, Greenhouse, & Joel, 2000).

One educational researcher, David Perkins, cognitive scientist and founding member of Project Zero, along with Howard Gardner, has conducted long-term programs of research in the areas of creativity, problem solving, reasoning, and learning. Perkins believes teachers have to do more than stimulate students to think critically. They must begin to teach thinking skills in a much more explicit way. "To do it well, you need to raise consciousness about the thinking patterns themselves" (Viadero, 1995).

In order to promote such cognition and instructional change, educators must have in place the attitudes and professional knowledge which advance their daily practice (Collinson, 1999). The same holds true for brain-based learning. Educators must have professional knowledge and a positive attitude to help learning advance. Learning happens over time (Jensen, 2000).

Metacognition

John Flavell is regarded as a leading researcher in metacognition. He was influenced by Jean Piaget. Flavell (1971) introduced the term metamemory, which refers to an individual's ability to monitor and manage the input, storage, search, and retrieval of contents in one's own memory. He has invited the academic community to come forward with additional metamemory research. In 1979, Flavell acknowledged the significance of metacogniton in a variety of applications that included reading, oral skills, writing, language acquisition, memory, attention, social interactions, self-instruction, personality development, and education (Flavell, 1979). These same attributes are what Brain Gym indicators enhance. Metacognitive strategies are designed to monitor cognitive processes. In 1987, Flavell was actively encouraging the development of

metacognition in schools where there are many opportunities to develop metacognitive knowledge about people, tasks, and strategies. Metacognitive theory in general focuses on: (a) individual differences in self management of cognitive learning; (b) awareness and management of one's thinking; (c) knowledge and ability that come with experience; and, (d) strategic and constructive thinking (Paris & Winograd, 1990).

Metacognition is "thinking about thinking" (Lazear, 1991, p. 144). The use of metacognitive strategies in the classroom is strongly supported in brain-based learning (Hart, 1975, 1983). Students learn self-reflectiveness and awareness through their thinking patterns and learn from their actions. Both behaviors and thinking patterns are altered for greater effectiveness the next time a similar situation arises (Lazear, 1991). Metacognition allows the learner to think outside the box and examine the process. Metacognition is simply an awareness and control over one's own thinking and behavior. "These latter developments are relevant to applications in education, especially in educational situations where learners have some control over their study activities" (Hacker, Dunlosky, & Graesser, 1998, p. x). Metacognition is an important aspect of brain-based learning since brain-based learning has to do with strategies and problem solving. Learners often talk aloud while working on problems. By using strategies in brain-based learning learners can enhance their verbal skills, therefore be better problem solvers.

In addition to increasing metacognition, brain-based instruction also enhances verbalization. Ericsson and Simon (1980), provided a system for distinguishing two types of verbalization. The main focus of their research on verbalization was based on the current contents of working memory. Brain-based learning and Brain Gym strategies

59

enhances parts of the brain which focus on working memory. They also found out that visual, spatial, and perceptual-motor information requires recoding into appropriate language. Certain movements and activities of the indicators in brain-based learning and Brain Gym enhance the visual, spatial and perceptual-motor areas of the brain to enhance learning. Brain-based instruction also augments writing. Research at Carnegie Mellon University (Penrose & Sitko, 1993) studied college students and their observations, reflections, monitoring, and controlling their own cognitive processes in writing. The students could "listen in" on their own processes, and use peer discussions and design for themselves effective strategies for the classroom. Peer and self reflection can have a positive effect and influence on the quality of learning and decisions students make (Hacker, Dunlosky, & Graesser, 1998).

In their study, Van Meter, Yokoi, and Pressley (1994) interviewed college students about the importance of studying strategies. Students stressed attention, understanding, organization of course material, connecting important ideas, remembering the information, and relating information to prior knowledge. These were all very important strategies in their learning process. Brain-based learning and Brain Gym strategies help all of those areas and strategies to enhance learning.

Putting these strategies to use is important. According to college students, motivating instructors are those who have the following characteristics: eager and interested in the material, responsible, permit choices, provide encouragement, provide challenging material, give timely feedback, grades for effort and improvement, emphasizes the learning process, provide a number of goals, and teat students like adults. Those are all similar to the brain-based learning goals and objectives.

60

Review of Brain-Based Learning in the Classroom

According to Jensen (1998), the cerebellum is commonly linked to movement and is a kind of switchboard of cognitive activity. "The part of the brain known to control movement is involved in learning" (p. 84). In a study that was done in Seattle, Washington by Gilbert, third graders studied language arts through dance activities. The students involved in dance increased their reading scores by 13% in six months (Jensen, 1998). Research suggests that the relationship between learning and movement continues throughout life.

Left-, Right-, and Middle-Brained

Educators need to know themselves, understand their style, and then understand the learning styles of our their students. According to Connell (2005), "One way to do this is to understand how our neurological style influences the way we teach" (p. 39). The brain is divided into two hemispheres which helps us process information. Each hemisphere works in a distinct way and has a certain function. The left side processes information in an analytical and sequential way; the right side in an intuitive and more holistic way. According to (Connell, 2005), a general description of the two hemispheres:

Left-brain functions:

- Constantly monitors our sequential, ongoing behavior;

- Responsible for awareness of time, sequence, details, and order;

- Responsible for auditory receptive and verbal expressive strengths;

- Specializes in words, logic, analytical thinking, reading, and writing;

61

- Responsible for boundaries and knowing right from wrong; and,

- Knows and respects rules and deadlines.

Right-brain functions:

- Alerts us to novelty; tells us when someone is lying or making a joke;

- Specializes in understanding the whole picture;

- Helps us form mental images when we read and/or converse;

- Responsible for intuitive an emotional responses; and,

- Helps us to form and maintain relationships.

Middle-brained means when neither hemisphere is dominant, you use both sides. "Your actions reflect your brain preferences, which in turn affect your teaching style" (Connell, 2005, p. 42). To help discover your left- and right-brain preferences, Loren Crane of Western Michigan University, devised the Alert Scale of Cognitive Style in 1989. You will find this in Table 4.

Left-brained educators prefers to use structured lessons, lectures and prefers giving assignments as research papers, debates and book reports that are written. Right-brained educators tend to lecture less and usually have colorful projects hanging from the ceiling, on the walls, wonderful bulletin boards, and have an abundance of art materials. Middle-brained educators tend to be more flexible with how tasks are carried out. They solve problems from different perspectives. Incorporating both left- and right-brain teaching strategies can enrich students' learning (Connell, 2005).

Table 4

Alert Scale of Cognitive Style

Choose the one sentence that is more true. Do not leave any blanks.

1. A. It's fun to take risks.
    B. I have fun without taking risks.

2. A. I look for new ways to do old jobs.
    B. When one way works well, I don't change it.

3. A. I begin many jobs that I never finish.
    B. I finish a job before starting a new one.

4. A. I'm not very imaginative in my work.
    B. I use my imagination in everything I do.

5. A. I can analyze what is going to happen next.
    B. I can sense what is going to happen next.

6. A. I try to find the one best way to solve a problem.
    B. I try to find different answers to problems.

7. A. My thinking is like pictures going through my head.
    B. My thinking is like words going through my head.

8. A. I agree with new ideas before other people do.
    B. I question new ideas more than other people.

9. A. Other people don't understand how I organize things.
    B. Other people think I organize well.

10. A. I have good self-discipline.
    B. I usually act on my feelings.

11. A. I plan time for doing my work.
    B. I don't think about the time when I work.

12. A. With a hard decision, I choose what I know is right.
    B. With a hard decision, I choose what I feel is right.

Table 4 (continued)

Alert Scale of Cognitive Style

Choose the one sentence that is more true. Do not leave any blanks.

13. A. I do easy things first and important things later.
    B. I do the important things first and the easy things later.

14. A. Sometimes in a new situation, I have too many ideas.
    B. Sometimes in a new situation, I don' have any ideas.

15. A. I have to have a lot of change and variety in my life.
    B. I have to have an orderly and well-planned life.

16. A. I know I'm right, because I have good reasons.
    B. I know I'm right, even without good reasons.

17. A. I spread my work evenly over the time I have.
    B. I prefer to do my work at the last minute.

18. A. I keep everything in a particular place.
    B. Where I keep things depends on what I'm doing.

19. A. I have to make my own plans.
    B. I can follow anyone's plans.

20. A. I am a very flexible and unpredictable person.
    B. I am a consistent and stable person.

21. A. With a new task, I want to find my own way of doing it.
    B. With a new task, I want to be told the best way to do it.

Table 4 (continued)

Alert Scale of Cognitive Style

Choose the one sentence that is more true. Do not leave any blanks.

Scoring

Give yourself one point for each time you answered "A" for questions:
1,2,3,7,8,9,13,14,15,19,20,21

Give yourself one point for each time you answered "B" for questions:
4,5,6,10,11,12,16,17,18

Add all points

   0-4 strong left brain   14-16 moderate right brain
   5-8 moderate left brain   17-21 strong right brain
   9-13 middle brain

Note. Connell, 2005, p. 43-44.

Factors Which Contribute to Faculty Change in Reform Efforts

Such as Using Brain-Based Techniques in the Classroom

Gender Differences

Many scientists, after years of research, noted physical difference between the male and female brain (Allen & Gorski 1991; Burton, Rabin, Vardy, Frohlich, Wyatt, Dimitri, Constante, & Guterman 2004; Kimura 2004; Witelson, Kigar & Harvey 1999). These structural differences may account for developmental, behavioral, and cognitive processing differences between male students and female students. For example, the anterior commissure is clearly larger in female brains (Allen & Gorski, 1991). Because of this, females may be able to tie verbal and nonverbal information more easily.

According to Jensen (2000), females generally outperform males in the following skills/tasks:

- Fine motor skills--ability to move fingers rapidly in unison;
- Computation tasks;
- Multi-tasking;
- Recalling the position of objects in an array;
- Spelling;
- Fluency of word generation;
- Sensitivity to external stimuli;
- Remembering landmarks along a route;
- Use of verbal memory;
- Appreciation of depth and perceptual speed; and,
- Reading body language/facial expressions.

Males generally outperform females in the following skills/tasks:

➢ Targeting skills;

➢ Working vocabulary;

➢ Extended focus and concentration;

➢ Mathematical reasoning and problem-solving aptitude;

➢ Navigation with geometric properties of space;

➢ Verbal intelligence;

➢ Habit formation and maintenance; and,

➢ Most special tasks.

Also according to Jensen, the female can hear better and is able to pick up different sounds, music, and voices better. Females also retain better hearing longer in life. They learn languages and learn to speak earlier and more quickly. Males have better depth perception and distance vision; while females have greater peripheral vision. Females see better at night and males see better in brighter light. According to Kimura and Hampson (1990), males and females have very different ways of approaching and solving problems. Knowing these differences should help teaches plan better instruction.

Gender Tips for Teachers (Jensen, 2000):

• Be aware of how gender differences may impact learners

• Be patient with learners who may not show the same brain development that others do, especially with boys who usually learn language skills one to two years later than girls; or girls who are not as skilled in the spatial or physical tasks as early); and,

67

- Respect differences and appreciate each learner's uniqueness. Use differences as
  an opportunity to teach about respecting our own and others developmental
  timelines.

Finally, becoming familiar with gender differences and their impact on learning is a good way to move toward meeting the needs of all students.

Classroom Seating

Researchers T. C. Shea (1983) and H. Hodges (1995) (Jensen 2000), studied formal and informal classroom seating that impacted learning. Shea found that students who preferred "informal" seating (pillows, lounge chairs, floor) performed "significantly" better on comprehension tests. Another group performed much higher in math when they were tested and taught in their preferred seating arrangement. This study is an asset and vital in the learning process. In addition to seating, location is also important in the room and is a factor in the effectiveness of learning. Good spellers seem to sit on the right side of the classroom which may be related to brain hemispheric dominance. Researchers Della Valle (1984); Hodges (1985); Shea (1983); and Kroon (1985) (Jensen, 2000) have found that learning styles (global, sequential, concrete, abstract, etc.) and the environment (seating choices, comfort levels, and lighting) are all significant factors in learner success.

Many educators were taught in teaching preparation courses to present a lesson in a logical, sequential fashion, yet 100% of students are multi-processors. In other words, the brain processes information on many levels and from multiple sources. The way we learn affects the very structure of our brain. According to Jensen, "Simply provide

variety and choice" (p. 139).   Jensen also notes that in order to teach to all learning styles teachers should provide as many different learning opportunities as possible.

The following provides an example of learning style factors, characteristics, (Jensen 2000):

1. *Context Variables*

    a. Field dependent: field trips, experiments, and real-life situations. Learners absorb their environment by interacting with it.

    b. Field independent: this learner likes computers, textbooks, videos, audiotapes, and books. They likely are good readers and enjoy libraries.

    c. Flexible environment: this learner does well in a variety of environments. They may like different lighting, music, temperature, furniture design, seating, noise levels, and people.

    d. Structured environment: this learner prefers a structured environment. They like to emphasize rules, conformity, and authority.

    e. Independent: this learner prefers to learn on their own. They learn more effectively alone.

    f. Dependent: this learner likes to work in pairs, teams, and groups. They are more focused in an interactive and busy environment.

    g. Interdependent: this learner works well alone and likes to help others. They feel successful if the group is successful.

    h. Relationship driven: this learner needs to respect and develop a trust relationship with the instructor first before learning takes place.

       i.   Content driven: learning takes place if the content is valuable. What is more important is who teaches it.

2. *Input Preferences*

    a.   Visual external: this learner prefers visual to auditory stimuli. They create mental images and prefer handouts.

    b.   Visual internal: this type of learner likes to "see it" first. They use mental pictures to visualize. They tend to imagine and daydream.

    c.   Auditory external: this learner prefers auditory over visual stimuli. They talk to others or themselves. They are very easily distracted. They like questions and tests to be sequenced in the order they were learned.

    d.   Auditory internal: this learner asks questions to himself. What does this mean? They have difficulty making up their minds.

    e.   Kinesthetic tactile: this learner learns best by doing. They prefer touch. They are very physical and active. They are impacted by personal attention. Learning the task is much better than reading about it or learning about it.

    f.   Kinesthetic internal: this learner prefers movies and storytelling. What impacts them most are stories that have a lot of "heart" and feeling in them. How something is said holds greater importance than what is said. They are less likely to raise their hand first. (p. 140)

"About 40% of learners develop into visual learners by secondary school age. Those learners who remain primarily kinesthetic often fall behind in instruction or get

labeled "developmentally delayed" or "hyperactive" (Jensen, 2000, p. 146). Learning

will become more enthusiastic when the learning is in their preferred style. According to

Jensen, an educator should expose learners to a variety of styles. He also indicates that to

build a successful brain-based learning style approach one should:

1) Provide a variety of approaches; and,

2) Offer choices.

In brief, the framework of all learning styles and formats is the most valuable

asset to help you determine if your teaching approach and methodology covers all

learners, rather than trying to figure out who is what kind of learner.

Teacher Education Programs

Evaluation studies of teacher education programs are constantly absent in the

literature on teacher and teacher education. Literature contains many studies on various

aspects and components of teacher education, but evaluation studies designed to provoke

critical thinking and making decisions with useful information are few and far between.

Kirk (1982) notes that according to the National Council for Accreditation of Teacher

Education (NCATE), the maintenance of "acceptable teacher education programs

demands a continuous process of evaluation of the graduates of existing programs" (p. 2).

For institutions of higher education, it is very important to maintain NCATE approval

and conduct follow-up studies of teacher education programs. From 1971 to 1981, 10

specific reports were submitted by colleges. These reports were examined with special

attention given to the section dealing with "Evaluation Program Review and Planning"

(Kirk, 1982, p. 2). Despite the examination by NCATE, violations calling for follow-up

studies of the effectiveness of teacher preparation are cited as a "weakness in 58%" of the

programs reviewed during 1979 (Kirk, 1982, p. 2).

In conclusion, although the effectiveness of teachers' education programs is

recognized as a critical element in improving the quality of education, follow-up studies

of these programs are lacking. Accreditation is a means to ensure that effective

innovations are applied across successful programs shared between universities. Sanders

(1993) indicate that the essential challenge in education today is improving the quality of

teacher education programs. National accreditation is a tool to maintain higher education

teacher education preparation standards and to ensure new teachers are successful in the

classroom. Gideonse (1993) states the most fundamental purpose for accreditation is the

validation of quality. Some controversy derives from the "fundamental philosophical

differences about the purposes of education and about the essence of teaching as a

profession, and about the role and status of expertise as compared with the needs and

aspirations of students" (Gideonse, p. 177). NCATE points out the importance of

constantly reviewing and updating the requirements of teacher education programs to

ensure student success.

Teacher's Beliefs, Knowledge, and Practices of Brain-Based Learning

According to a study by Karen Ellen Martin in 2006, at the Union Institute and

University in Cincinnati, Ohio the perceptions of brain-based learning from principals in

the Bulloch County School System in Georgia were researched. The purpose of this

study was to examine principals' perceptions regarding the integration of brain-based

learning in their schools. The four factors identified in this study important in supporting

brain-based learning were: (1) physical environments; (2) instructional strategies used to promote brain-based; (3) affective domain practices used; and, (4) implementing brain-based strategies. The research showed a need for additional training in brain-based learning, knowledge, and applying brain-based learning practices.

In conclusion the researcher suggested that more research needed to be done on the teachers' instructional practices and their knowledge of brain-based teaching and learning. Also needed, was information to gain an understanding of the teachers' knowledge of brain-based education practices.

In another study at the Bright Beginnings Committee of the Port Washington-Sakville (Wisconsin) School District (Myrah & Erlauer, 1999) effective teaching strategies to engage all students in learning was addressed. Teachers were surveyed about what brain-based teaching strategies were being used in their classrooms. The study found that students were more engaged in learning. The district will continue to use brain-based strategies to promote student learning.

Summary

If faculty does not fully understand how instructional change affects learning both inside and outside the classroom, it is unlikely they will embrace that change (Weick, 1995). Although, increased knowledge of brain-based learning is mentioned in much of the current research, detailed descriptions of the current status of faculty knowledge of brain-based learning is lacking. Determining the conditions of faculties' knowledge, beliefs, and practices helps to bridge the current gap in this area. This study will show that there is a lack of knowledge, beliefs, and practices of brain-based learning and a

limited variety of brain-based teaching strategies in teacher education faculty in the

Pennsylvania State System of Higher Education. Professional development is

extensively viewed as a pivotal factor in developing the knowledge and attitudes needed

for brain-based learning reform. Many faculty members feel that there is no need to

change the way they teach. Research that deals specifically with professional

development reveals a much more detailed picture of this aspect and is therefore

necessary in order to apply what is known about the change process in current reform

efforts. This research will also show the need for professional development in the area of

brain-based learning and brain-based teaching strategies. According to Sykes (1996),

schools today are largely unprepared for the processes and types of professional

development required to meet the needs of curriculum change proposed by current reform

measures. To achieve better ongoing teacher learning, the process of reform itself needs

reforming. Consequently, the review of literature progresses from past teaching to a

description of current research in the area of brain-based learning and new trends.

Chris Argyris' early research explored the impact and has made a significant

contribution to the development of organizational learning. Argyris and Donald Schon

(1994) stated that people have mental maps with how to act in certain situations. This

has to do with planning, implementing, and reviewing one's own actions. He also

developed the Espoused Theory which is the theory of action of allegiance and

communication to others (Argyris & Schon, 1974). They both indicated learning

involves knowing when an error has been made and how to correct that error. When an

error has been made, it is suggested that you look for another strategy that will address

the variables. This is called single-loop learning. Double-loop learning is when an error

is recognized and corrected in a way that one has to modify the strategy. Arygis' insists for organizations to increase double loop learning it is necessary for practitioners to make informed decisions in a rapidly changing environment (Arygis ,1974).

Also associated with Chris Arygis is action science. Action science generates knowledge that is useful, valid, descriptive, and informative on how we might change it (Argyris, Putnam, & McLain Smith, 1985). Basic knowledge is emphasized while also solving practical problems. Two of the best known researchers of action science were Kurt Lewin and John Dewey. Both conducted research on fundamental knowledge while solving practical problems such as educating children, influencing, or reeducating people of their prejudices. Arygis' view of action science was built on Lewin and Dewey's ideas. In action science the researcher seeks to promote learning and at the same time contributes to general knowledge. The knowledge needed for action science is practical knowledge because it will be helpful for people to learn and use.

Theory of Planned Behavior

Justification of the Choice of This Model

Martin Fishbein and Icek Ajzen in 1975 attempted to resolve a particular problem in psychological research. For many years psychologist sought to examine the role of attitudes in human behavior. This failed to bring about conclusive results.

Their beliefs of the importance of attitudes grew stronger, so they decided to move ahead, but noted:

How does one select a course of study from a truly overwhelming amount of

Literature . . . how does one select a course of study from a literature that, in

almost every topic area, is characterized by a lack of integration, radically

 different approaches and definitions . . . ? (1975, p. v)

It is very important to note that Fishbein and Ajzen's description of that state of

attitude research applies equally well to the state of attitudes and learning research today.

Fishbein and Ajzen approached the problems of attitude research by finding that different

researchers' measurement tools and procedures, yielded different and conflicting results.

Triangulation of data can yield valuable information and ideal circumstances would

involve all researchers' measurements being consistently applied to a single defined

subject.

Consequently, Fishbein and Ajzen decided that their first task was to develop a

standard definition of "attitude." They created a "conceptual framework that emphasized

the necessity of distinguishing . . . conceptually independent categories . . . accompanied

by a consideration of the relations among those variables" (p. vi).

The principles of the theoretical model permeate this study, in that Ajzen's

method of obtaining expert ideas and choosing the most important ones to consider is

also the method incorporated into both the eight-step process as well as this dissertation

study that seeks the knowledge, beliefs, and practices of college of education faculty in

the area of brain-based learning. Fishbein and Ajzen discovered in their years of research

a more coherent body of knowledge that showed various ways in which attitudes

influenced behavior. In *Understanding Attitudes and Predicting Social Behavior* (1980),

Fishbein presented his Theory of Reasoned Action, a model of how these influences

operated. Then Ajzen corrected some gaps in the model by creating the Theory of TPB, which is an extended model of Fishbein's. Especially in Ajzen's field, these theories have become the most widely used in their field (Greve, 2001). Ajzen's work dealt with how to use knowledge of subjects' attitudes to lead them to change their behaviors.

Credibility of the Model of Planned Behavior

The TPB model addresses the problem of practice. TPB is "one of the most widely known and applied psychological action theories" (Greve, 2000, p. 45). The majority of studies using the model pinpointed which attitudes and intentions have the greatest impact on, and the best predictor of behavior or on a specific behavior. All of these studies focusing on the most significant factors within a specific area, the most effective actions can be taken. Most of these studies examined attitudes and intentions of healthcare professionals with regard to practices in their own fields (i.e., doctors' attitudes toward a new technique). The majority of these studies found that when using the model alone, or with other ideas or methods from similar models, the TPB provided very useful tools for explaining and predicting behaviors.

The Eight-Step Process in the Context of Brain-Based Learning

Table 1 shown earlier explains how the eight-step process works according to Ajzen's Theory of Planned Behavior. However, it is also necessary to link this process within the context of the field of learning. Of these, the eight-step process closely resembles the "Pragmatic" approach to learning, in which the program users seek out methods for finding ways in which to improve their programs. By finding out the

knowledge, beliefs, and perceptions of college of education faculty in brain-based learning, we can look more closely at strategies and methods they use.

Summary

In conclusion, brain-based learning provides an environment for students to thrive. All of these studies are indications that brain-based learning can be successful. Improvement in test scores, students with diverse needs, and attention and alertness can all be improved with brain-based learning strategies and techniques. If higher education faculty today has the knowledge, beliefs, and practices of brain-based learning in place, then they can pass that knowledge to our young teachers of the future. Also, educators need to know how to create knowledge that is useful, valid, descriptive, and informative. Educators also should know how to change that knowledge so it can help all learners.

CHAPTER III

METHODOLOGY

Chapter III presents the methods, materials, and procedures utilized to: (a) to investigate college of education faculty members' foundation of knowledge of brain-based learning in their classrooms; (b) to analyze faculty members' professional experiences and beliefs in relationship to brain-based learning; and, (c) to access faculty members' practices of the application of brain-based learning in the classroom. The literature review in the preceding chapter offers ample support for the actions that make up the eight-steps that form the basic foundation of this study.

In attempt to address the research questions presented in the literature review, this chapter describes the methodology used in my study. Procedures presented include: (1) the study design; (2) the data base and procedure employed in the selection of subjects; and, (3) the analytical strategy used.

Choice of Research Method

According to Smart (2005), quantitative research permits investigators to explore possibilities of conditional effects and to conduct analysis of different genders. With careful design of the study and questionnaire, self-completion questionnaires can provide very useful and representative information as well as overcome barriers in the collection of sensitive data (Oppenheim, 1992).

One quantitative mode, the positivist model, was most commonly used in the early days of social science research. This model used quantitative (statistical) data to measure human behavior (Patton, 1990). However, as qualitative (interpretive model)

grew in the 1990s there was a paradigmatic shift toward favoring qualitative approaches

or using mixed-method approaches (Lawly, 1999). Others still acknowledged that the

strength of quantitative or statistical data is that it reveals the magnitude of a problem,

while the value of qualitative data tends to reveal the causes of the problem (Dervin &

Clark, 1987).

Surveys are the most appropriate design to obtain a large sample (Babbie, 1995).

A self-designed survey was selected to be used in this study. The survey method relies

on a questionnaire and is the most common method used in social science research

(Barnard, 2000), and for studies of use and gratification (Parker & Richard, 2000). Julien

(1996) found that 54% of all user and information use studies that utilize surveys.

Surveys also identify user needs and priorities, and define user interests, opinions,

attitudes, and characteristic demographics, as well as user studies for characteristics,

information seeking for user strategies and behaviors, and information skills to discover

user skills (Walster, 1996). Finally, the survey method was most appropriate for this

study because it measures faculty members' background and experience and what they

know about brain-based learning, and it was well-suited to the research questions in this

study.

After completing an exhaustive search of instruments and after looking at other

studies, it was determined that there were no studies adequate to measure education

faculties' foundation of knowledge, beliefs, and practices in brain-based learning in the

classroom; an original survey instrument was then developed. Questionnaires are

developed in order to obtain data from participants in self-report research studies (Gay &

Airasian, 2000). Questionnaires have advantages that make them a good evaluation tool.

They: (a) permit anonymity; (b) permit a considerable amount of time to think about answers before responding; (c) can be given to many people at once; (d) provide uniformity across measurement situations; and, (e) provide data that can be easily analyzed and interpreted.

Instrument Design Questionnaire Design

Selection of the Expert Panel

The survey instrument was modified and validated by a panel of seven educational professionals. The panel of seven professionals served as a source of information for determining appropriate brain-based learning statements and four college of education faculty members served as a pre-pilot screening committee. The expert panel included three physical therapists, one occupational therapist, and one college of education faculty member with more than 10 years of higher education instruction to pre-service student teachers, one librarian, and one school administrator with five years of administrative experience. The seven members of the expert panel were selected because they have experience in brain-based learning and Brain Gym.

The Brain-Based Learning Survey was sent to the expert panel with a cover letter explaining the study and thanking them for their participation. The panel was asked to validate and evaluate the competency statements. The panel was encouraged to make any changes, additions, or deletions that they deemed necessary. One member indicated that none of the items applied on the Brain Gym page so a logic question was developed. If answered no, then the survey directs the respondent to the last page. If the survey respondent answers yes, then it proceeded to the second page of questions.   Another

comment was that the format was easy to use and easy to access. After a review of the expert panel's suggestions, comments, and corrected grammar, the instrument was finalized. The seven members of the expert panel were provided a draft of the Brain-Based Learning Survey Questionnaire. The survey consisted of 45 competency/brain-based learning indicators and Brain Gym indicators statements divided into four parts.

The first part of the questionnaire included five items about demographics. These included: gender, age (e.g., younger than 30, 30-39, 40-49, 50-59, 60 or older), whether you were in the college or school of education faculty or not, years teaching in higher education (e.g., less than 5, 5-10, 11-15, 16-20, more than 20), highest degree earned (e.g., Bachelor of Science, Bachelor of Arts, Masters Degree, Ph.D./D.Ed., or Other).

The second part of the questionnaire asked respondents to rate the items in order to describe their knowledge of, beliefs toward, and practices of brain-based learning on a strongly agree to strongly disagree scale. For example, respondents were asked statements such as, "I view how students will learn best, more important than, what should I teach" and "I feel how one learns, plays an important role in classroom learning."

The second part was divided into three categories: (1) knowledge-14 items, (2) beliefs-13 items, and (3) practices-9 items.

Table 5

Knowledge of College of Education Faculty on Brain-Based Learning

Q.6. I would pre-expose my students to content & context of a topic at least one week before introducing it.
Q. 7. I have sufficient understanding of how the brain learns.
Q. 8. I am comfortable with the use of various learning strategies as part of my classroom teaching.
Q.9. I am knowledgeable about the use of providing frequent, non-judgmental feedback as a useful tool.
Q.10. I feel the need to be more adequately trained in the area of how the brain learns best.
Q.11. Our University has encouraged workshops, conferences, or in-service training on the topic of the newest strategies in classroom teaching.
Q.12. I know that everyone learns differently and I know how to evaluate that.
Q.13. I have attended worthwhile workshops or conferences which dealt with the topic of how students learn.
Q.14. I have sought the advice of colleagues concerning the implementation of a certain type of learning strategy**.**
Q.15. I support the use of real-life, immersion-style multi-path learning over traditional learning in my classroom. Q.35. I use or encourage some form of movement in my classroom to help with focus, attention, or learning readiness. Q.39. I view movement, relaxation, and cross lateral stretching a valid form of Readiness for learning.

Q.40. I feel that movement, relaxation, and cross lateral stretching should play and

Important role in classroom learning.

Q.41. I feel that drinking water is a very important aspect that enhances learning.

Table 6

Beliefs and Attitudes of College of Education Faculty Toward Brain-Based Learning

Q.16. Different learning approaches are a waste of time in the University setting.
Q.17. The purpose in my classroom is to create a supportive, challenging, and complex environment where questions are encouraged.
Q.18. I view how will students learn best, more important than, what should I teach.
Q.19. I feel that how one learns, plays an important role in classroom learning.
Q.20. I would be more willing to initiate various learning strategies if there were more time to do so.
Q.21. Brain-based learning is a fad in education which will pass as many other so-called "reforms" have done.
Q.22. I believe I already do brain-based learning in my classroom.
Q.23.I would be more willing to initiate brain-b. learning if I knew more about it.
Q. 24. Brain-based learning is a very positive way to learn.
Q.25. I feel all college of education faculty should know how to implement brain-based learning.
Q.36. I encourage my students to use some form of cross lateral movements or Crossing the midline for concentration or thinking skills.
Q.37. I have attended workshops or in-services which dealt with the topic of Relaxation, movement, and crossing the midline activities and strategies for My classroom to enhance learning.
Q.38. I feel the need to be more adequately trained in relaxation, movement, and crossing the midline activities and strategies to enhance learning.

Table 7

Practices of College of Education Faculty Utilizing Brain-Based Learning

Q.26. I utilize some form of brain-based learning strategy (e.g. students: drawings, charts, lists, dialogues, actions, demonstrations**,** debates, or maps) on a weekly basis.
Q.27. It is not important to practice various learning strategies in my classroom.
Q.28. I should teach all my students the meaning and purpose of various styles of learning.
Q.29. I have been successful; therefore I will not change my teaching strategy.
Q.30. I am willing to change my teaching style.
Q.31. I use new and updated information in all my education classes.
Q.32. It is important to demonstrate and show educators new ways of teaching.
Q.33. I use the newest technology in my classroom
Q.34. I currently attend educational conferences and workshops about the latest trends in education.

The third part was questions about Brain Gym consisting of two items and the fourth part consisted of two open ended questions about Brain Gym. The open-ended items were included on the questionnaire instrument to invite respondents to write separate answers to the following:

Have you ever heard of Brain Gym?

Have you ever taken courses, workshops, or in-services in Brain Gym? If yes, what was the name of the course, workshop, or in-service?

The expert panel reviewed the survey statements and returned them to the researcher. Once the surveys were returned, the researcher went through all seven questionnaires and noted the comments and suggestions. After review of the returned surveys it was determined there were no statements that needed eliminating. Wording was added or changed in the survey for clarification. At the completion, changes were made to the instrument, the survey was ready for piloting.

Results--Preliminary Design

A second panel of four college of education faculty members were asked to determine if the survey and instructions were clear and unambiguous? This panel addressed questions such as: Are the questions on the survey clear and unambiguous? Do the questions on the survey encourage respondents' honesty in admitting lack of uncertainty of knowledge? And, are questions on the survey free from obvious bias?

The researcher noted all the responses and items were reworded, changed, and revised in accordance with the recommendations of this panel.

Reliability of the Instrument

Due to the length of the survey, reliability of the instrument will be determined by using the split-half reliability technique (Gay, 2000). The survey was divided into halves upon completion of the pilot study. Even-numbered questions were placed in one group; odd-numbered questions were placed in another group. A reliability correlation was calculated for the two halves. According to Gay and Airasian (2000), the split-half reliability test represents the reliability of a test only half as long as the actual test. Thus, the Spearman-Brown correction formula was computed to determine the overall reliability of the instrument (Gay, 2000).

Validity of the Instrument

Content validity can be established by judgment from an expert panel (Gay & Airasian, 2000). For the purposes of this research, the expert panel consisted of four experts in the field of therapy and three experts in the field of education. The panel of experts reviewed the survey and made judgments concerning how well items represented the intended content item (Gay & Airasian, 2000). The expert panel reviewed all items and provided comments regarding the validity of each question. Revisions included adding more information to the definition of brain-based learning and Brain Gym and to change the wording to "indicators of" brain-based learning and "indicators" of Brain Gym.

Procedures

Method of Subject Selection

The College of Education Faculty in the Pennsylvania State System of Higher Education was contacted by e-mail. They were asked to participate and sent a letter explaining the research. The population was a non-probability sample, where participants were invited to participate in a survey and that they were college of education faculty in the PASSHE system. The population for which the study was conducted was approximately 700 members. All college of education faculty members from 13 PASSHE universities were invited to complete the Brain-Based Learning Survey Questionnaire (BBLSQ).

Sample Size, Selection, and Study Sites

The sample included college of education faculty in the PASSHE. The participants were selected from the following universities in Pennsylvania: Bloomsburg; California; Cheyney; Clarion; East Stroudsburg; Edinboro; Indiana; Kutztown; Lock Haven; Millersville; Shippensburg; Slippery Rock; and, West Chester. These universities were selected because they all belong to the PASSHE. Mansfield University elected not to participate in the study due to overload of duties and commitments already on the College of Education Department. All 13 college of education university faculty members were eligible to participate in the survey because they teach using learning strategies and teaching methods. Each participant was contacted by e-mail. Faculty members who were not currently college of education faculty were not eligible to participate. The target population of volunteers consisted of 700 members which is the

total number of college of education faculty in the 13 selected PASSHE schools. The survey was done electronically.

Bloomsburg University of Pennsylvania. Bloomsburg University of Pennsylvania is located in Bloomsburg, Pennsylvania (population 12,000). Bloomsburg was founded in 1839 as the "Bloomsburg Literacy Institute." Bloomsburg is the county seat of Columbia City. It is the only incorporated town in the state of Pennsylvania. Bloomsburg's earliest development was closely associated with the Native American period of American history. Susquehanna, Catawissa and Nescopeck are among the reminders of the original inhabitants.

California University of Pennsylvania. California University of Pennsylvania is located in California, Pennsylvania (population 6,000).   California was founded in 1852 and is located on the banks of the Monongahela River and the Appalachian Plateau which is an area of rolling hills. The institution began as an academy more than 150 years ago. The institution was supported by local taxes and the donations of residents of the community.

Cheyney University of Pennsylvania. Cheyney University of Pennsylvania is located in Cheyney, Pennsylvania (population 7,000). Cheyney was founded in 1837 as the African Institute later called the Institute for Colored Youth. Cheyney University of Pennsylvania is the oldest of the Historically Black Colleges and Universities in America. Richard Humphrey, a Quaker philanthropist, founded Cheyney University to educate the

descendants of the African race. Today, Cheyney University represents a variety of races, cultures, and nationalities who receive educational instruction.

Clarion University of Pennsylvania. Clarion University of Pennsylvania is located in Clarion, Pennsylvania (population 6,000). Clarion was founded in 1867 and is located in the Appalachian Mountain region of Northwestern Pennsylvania. Clarion University specializes in preparing students for professional careers in fields such as education, business, and science. Clarion is recognized as the "Autumn Leaf Capital of the World."

East Stroudsburg. East Stroudsburg University of Pennsylvania is located in East Stroudsburg, Pennsylvania (population 9,800). East Stroudsburg was founded in 1893 as a Normal School to prepare teachers. The institution changed its name in 1927 to East Stroudsburg Teacher College and again in 1960 to East Stroudsburg State College. East Stroudsburg University of Pennsylvania specializes in liberal arts and science curriculums.

Edinboro University of Pennsylvania. Edinboro University of Pennsylvania is located in Edinboro, Pennsylvania (population 6,900). Edinboro was founded in 1857 by Scottish immigrants as the Edinboro Academy, a private training school for teachers. Edinboro is located in Northwestern Pennsylvania and is ranked among the top 10 universities in the nation for students with disabilities.

Indiana University of Pennsylvania. Indiana University of Pennsylvania is located in Indiana, Pennsylvania (population 14,900). Indiana was founded in 1875 and

now is the largest University in the Pennsylvania State System of Higher Education. IUP is also the Commonwealth's fifth largest University. IUP was first known as Indiana Normal School, first chartered in 1871 by Indiana County investors.

Kutztown University of Pennsylvania. Kutztown University of Pennsylvania is located in Kutztown, Pennsylvania (population 5,000). Kutztown was founded in 1866 as the Keystone State Normal School. It became Kutztown State Teachers College in 1928. The campus is in a beautiful rural Pennsylvania Dutch community.

Lock Haven University of Pennsylvania. Lock Haven University of Pennsylvania is located in Lock Haven, Pennsylvania (population 9,100). Lock Haven was founded in 1870 as the Central State Normal School. Lock Haven is located along the Susquehanna River. By 1927, it was known as the State Teachers College in Lock Haven.

Millersville University of Pennsylvania. Millersville University of Pennsylvania is located in Millersville, Pennsylvania (population 7,800). Millersville was founded in 1855 as the Lancaster County Normal School and in 1856 as Millersville State Normal School (the first Pennsylvania State Normal School). Millersville is located near Lancaster, the heart of Pennsylvania Dutch Country.

Shippensburg University of Pennsylvania. Shippensburg University of Pennsylvania is located in Shippensburg, Pennsylvania (population 5,500). Shippensburg was founded in 1871 as the Cumberland Valley State Normal School. It is located in the Cumberland Valley. The school was purchased by the commonwealth of Pennsylvania in

1917. In 1926, Shippensburg was the first Normal School in Pennsylvania to become a State Teachers College.

Slippery Rock University of Pennsylvania. Slippery Rock University of Pennsylvania is located in Slippery Rock, Pennsylvania (population 3,200). Slippery Rock was founded in 1889 by the citizens of the borough and gave it the town's picturesque name, Slippery Rock Normal School. It was limited to a singular mission in teacher education.

West Chester University of Pennsylvania. West Chester University of Pennsylvania is located in West Chester, Pennsylvania (population 17,800). West Chester was founded in 1871. From 1812 to 1869 it was a private state aided school called West Chester Academy. It was recognized as one of Pennsylvania's leading preparatory schools. West Chester became the first of the Normal Schools to be owned outright by the Commonwealth. West Chester University became West Chester State Teachers College in 1927.

Data Collection Procedure

Phase One

College of Education faculty members in each of the 13 PASSHE universities was notified by e-mail and given a detailed description of the proposed study and was invited to participate in the study. A flowchart of procedures and methods is found in the Appendices. An introductory letter included an invitation for them to participate in the study along with a copy of the Informed Consent and a copy of the survey instrument

which were e-mailed to the Provost and Institutional Review Board Chairs (IRB) to each

of the 13 Universities. A response form to indicate approval or disapproval of the

research study to be conducted at the university was also included along with an e-mail

address and a self-addressed, stamped envelope for ease of Provost and IRB Chair

response.

Phase Two

Once the number of universities willing to participate was identified (n=13),

college of education faculty in each of the universities (n = 700), copies of the Letter of

Informed Consent and the survey instrument were e-mailed.

Phase Three

The Brain-Based Learning Survey was established as a web-based survey using

Student Voice, an Indiana University of Pennsylvania on-line survey system. According

to Kiesler (1986), web-based surveys allow automatic verification and survey responses

to be captured in databases. Fowler (2002) indicates that highly literate populations,

motivated intrinsically and interested in research are more likely to respond to internet

surveys. The researcher chose an on-line survey method to achieve faster distribution

because e-mail addresses were readily accessible and economically feasible.

The web-based survey was implemented as follows: an e-mail invitation was sent

to participants. Those participants who selected yes to participate were directed to a

website to take the survey. When a participant clicked on the URL, they were taken to

the website and instructions were given on how to complete the survey. After reading the

instructions, the participant completed the survey questions and was asked if they wanted

to participate in a drawing.   Participants marked each question with their response.

Upon completing the survey, respondents clicked on "submit" and placed their survey in

the database.

Participants only completed the survey once. The program had the ability to

determine who did and who did not respond. Thus, after one week from the initial e-mail

letter, a follow-up e-mail was sent to participants to remind them they still had time to

participate in the study. A third and final reminder was sent to participants who did not

complete the survey.

Data Analysis Procedures

The SPSS statistical analysis software package was used to analyze and tabulate

the survey results. Demographic information was used to provide frequencies,

percentages, means, and standard deviations to describe characteristics of the population.

The researcher used two statistical analysis phases on the data. Descriptive statistics such

as frequencies, percentages, and standard deviation were used to determine patterns and

trends.

Independent t-tests were computed to compare gender. Spearman correlations

were computed to measure years of teaching. Pearson correlations were computed to

show relationships.

Cronbach's alpha reliabilities were computed to test for the internal consistency

of the items for each scale. Reliabilities should be above .70 to be considered acceptable

(cronbach, 1951). Only the Practices Scale showed a less-than acceptable reliability ($\underline{a}$ =

.64).

Table 8

Internal Consistency (Standardized Alpha) for Scales

	N	Number of Items	Reliability
Knowledge	188	14	.79
Beliefs	188	13	.86
Practices	190	9	.64

Analysis of variance (ANOVA) test was applied to discover if there were statistically significant differences among faculty values of brain-based learning strategies and their frequency of practice or utilizing indicators of brain-based learning in their teaching. Furthermore, the ANOVA test was used to determine if faculty with different backgrounds, education, and experience viewed brain-based learning differently, and if faculty with less background viewed the usefulness of brain-based learning differently.

Summary

The purpose of this chapter has been to describe the researcher's plan. This description included the selection process of the expert panel, details on how the survey was developed, sample size and selection, pilot testing of the initial survey, administration of the instrument, and data analysis. The overall plan of this chapter allowed the researcher to address the research questions and to interpret the results in a uniform fashion.

CHAPTER IV

RESULTS OF DATA ANALYSIS

This descriptive study identifies PASSHE College of Education faculties'
knowledge of, beliefs toward, and practices of brain-based learning. This study explored
these variables through five research questions:

1. What is the extent of knowledge Pennsylvania State System of Higher Education
   college of education faculty have about the indicators of brain-based learning and
   Brain Gym?

2. To what extent does Pennsylvania State System of Higher Education college of
   education faculty rate the value of brain-based learning and Brain Gym?

3. To what extent does College of Education faculty in the Pennsylvania State
   System of Higher Education practice or utilize indicators of brain-based learning
   in their teaching?

4. What is the relationship between the Pennsylvania State System of Higher
   Education college of education faculties' level of knowledge of brain-based
   learning and indicators of Brain Gym and their beliefs about brain-based
   learning?

5. What is the relationship among gender, years of teaching experience, background,
   and faculties' beliefs, knowledge, and practice in relation to brain-based learning?

   In addition, participants were asked questions to reflect their teaching styles and if
they thought brain-based learning strategies and Brain Gym indicators were important
and which ones were important. External variables such as faculties' age, gender, years

experience in higher education and highest degree earned were also explored in relation to brain-based learning.

Description of Sample Data

Data on PASSHE College of Education faculties' knowledge, beliefs, and practices of brain-based learning were collected through the use of an on-line survey. A link to the survey was distributed electronically via electronic mail to all PASSHE college of education faculty in 13 of the 14 universities. The Associate Provost of Graduate Professional Programs at Mansfield University of Pennsylvania, decided not to participate in this study due to a heavy workload already in the College of Education Department.

The first week the survey generated approximately 100 responses. Follow-up messages were sent which generated 110 additional responses bringing the total number of respondents that started the survey to 210 or approximately 30% of the roughly 700 faculty members who were asked to participate in this study. Of these, 14 respondents were not included in the data analysis because they were no longer considered a member of the College or School of Education faculty and six dropped out due to circumstances unknown.

Demographic Characteristics of Participants

Five pieces of demographic data were requested to facilitate understanding faculties' responses: (1) Age; (2) Gender; (3) College or School of Education faculty member; (4) Years Taught in Higher Education; and, (5) Highest Degree Earned.

Table 9 summarizes the responses for the frequencies and percentages for the

demographic variables.

Table 9

Frequencies and Percentages for Demographic Variables

		Frequency	Percent
Gender	Male	79	41.6
	Female	111	58.4
Highest Degree	Bachelor's	0	0
	Master's	19	10.0
	Other	4	2.1
	Ph.D./Ed.D.	167	87.9
Age	Younger than 30	2	1.1
	30 – 39	20	10.5
	40 – 49	51	26.8
	50 – 59	88	46.3
	60 or older	29	15.3
Years Taught	Less then 5 years	27	14.2
	5 – 10	55	28.9
	11 – 15	30	15.8
	16 – 20	34	17.9
	More than 20	44	23.2

Description of the Variables

The variables used in this study were the PASSHE College of Education faculties'

knowledge about the indicators of brain-based learning and Brain Gym, beliefs of brain-

based learning and Brain Gym, and practices of indicators of brain-based learning in their teaching.

<div align="center">Faculties' Knowledge about the Indicators of</div>

<div align="center">Brain-Based Learning and Brain Gym</div>

Research question 1. What is the extent of knowledge Pennsylvania State System of Higher Education college of education faculty have about the indicators of brain-based learning and Brain Gym?

Brain-Based Learning Scale

The items from the Brain-Based Learning Survey were categorized into three different scales: knowledge; beliefs; and, Practices. The Knowledge Scale comprised the following 14 items: Q6, Q7, Q8, Q9R, Q10, Q11, Q12, Q13, Q14, Q15, Q35, Q39, Q40, and Q41. The letter "R" indicates that the item was reverse-keyed. The Beliefs Scale comprised 13 items: Q16R, Q17, Q18, Q19, Q20, Q21R, Q22, Q23, Q24, Q25, Q36, Q37, and Q38. The Practices Scale comprised the following 9 items: Q26R, Q27, Q28R, Q29, Q30, Q31, Q32, Q33, and Q34.

The knowledge scale was reported through the frequencies and percentages regarding the knowledge of brain-based learning and the knowledge of indicators of Brain Gym. Table 10 presents frequencies and percentages for the knowledge of brain-based learning survey questions that were designed to address RQ1. Five questions were presented to indicate the level of knowledge with agreement that college of education faculty members have in the area of brain-based learning. Participants were asked to indicate: Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, or Strongly

Table 10

Frequencies and Percentages for Brain-Based Learning Knowledge Questions with

Agreement Ratings (N = 190)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I have sufficient understanding of how the brain learns.	4 (2.1%)	38 (20.0%)	30 (15.8%)	92 (48.4%)	26 (13.7%)
I am comfortable with the use of various learning strategies as part of my teaching.	2 (1.1%)	3 (1.6%)	4 (2.1%)	82 (43.2%)	99 (52.1%)
I am knowledgeable about the use of providing frequent, non-judgmental feedback.	0 (0%)	7 (3.7%)	4 (2.1%)	68 (35.8%)	111 (58.4%)
I feel the need to be more adequately trained in the area of how the brain learns best.	11 (5.8%)	30 (15.8%)	44 (23.2%)	75 (39.5%)	30 (15.6%)
I evaluate in a way that accounts for the fact that all students learn differently.	3 (1.6%)	16 (8.4%)	21 (11.1%)	83 (43.7%)	67 (35.3%)

Agree. Of the 190 participants in the study, 92 (48.4%) indicated they agreed they had

sufficient understanding of how the brain learns, 26 (13.7%) strongly agreed, 30 (15.8%)

neither agreed nor disagreed, 38 (20%) disagreed, and 4 (2.1%) strongly disagreed.

However, 75 (39.5%) faculty members indicated they agreed and felt the need to be more

adequately trained in the area of how the brain learns best. Thirty faculty members

(15.6%) strongly agreed, 30 (15.8%) disagreed, 11 (5.8%) strongly disagreed, and 44

(23.2%) neither agreed nor disagreed, feeling the need to be more adequately trained in

the area of how the brain learns best.

Table 11 presents one question that indicates the level of indicators of Brain Gym

knowledge. In this question, 75 (39.9%) agreed they felt the need to be more adequately

trained in relaxation, movement, and crossing the midline activities and strategies for

their classroom to enhance learning which are indicators of Brain Gym, 75 (39.9%)

faculty members agreed; 26 (13.7%) strongly agreed; 28 (14.9%) disagreed; 7 (3.7%)

strongly disagreed; and 54 (28.7%) neither agreed nor disagreed they needed to be more

adequately trained.

Table 11

Frequencies and Percentages for Brain Gym Knowledge Questions with Agreement

Ratings (N = 188)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I feel the need to be more adequately trained in relaxation, movement, and crossing the midline activities and strategies for my classroom to enhance learning.	7 (3.7%)	28 (14.9%)	54 (28.7%)	75 (39.9%)	26 (13.7%)

Table 12 presents five questions to indicate the level of knowledge with ratings for how often faculty members pre-expose their students, attend worthwhile workshops, sought advice, support certain learning, and how often their university has encouraged workshops, conferences, or in-services. Respondents were asked to indicate--Never, Rarely, Occasional, Often, or Always if they have attended worthwhile workshops or conferences which dealt with the topic of a certain type of learning strategy. On this question 58 respondents (30.5%) indicated they occasionally attended a worthwhile workshop or conference, 55 (29%) often, 46 (24.2%) always, 22 (11.6%) rarely, and 9 (4.7%) attended a worthwhile workshop or conference which dealt with the topic of a certain type of learning strategy. When asked if the respondents sought the advice of colleagues concerning the implementation of a certain type of learning strategy , 69 (36.3%) respondents occasionally, 55 (29%) often, 30 (15.8%) always, 29 (15.3%) rarely, and only 7 (3.7%) never sought the advice of colleagues.

Table 13 presents frequencies and percentages for Brain Gym knowledge questions with ratings for how often. Exactly, 61 (32.5%) occasionally, 54 (28%) often, 27 (14.4%) always, 35 (18.6%) rarely, and 11 (5.9%) never uses or encourages some form of movement in their classroom to help with focus, attention, or learning readiness. As far as attending worthwhile workshops or conferences which dealt with the topic of relaxation, movement, and crossing the midline activities and strategies for their classroom to enhance learning, almost half or 93 (49.5%) indicated they never attended, about 41 (21.8%) rarely, 29 (15.4%) occasionally, 19 (10.1%) often and 6 (3.2%) indicated they always attended.

Table 12

Frequencies and Percentages for Brain-Based Learning Knowledge Questions with

Ratings for How Often (N = 190)

	Never	Rarely	Occasional	Often	Always
I pre-expose my students to content and context of a topic at least one week before introducing it.	5 (2.6%)	14 (7.4%)	55 (29%)	80 (42.1%)	36 (19%)
I have attended worthwhile workshops or conferences which dealt with the topic of a certain type of learning strategy.	9 (4.7%)	22 (11.6%)	58 (30.5%)	55 (29%)	46 (24.2%)
I have sought the advice of colleagues concerning the implementation of a certain type of learning strategy.	7 (3.7%)	29 (15.3%)	69 (36.3%)	55 (29%)	30 (15.8%)
I support real-life, immersion-style, multi-path learning over traditional learning.	3 (1.6%)	11 (5.8%)	27 (14.2%)	74 (39%)	75 (39.5%)
Our university has encouraged workshops, conferences, or in-service training on the topic of the newest strategies in classroom teaching.	7 (3.7%)	37 (19.5%)	64 (33.7%)	47 (24.7%)	35 (18.4%)

Table 13

Frequencies and Percentages for Brain Gym Knowledge Questions with Ratings for

How Often (N = 188)

	Never	Rarely	Occasional	Often	Always
I use or encourage some form of movement in my classroom to help with focus, attention, or learning readiness.	11 (5.9%)	35 (18.5%)	61 (32.5%)	54 (28.7%)	27 (14.4%)
I have attended worthwhile workshops or conferences which dealt with the topic of relaxation, movement, and crossing the midline activities and strategies for my classroom to enhance learning.	93 (49.5%)	41 (21.8%)	29 (15.4%)	19 (10.1%)	6 (3.2%)

Table 14 presents descriptive statistics for brain-based learning knowledge questions. On average, the results indicate a high level of agreement for the question of whether faculty members were comfortable with the use of various learning strategies as part of their teaching. The mean was 4.44. There was not much variability on that same question (SD = .715). Faculty members also indicated a high level of agreement with the statement they were knowledgeable about providing frequent, non-judgmental feedback. This same question indicated a means of 4.49 and little variability.

Table 15 presents descriptive statistics for indicators of Brain Gym knowledge questions. The results indicate agreement for the question faculty members believed that drinking water was a very important aspect that enhances learning. The mean was 3.51 and there was a variability of .97. Faculty members also agreed on the aspect of movement, relaxation, and cross-lateral stretching was a valid form of readiness for leaning. The mean was 3.48 with a standard deviation of .90. Faculty members also agreed they needed to be more adequately trained in relaxation, movement, and crossing the midline activities and strategies for their classroom to enhance learning. The mean was 3.43 and the standard deviation was 1.01.

Table 14

Brain-Based Learning Descriptive Statistics for Knowledge

	N	M	SD	Range
I have sufficient understanding of how the brain learns.	190	3.51	1.03	1 – 5
I am comfortable with the use of various learning strategies as part of my teaching.	190	4.44	.72	1 – 5
I am knowledgeable about providing frequent, non-judgmental feedback.	190	4.40	.72	1 – 4
I feel the need to be more adequately trained in how the brain learns best.	190	2.56	1.11	1 – 5
When evaluating students, I evaluate in a way that accounts for the fact that students learn differently.	190	4.03	.98	1 – 5
I pre-expose my students to content and context of a topic at least one week before introducing it.	190	3.67	.96	1 – 5
I have attended worthwhile workshops or conferences which dealt with the topic of a certain type of learning strategy.	190	3.56	1.12	1 – 5
I have sought the advice of colleagues concerning the implementation of a certain type of learning strategy.	190	3.37	1.04	1 – 5

Table 14 (continued)

Brain-Based Learning Descriptive Statistics for Knowledge

	N	M	SD	Range
I support the use of real-life, immersion-style, multi-path learning over traditional learning in my classroom.	190	4.09	.90	1 – 5

Table 15

Brain Gym Descriptive Statistics for Knowledge

	N	M	SD	Range
I use or encourage some form of movement for focus, attention, learning readiness.	188	3.27	1.10	1 – 5
I encourage my students to use some form of cross lateral movements.	188	2.39	1.17	1 – 5
I view movement, relaxation, and cross lateral stretching a valid form of readiness for learning.	188	3.48	.90	1 – 5
I feel that drinking water is a very important aspect that enhances learning.	188	3.51	.97	1 – 5
I feel the need to be more adequately trained in relaxation, movement, and crossing the midline activities and strategies for my classroom to enhance learning.	188	3.43	1.01	1 – 5
I feel that movement, relaxation, and cross lateral stretching should play an important role in classroom learning.	188	3.34	.90	1.5

Table 15 (continued)

Brain Gym Descriptive Statistics for Knowledge

	N	M	SD	Range
I have attended workshops or worthwhile in-services which dealt with the topic of relaxation, movement, and crossing the midline activities and strategies for my classroom to enhance learning.	188	3.43	1.01	1 – 5

Faculties' Beliefs about the Value of

Brain-Based Learning and Brain Gym

Research question 2. To what extent does Pennsylvania State System of Higher

Education college of education faculty rate the value of brain-based learning and Brain

Gym?

The extent of beliefs to which the college of education faculty members have

about brain-based learning and the indicators of Brain Gym were defined by 13 questions

dealing with various facets of views. Table 16 presents frequencies and percentages for

belief questions designed to address RQ2. Participants were asked to indicate: Strongly

Disagree; Disagree; Neither Agree nor Disagree; Agree or Strongly Agree. When asked

if different learning approaches were not a waste of time in a university setting, about 126

(66.3%) of the respondents strongly indicated they were not; slightly over 30% of

respondents disagreed; and 6 (3.2%) neither agreed nor disagreed. When asked how one

learns plays an important role in classroom learning; Slightly over 15% strongly agreed,

over 15% disagreed, and over 5% strongly disagreed that how one learns plays an

important role in classroom learning. When asked if they would be more willing to

initiate brain-based learning if they knew more about it, over 34% of the respondents

agreed; about 3% strongly disagreed; over 6% disagreed; and 41% neither agreed nor

disagreed they would be more willing to initiate brain-based learning if they knew more

about it. When asked if they believed brain-based learning is a very positive way to

learn, just about half 93 (49%) agreed; and 50 (26.3%) strongly agreed. When asked if

they believed all college of education faculty should know how to implement brain-based

learning slightly over 45% believed they should know; over 24% strongly agreed; and

113

Table 16

Frequencies and Percentages for Brain-Based Learning Belief Questions with

Agreement Ratings (N = 190)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Different learning approaches are a waste of time in a university setting.	126 (66.3%)	58 (30.5%)	6 (3.2%)	0 (0%)	0 (0%)
The purpose of my classroom is to create a supportive, challenging, and a complex environment where questions are encouraged.	4 (2.1%)	0 (0%)	3 (1.6%)	45 (23.7%)	138 (72.6%)
I view how students will learn best, more important than, what I should teach.	8 (4.2%)	34 (17.9%)	74 (39%)	47 (24.7%)	27 (14.2%)
I feel that how one learns plays an important role in classroom learning.	11 (5.8%)	30 (15.8%)	44 (23.2%)	75 (39.5%)	30 (15.6%)
I would be more willing to initiate various learning strategies if there were more time to do so.	5 (2.6%)	13 (6.8%)	55 (29%)	62 (32.6%)	55 (29%)
Brain-based learning is a fad in education which will pass as many other so-called "reforms" have done.	4 (24.7%)	76 (40%)	45 (23.7%)	15 (17.9%)	7 (3.7%)
I believe I already do brain-based learning in my classroom.	3 (1.6%)	11 (5.8%)	48 (25.3%)	95 (50%)	33 (17.4%)

Table 16 (continued)

Frequencies and Percentages for Brain-Based Learning Belief Questions with

Agreement Ratings (N = 190)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I would be more willing to initiate brain-based learning if I knew more about it.	6 (3.2%)	13 (6.8%)	78 (41.1%)	66 (34.7%)	7 (1.2%)
Brain-based learning is a very positive way to learn.	2 (1.1%)	1 (.5%)	44 (23.2%)	93 (49%)	50 (26.3%)
I feel all college of education faculty should know how to implement brain-based learning.	6 (3.2%)	6 (4.2%)	43 (22.4%)	86 (45.3%)	47 (24.7%)

over 22% neither agreed nor disagreed with the statement that all college of education faculty should know how to implement brain-based learning.

As indicated in Table 17, when asked if they believed movement, relaxation, and cross-lateral stretching was a valid form of readiness for learning readiness, 66 (35.1%) participants agreed and 25 (13.3%) strongly agreed; 22 (11.7%) disagreed; 2 (1.1%) strongly disagreed; and 73 (38.8%) neither agreed nor disagreed that they believed movement relaxation, and cross-lateral stretching was a valid form of readiness for learning. Exactly, 53 (28.2%) indicated agreement that movement, relaxation, and cross-lateral stretching should play an important role in classroom learning. Slightly over 45% neither agreed nor disagreed that movement, relaxation, and cross-lateral stretching should play an important role in classroom learning. When asked if drinking water was a very important aspect that enhances learning, only 28% agreed; 18% strongly agreed; and 43% neither agreed nor disagreed.

Table 17

Frequencies and Percentages for Brain Gym Belief Questions with Agreement

Ratings (N = 188)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I feel that movement, relaxation, and cross lateral stretching should play an important role in classroom learning.	3 (1.6%)	25 (13.3%)	86 (45.7%)	53 (28.2%)	21 (11.2%)
I feel that drinking water is a very important aspect that enhances learning.	5 (2.7%)	15 (7.9%)	81 (43.1%)	53 (28.2%)	34 (18.1%)
I view movement, relaxation, and cross lateral stretching a valid form of readiness for learning.	2 (1.1%)	22 (11.7%)	73 (38.8%)	66 (35.1%)	25 (13.3%)

Table 18

Descriptive Statistics for Belief Questions

	N	M	SD	Range
Different learning approaches are a waste of time in a university setting.	190	4.63	.55	1 – 3
The purpose of my classroom is to create a supportive, challenging, and a complex environment where questions are encouraged.	190	4.64	.72	1 – 4
I view how students will learn best, more important than, what I should teach.	190	3.26	1.05	1 – 5
I feel that how one learns plays an important role in classroom learning.	190	4.34	.79	1 – 5
I would be more willing to initiate various learning strategies if there were more time to do so.	190	3.78	1.03	1 – 5
Brain-based learning is a fad in education which will pass as many other so-called "reforms" have done.	190	3.74	1.04	1 – 5
I believe I already do brain-based learning in my classroom.	190	3.76	.87	1 – 5

Table 18 (continued)

Descriptive Statistics for Belief Questions

	N	M	SD	Range
I would be more willing to initiate brain-based learing if I knew more about it.	190	3.50	.93	1 – 5
Brain-based learning is a very positive way to learn.	190	3.99	.78	1 – 5
I feel all college of education faculty should know how to implement brain-based learning.	190	3.84	.96	1 – 5

Faculties' Practice of Indicators of

Brain-Based Learning

Research question 3. To what extent does College of Education faculty in the
Pennsylvania State System of Higher Education practice or utilize indicators of brain-
based learning in their teaching?

This research question was answered by examining the frequencies and
percentages regarding the faculty members' practices or use of indicators of brain-based
learning in their teaching. Table 19 presents frequencies and percentages for the
practices of brain-based learning survey questions that were designed to address research
question three. Nine questions were presented to indicate the level of practice and
utilization a college of education faculty member has in the area of brain-based learning
in their classroom. Participants were asked to indicate: Strongly Disagree; Disagree;
Neither Agree nor Disagree; Agree; or Strongly Agree. When asked if it was not
important to practice various learning strategies in their classroom, of the 190 participants
in the study, 113 (59.5%) strongly disagreed; about 58 (30.5%) disagreed; 9 (4%)
strongly agreed; 6 (3.2%) agreed; and 4 (2.1%) neither agreed nor disagreed with the
previous statement. As far as teaching all their students the meaning and purpose of
various styles of learning, 87 (45.8%) strongly agreed; 65 (34.2%) agreed; 23 (12.1%)
neither agreed nor disagreed; 10 (5.3%) disagreed; and only 5 (2.6%) strongly disagreed.
Table 20 displays frequencies and percentages for practice questions with ratings for how
often practices occurred. When asked if it was important to demonstrate and show
educators new ways of teaching, over half 110 (57.9%) strongly agreed; 68 (35.8%)

Table 19

Frequencies and Percentages for Practice Questions with Agreement Ratings (N = 190)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
It is not important to practice various learning strategies in my classroom.	113 (59.5%)	58 (30.5%)	4 (2.1%)	6 (3.2%)	9 (4.7%)
I should teach all my students the meaning and purpose of various styles of learning.	5 (2.6%)	10 (5.3%)	23 (12.1%)	65 (34.2%)	87 (45.8%)
I have been successful; therefore I will not change my teaching strategy.	40 (21.1%)	86 (45.3%)	49 (25.6%)	11 (5.8%)	4 (2.1%)
It is important to demonstrate and show educators new ways of teaching.	2 (1.1%)	0 (0%)	10 (5.3%)	68 (35.8%)	110 (57.9%)

Table 20

Frequencies and Percentages for Practice Questions with Ratings for How Often (N =

190)

	Never	Rarely	Occasional	Often	Always
I am willing to change my teaching style.	0 (0%)	42 (22.1%)	42 (22.1%)	87 (45.8%)	61 (32.1%)
I utilize some form of brain-based learning strategy on a weekly basis.	1 (0.5%)	4 (2.1%)	32 (16.8%)	75 (39.5%)	78 (41.1%)
I use new and updated information in all my education classes.	0 (0%)	1 (0.5%)	14 (7.4%)	83 (43.7%)	92 (48.4%)
I use the newest technology in my classroom.	1 (0.5%)	8 (4.2%)	43 (22.6%)	90 (47.4%)	48 (25.3%)
I currently attend educational conferences and workshops about the latest trends in education.	7 (3.7%)	22 (11.6%)	43 (22.6%)	58 (30.5%)	60 (31.6%)

agreed; 10 (5.3%) neither agreed nor disagreed; and only 2 (1.1%) strongly disagreed. About 87 (45.8%) indicated they were often willing to change their teaching style; 61 (32.1%) always willing; and 42 (22.1%) were both rarely and occasionally willing to change. When asked if they utilize some form of brain-based learning strategy on a weekly basis, 78 (41.1%) responded always; 75 (39.5%) often; 32 (16.8%) occasionally; 4 (2.1%) rarely; and only 1 (.5%) never. When surveyed whether faculty members currently attended educational conferences and workshops about the latest trends in education, 60 (31.6%) responded always; 58 (30.55) often; 43 (22.6%) occasionally; 22 (11.6%) rarely; and 7 (3.7%) never attended. Table 20 presents descriptive statistics for practice questions.

Research question 4. What is the relationship between the Pennsylvania State System of Higher Education college of education faculties' level of knowledge of brain-based learning and indicators of Brain Gym and their beliefs about brain-based learning?

Table 9 presented the reliabilities. The Beliefs Scale items were highly consistent ($\underline{a}$ = .86). The Knowledge Scale items were also well above the acceptable cutoff ($\underline{a}$ = .79). Only the Practices Scale showed a less-than acceptable reliability ($\underline{a}$ = .64), indicating that some of the items did not show as much consistency with the other items as might be desired.

Scale scores were computed by summing across the items for each scale. Descriptive statistics for each scale score are presented in Table 23.

Table 21

Descriptive Statistics for Practice Questions

	N	M	SD	Range
It is not important to practice various learning strategies in my classroom.	190	4.37	1.02	1 – 5
I should teach all my students the meaning and purpose of various styles of learning.	190	4.15	1.00	1 – 5
I have been successful; therefore I will not change my teaching strategy.	190	3.77	.92	1 – 5
It is important to demonstrate and show educators new ways of teaching.	190	4.49	.70	1 – 4
I am willing to change my teaching style.	190	4.10	.73	1 – 3
I utilize some form of brain-based learning strategy on a weekly basis.	190	4.18	.83	1 – 5
I use new and updated information in all my education classes.	190	4.40	.65	1 – 5
I use the newest technology in my classroom.	190	3.93	.83	1 – 5
I currently attend educational conferences and workshops about the latest trends in education.	190	3.75	1.13	1 – 5

Table 22

Descriptive Statistics for Scales

	N	M	SD	Range
Knowledge	190	48.02	7.39	29 – 65
Beliefs	190	49.73	7.14	25 – 65
Practices	190	37.15	4.01	25 – 45

Research question four was addressed first by computing Pearson correlations between the Knowledge Scale scores and the Beliefs Scale scores. Table 23 shows that the correlation between Knowledge and Beliefs ($r = .51$, $p < .001$) was positive, strong, and highly significant. Thus, there is a significant strong positive relationship between knowledge and beliefs. Table 23 shows the most significant, positive, and strongest correlations between knowledge and practices ($r = .59$, $p < .001$). Beliefs and practices ($r = .56$, $p < .001$), were also significant, strong, and positive.

Table 23

Correlations Between Scales (N = 190)

	Knowledge	Beliefs	Practices
Knowledge	--		
Beliefs	r = .51 (p <.001)	--	
Practices	r = .59 (p <.001)	r = .56 (p <.001)	--

Research question 5. What is the relationship among gender, years of teaching experience, background, and faculties' beliefs, knowledge, and practice in relation to brain-based learning?

Relationships

Research question five addressed the relationships between the three scale scores and (a) gender, (b) years of teaching experience, and (c) background. Each will be addressed in turn.

Gender. Independent *t*-tests were computed to compare males and females on each of the scale scores. Scale scores were computed such that higher scores indicate more knowledge, more agreement with the stated beliefs, or more use of the stated practices. The results are presented in Table 24. For each of the scale scores, females scored significantly higher than males ($p < .001$); thus, females indicated that they had more knowledge, agreed with the beliefs more, and used the stated practices more than males.

Table 24

T-Tests Comparing Males and Females on Scale Scores (N = 190)

	Males (n = 79)	Females (n = 111)		
	M (SD)	M (SD)	t (188)	p
Knowledge	45.84 (6.33)	49.58 (7.72)	-3.54	<.001
Beliefs	46.94 (7.47)	51.72 (6.19)	-4.81	<.001
Practices	35.95 (4.23)	38.00 (3.63)	-3.58	<.001

Years of Teaching Experience

Spearman Rank-Order correlations were computed between years of teaching experience and each of the scale scores. Spearman correlations were appropriate because years of teaching were measured on an ordinal scale. The results are presented in Table 25. There were no significant relationships between any of the scale scores and years of teaching.

Table 25

Spearman Correlations Between Years of Teaching and Scales (N = 190)

	Years of Teaching	
	rho	*p*
Knowledge	-.01	.858
Beliefs	-.09	.200
Practices	-.10	.183

Note. Spearman correlations were used because the variable years of teaching is measured on an ordinal scale. No correlations were significant.

Background

Background was measured as highest degree earned. The answers consisted of Master's Degree, Ph.D./Ed.D., and Other. One-way Analysis of Variance (ANOVA) was used to address whether any of the scale scores differed by background. The results are

presented in Table 26. There were no significant differences between different

backgrounds for any of the scale scores.

Table 26

ANOVAs Comparing Scale Scores Across Backgrounds (N = 190)

	Master's (n = 10) M (SD)	Ph.D./Ed.D. (n = 167) M (SD)	Other (n = 4) M (SD)	F(2,187)	*p*
Knowledge	46.63 (4.81)	48.11 (7.70)	51.00 (9.13)	0.67	.513
Beliefs	51.00 (4.96)	49.52 (7.40)	52.75 (2.36)	0.73	.482
Practices	36.26 (3.49)	37.25 (4.07)	37.00 (4.32)	0.52	.596

Note. No differences were significant.

Summary

Participants agreed they had sufficient understanding of how the brain learns.

Although, some indicated they needed to be more adequately trained in the area of how

the brain learns best. Over half of the faculty indicated that different learning approaches

were not a waste of time. Some agreed to be more willing to initiate brain-based learning

if they knew more about it. There were a below average of faculty using and practicing

brain-based learning in their classroom.

There was a significant, strong, positive relationship between knowledge and beliefs and an even stronger relationship between knowledge and practices. On the other hand, the lack of correlations with demographics was not a "consequence." Also, there were no correlations between demographics and knowledge, beliefs, and practices in brain-based learning.

CHAPTER V

SUMMARY, IMPLICATIONS, AND CONCLUSIONS

Introduction

The purpose of this research was to examine the knowledge, beliefs, and practices of college of education faculty in the Pennsylvania State System of Higher Education (PASSHE) in relationship to brain-based learning and how their knowledge affects their beliefs and practices in their own classrooms. Various demographic variables were also examined for patterns and themes in the data as reflected in faculty understandings, beliefs, and practices of brain-based learning.

Chapter I provided an overview of the importance of brain-based learning. Chapter II outlined the history, conceptual, and theoretical perspectives on brain-based learning. Chapter III detailed the study's procedures, institutional settings, and participants. Chapter IV presented the results of data collection and the results of the analyses of the data collected via the survey instrument used in this study. Chapter V summarizes and interpret the results of those data analyses. Conclusions based on the study's findings, as well as practical implications and implementations for using brain-based learning and Brain Gym in the classroom, will be discussed.

Summary of Research Findings

This study examined a number of questions related to brain-based learning. The following presents a summary of the research findings as they relate to the research questions for the study.

Research question 1. What is the extent of knowledge Pennsylvania State System of Higher Education college of education faculty have about the indicators of brain-based learning and Brain Gym?

The participants' scores reflect an average amount of knowledge in the area of brain-based learning. Knowledge questions have a possible score ranging from 14 – 70. The 190 members that participated in the study had a mean score of 7.39 on knowledge of indicators of brain-based learning and Brain Gym, which means they answered, on average 48.02 % of the items correctly. The ranges for the study of participants were 29 – 65 on the instrument. This suggests the faculty members participating in the study had about an average level of knowledge of indicator of brain-based learning and Brain Gym.

As far as have you ever heard of Brain Gym, only 38 (20.4%) answered yes, and 148 (79.6%) responded no. But, when asked if they used or encouraged some form of movement in their classroom to help with focus, attention, or learning readiness, which is an indicator of Brain Gym, 61 (32.5%) indicated occasionally, 54 (28.7%) often, 27 (14.4%) always, 35 (18.6%) rarely, and 1 (5.9%) never encouraged some form of movement. That suggests they do use movement to enhance focus, attention, and learning readiness, even though they have never heard of Brain Gym.

Research question 2. To what extent does Pennsylvania State System of Higher Education college of education faculty rate the value of brain-based learning and Brain Gym?

In this investigation, the participants' scores reflected an average amount of values or beliefs. The belief questions have a possible score of 13 – 70. The 190

132

members that participated in the study had a mean score of 7.14 of the indicators of

brain-based learning and Brain Gym beliefs, which means they answered, on average

49.73% of the items correctly. The ranges for participants were 25 – 65. The faculty

members participating in the study had an average rate of value of brain-based learning

and Brain Gym.

   Research question 3. To what extent does College of Education faculty in the

Pennsylvania State System of Higher Education practice or utilize indicators of brain-

based learning in their teaching?

   The participants' scores reflected a below average of practice using brain-based

learning in their teaching. The brain-based learning practice questions have a possible

score ranging from 9 – 70. The 190 members that participated in the study had a mean

score (SD) on practices of brain-based learning of 4.01, which means they answered, on

average 37.15% of the items positively. The range for the study participants was 25 – 45

on the instrument. This suggests that the faculty members participating in the study had

below average practices of uses of brain-based learning in their classroom.

   Research question 4. What is the relationship between the Pennsylvania State

System of Higher Education college of education faculties' level of knowledge of brain-

based learning and indicators of Brain Gym and their beliefs about brain-based learning?

   Research question four examined correlations between knowledge and beliefs of

college of education faculty members. There was a significant, strong positive

relationship between knowledge and beliefs. There was also a significant, strong positive

correlation between knowledge and practices. Therefore, if a faculty member had a

strong knowledge of brain-based learning, then they had strong beliefs about brain-based

133

learning. This was very similar to knowledge and practice. If faculty members had a strong knowledge of brain-based learning then they strongly practiced or utilized some form of brain-based learning in their classroom.

Research question 5. What is the relationship among gender, years of teaching experience, background, and faculties' beliefs, knowledge, and practice in relation to brain-based learning?

A related finding from this study was that female scores were significantly higher than male scores. In knowledge, on average females scored scales were 49.6% compared to 45.8% of males. Females scored 51.7% in beliefs, compared to 46.9% males. In practices, females scored 38%, to 36% in males.

There were no significant relationships between any of the scales and years of teaching. There were also no significant differences between different backgrounds for any of the scales scores.

Conclusions

The conclusions from this study are only applicable to the study population. The following are conclusions from this investigation:

1. College of education faculty members in the PASSHE in the study had an average level of knowledge in the area of brain-based learning and Brain Gym. One possible explanation for the average level of knowledge is that they really did not know what brain-based learning or Brain Gym was. For example, 92 (48.2%) participants answered they agreed they had sufficient understanding of how the brain learns, but 75 (39.5%) agreed and 30 (15.8%) strongly agreed they needed

to be more adequately trained in the area of how the brain learns best. As previously noted in Chapter II, if teachers are effective facilitators of the learning process in students, then it is essential that teachers gain specific knowledge regarding the new cognitive brain-based learning theories (Gardner, 1983; Hart, 1975), and that they understand the theoretical rationale on which new cognitive theories (Hart, 1975, 1983; MacLean, 1973, 1978, 1990) are used in order to promote application in the classroom.

Additionally, 64 (33.7%) indicated their university only occasionally had encouraged workshops, conferences, or in-service trainings on the topic of the newest strategies in classroom learning. About 37 (19.5%) rarely and 7 (3.7%) of the universities never encouraged workshops, conferences, or in-service trainings on the newest teaching strategies. These findings may mean faculty needs and wants to have more knowledge about how the brain learns best which should be encouraged by their university. Also noted in the Literature Review, schools today are largely unprepared for the processes and types of professional development required to meet the needs of curriculum change proposed by current reform measures (Sykes, 1996). Staff development for teachers and the entire school community is a very important part of a stimulating program (Wagmeister & Shifrin, 2000).

2. College of education faculty members in the PASSHE in the study had an average level of beliefs in the area of brain-based learning and Brain Gym. More than half 126 (66.3%) of the faculty members strongly disagreed that different learning approaches are a waste of time in a university setting, and 92 (48.4%) strongly

agreed and 47 (24.7%) agreed they felt that how one learns plays an important role in classroom learning. Findings also indicated faculty members would be more willing to initiate various learning strategies if there were more time to do so. About 62 (32.6%) agreed and 55 (29%) strongly agreed. The misconception about needing more time to initiate various strategies especially in brain-based learning may be lower if they knew more strategies about brain-based learning, Brain Gym, and how the brain learns best, which hardly takes any time at all to initiate. "Challenge, feedback, novelty, coherence, and time are crucial ingredients for rewiring the brain" (Jensen, 1995, p. 79). In Chapter II under the theoretical framework, brain-based learning encourages teachers to view intelligence in a variety of ways (Hart, 1975, 1983). According to Gardner (1989), "There is interest in new programs which seek to develop human intelligence for a whole culture to train individuals in such general skills as 'anticipatory learning,' to help individuals to realize their human potential" (p. 5). This relates to my study by using a variety of methods including using many intelligences and different techniques, such as Brain Gym. If there was a faculty interest to be trained then skills could be used to help students realize their full potential.

3. College of education faculty members in the PASSHE in the study had a below average level of practices in the area of brain-based learning. As noted by Jensen (1995) in the Literature Review, educators need to combine the findings of brain research and other fields to strengthen their teaching techniques.

4. Again, this could be due to lack of knowledge, such as when faculty indicated they did not know what Brain Gym was or that they needed more professional development in how the brain learns best. Time, conferences, workshops, or in-services dealing with the latest educational teaching strategies as when faculty indicated they needed more time to do so and universities did not stress professional development for new strategies or new ways of learning. Faculty indicated it was very important to demonstrate and show educators new ways of teaching. As indicated by the examination by NCATE, violations calling for follow-up studies of the effectiveness of teacher preparation were cited as a weakness in 58% of the programs reviewed during 1979 (Kirk, 1982, p. 2). Also according to (Sanders, 1993), the essential challenge in education today is improving the quality of teacher education programs. Faculty themselves reported they were willing to change their teaching style.

5. In addition to the description of faculty's' knowledge, beliefs, and practices of brain-based learning, the relationship between the three areas were also explored. It was revealed that items dealing with knowledge on the survey were significantly related to each other. In other words, knowledge in the area of brain-based learning and indicators of Brain Gym was related to beliefs and practices of brain-based learning. This finding is significant in that it reveals the connectedness of such practices in classroom learning. This finding suggests that faculty members who believe in and have the knowledge necessary to successfully implement brain-based learning in their classroom will be likely to successfully practice brain-based learning strategies as well.

Knowledge of brain-based learning also correlated with faculty's desire for future training and practices in brain-based learning and having more time to initiate various learning strategies. As expected, results revealed that knowledge in the area of brain-based learning led to greater practices. As stated in Chapter II, "A well-trained and effective teacher is still preferable to the most advanced technology, and that even excellent hardware and software are too little avail in the absence of appropriate curricula, pedagogy, and assessment "(Gardner, 1995, p. 223).

In summary, the results indicated a relationship between knowledge and beliefs and knowledge and practices. These results indicate as Darling-Hammond, Ancess, and Falk (1995) suggest, teacher knowledge is crucial in making the reform a reality in the classroom. Chapter II stresses cognitive ability can be broken down into separate pieces of knowledge, and those pieces are strengthened based on their use, practice, and learning. The more learners engage in processing that requires them to break down certain pieces of knowledge, the more they will learn (Lovett, Greenhouse, & Joel, 2000).

Just as noted in Table 9, when faculty members were asked if they felt the need to be more adequately trained in the area of how the brain learns best, 75 (39.5%) indicated agreement. Table 16 indicated, 66 (35.1%) faculty members believed movement, relaxation, and cross-lateral stretching was a valid form of readiness for learning. Table 10 in addition to, 75 (39.9%) faculty members agreed they needed to be more trained in relaxation, movement, and crossing the midline activities and strategies for their classrooms to enhance learning.

As indicated in the Literature Review, schools that are using new teaching strategies are becoming highly effective. In a study by Köksal & Yel (2007), Multiple Intelligence Theory (MIT) base instruction had a statistically significant effect upon the academic success of students and the permanence of the teaching process. In this study, only 58 (30.5%) faculty occasionally, and 22 (11.6%) rarely attended worthwhile workshops or conferences which dealt with the topic of and 22 (11.6%) rarely attended worthwhile workshops or conferences which dealt with the topic of a certain type of learning strategy. Also, 64 (33.7%) faculty members often and 37 (19.5%) rarely has PASSE universities encouraged workshops, conferences, or in-service training on the topic of the newest strategies in classroom learning. When asked if faculty attended worthwhile workshops or conferences which dealt with the topic of relaxation, movement, and crossing the midline activities and strategies for their classroom to enhance learning, 93 (49.5%) indicated they have never attended and 41 (21.8%) indicated they rarely attended. This emphasizes the study by Carla Hannaford in 1995, when she suggested that the use of cross-lateral re-patterning motion can definitely have positive and dramatic effects in learning.

Implications

There are many possible implications of brain-based learning and Brain Gym. "Lack of knowledge about it" was indicated in this study. Because they lack knowledge, many faculty members may be resistant to implement brain-based learning or Brain Gym strategies in their classroom. However, given all of the newest strategies available and the "explosion" of new information on the brain, neurology, and how one learns, faculty

may ultimately simply not know how to go about the task of incorporating brain-based learning and Brain gym in their classroom.

Recognizing this, the literature suggests that a new role for college of education faculty and universities may be to focus on educating the faculty rather than the students. The research shows a need for additional training in how the brain learns best, and applying the newest strategies and techniques in brain-based learning in the classroom. The amount of time and effort traditionally devoted to instructing students would be better focused on faculty. By better understanding the concept and how to incorporate something, faculty will create a nurturing, facilitative environment wherein individuals can more readily learn how to learn and where such is no longer the exception but rather the norm (Smith, 1997).

Also in the literature, effectiveness of teachers' education programs is recognized as a critical element in improving the quality of education. Universities need to provide training in relaxation, movement, and crossing the midline activities and strategies for university faculty members' classrooms to enhance learning which are the indicators of Brain Gym, and provide opportunities for faculty members to attend professional development on this topic. Since faculty members stated it was important to practice various learning strategies in their classroom, they should be encouraged to collaborate with colleagues concerning the implementation of a certain type of learning strategy, and to realize the importance of practicing various learning strategies in their classroom.

Recommendations for Practice

As was suggested by studies sited in the literature review, effective brain-based learning compels teachers to alter their thinking and incorporate strategies from research on learning and the brain. This was supported by the results of the current study. When faculty members responded to the statement, "I have been successful, therefore I will not change my teaching strategy," 66.32% of respondents (126) indicated they were willing to change their teaching style, suggesting they were open to altering their thinking and incorporating brain-based learning strategies. Daniel pink, noted author and former chief speechwriter to Al Gore, is a researcher who promotes using skills associated with the right-brain. Pink examined economic factors changing the workforce and how government professionals can take advantage of their skills to achieve success in this rapidly shifting environment. He indicates today's workers now need skills associated with the right side of the brain--artistry, empathy, and big-picture thinking (Pink, 2006). Pink also notes that right brain skills are quickly becoming indispensable in today's workforce. He points out that right-brained skills can make someone a happier, more fulfilled person. Tapping into right-brained abilities can make people more effective in their career and in their relationships. Pink identifies six right-brained skills that are very crucial: Design; Story; Symphony; Empathy; Play; and, Meaning. Pink believes today's workforce wants right-brained thinkers who can create products and ideas that are new, fresh, and needed. That is consistent with the results from the current research. When faculty members were asked the purpose for teaching learning readiness skills, 78.49% responded that it would be useful in promoting creative thinking. He also notes that improving empathy in people not only makes them keener, but helps them stay in tune

with the emotions of the people around them. Those right-brained skills are the ones

educators and students should possess. They are exactly the skills that should be taught

to pre-service teachers along with other techniques learned in the professional education

classroom. Pink explains, "If you can tap into your right brain skills, you won't just get

ahead in the workforce, but find a pathway to being more human (Pink, 2009).

Recommendations for Future Research

It would be interesting to learn that if faculty actually used brain-based learning

and Brain Gym in their classrooms what might be the results. As indicated in the current

study, 67.37% (128) of faculty members stated they believe they already do brain-based

learning in their classroom. As Wagmeister and Shifrin (2000) indicated, brain-based

learning helped children with dyslexia, dysgraphia, and dyscalculia. Caine and Caine

(1995) reported that students in their study showed a steady improvement in standardized

test scores. Finally, Caulfield, Kidd, and Kocher (1999) showed their subjects had gains

in reading. More research might provide information about the potential gain in other

academic areas. Would students whose teachers incorporated brain-based learning or

Brain Gym in their classrooms show gains in subjects such as mathematics, science, or

even music? Might there be increased self-awareness? Would students be calmer,

happier, or less moody? Could teachers find improved organization in their students?

More research in these areas could provide the answers. As stated by faculty in my

research, when asked if they would be more willing to initiate brain-based learning if

they knew more about it, 48.95% (93) agreed they would be more willing to initiate it.

This indicated these faculty members were not quite sure if they knew everything about brain-based learning. Yet, the faculty expressed willingness to learn more about it.

Follow-Up--Questions Unanswered

One important question to ask is, "How will faculty come to understand and use this process?" Since the participants in the study indicated they occasionally attended a worthwhile workshop or conference, might there be some kind of professional development available at the universities themselves if professors cannot find the time to attend a workshop or conference elsewhere? It would be interesting to see if the universities could link with schools in their areas to provide training for both the university professors in professional education as well as teachers in the local schools. A partnership with the universities and schools might provide a catalyst for learning about brain-based learning and Brain Gym.

If faculty of education members are not learning about brain-based learning and Brian Gym, how will this information become available to the faculty of education members and the universities? If faculty are not attending conferences and workshops, by what other means will they learn about the processes?

Finally if the participants state they are utilizing some form of brain-based learning strategy on a weekly basis, what strategies are they using? Why are they using the ones they are? Would there be a reason to use some strategies over the others?

Although this study provided some information about the use of brain-based learning and Brain Gym, there are still many questions that can be asked and later answered.

Implications

There are many possible implications of brain-based learning and Brain Gym.

"Lack of knowledge about it" was indicated in this study. Because they lack knowledge,

many faculty members may be resistant to implement brain-based learning or Brain Gym

strategies in their classroom. However, given all of the newest strategies available and

the "explosion" of new information on the brain, neurology, and how one learns, faculty

may ultimately simply not know how to go about the task of incorporating brain-based

learning and Brain Gym in their classroom.

Recognizing this, the literature suggests that a new role for college of education

faculty and universities may be to focus on educating the faculty rather than the students.

The research shows a need for additional training in how the brain learns best, and

applying the newest strategies and techniques in brain-based learning in the classroom.

The amount of time and effort traditionally devoted to instructing students would be

better focused on faculty. By better understanding the concept and how to incorporate

something, faculty will create a nurturing, facilitative environment wherein individuals

can more readily learn how to learn and where such is no longer the exception but rather

the norm (Smith, 1997).

Also in the literature, effectiveness of teachers' education programs is recognized

as a critical element in improving the quality of education. Universities need to provide

training in relaxation, movement, and crossing the midline activities and strategies for

university faculty members' classrooms to enhance learning which are the indicators of

Brain Gym and provide opportunities for faculty members to attend professional

development on this topic. If an error is being made in universities not to encourage in-

services or professional development for different types of learning strategies then faculty needs to know when an error has been made and how to correct that error. As noted in the literature review with Chris Argyris' early research, people have mental maps with how to act in certain situations (Argyris & Schon, 1974). The Espoused Theory is the theory of action of allegiance and communication to others. If faculty members communicate to universities the importance of learning styles and strategies, maybe more emphasis will be added to professional development and to the importance of different learners and the importance of new strategies and techniques in the classroom to enhance learning. Since faculty members stated it was important to practice various learning strategies in their classrooms, they should be encouraged to collaborate with colleagues concerning the implementation of a certain type of learning strategy, and to realize the importance of practicing various learning strategies in their classroom.

Closing

Any effort to reform instructional practices involves a change in knowledge, attitudes, and practices of the participants in the change effort (Weick, 1995). As research in the literature review suggested, effective brain-based learning ultimately requires teachers to change their thinking and teaching methods to encompass research on learning and the brain. In addition to research in education, new knowledge from such fields as medicine, technology, genetics, and communication lends further support to brain-based teaching as an effective means to improve student achievement, focus, and attention skills. Therefore, there is evidence in many fields to support the findings from this study that pre-service teachers and in-service teachers should be trained to practice

various learning strategies in their classrooms. Teachers and educators of future teachers are in a unique position to bring about a paradigm shift that recognizes brain-based teaching methods as effective educational practices.

REFERENCES

Abruscato, J. (1993). Early results and tentative implications from the Vermont

   Portfolio Project. *Phi Delta Kappan, 74*, 474-477.

Adler, D. L. (1998). *Understanding: Coming to terms with the u-word of instructional*

   design. Paper presented at the annual meeting of the Mid-South Educational

   Research Association, New Orleans, LA.

Ajzen, I., & Fishbein, M. (1980). *Undertanding attitudes and predicting social*

   behavior. Englewood Cliffs, JN: Prentice Hall.

Allen, L. , & Gorski, R. (1991). Sexual dimorphism of the anterior commissure

   and massa inter media of the human brain. *Journal of Comparative Neurology,*

   312, 97-104.

Andrews, A., Nonnecke, B., & Preece, J. (2003). Electronic survey methodology;

   A case study in reaching hard to involve internet users. *International Journal of*

   Human-Computer Interaction, *16*(2), 185-210.

Argyris, C. (1974). *Behind the front page.* San Francisco: Jossey Bass.

Argyris, C. (1993). *Knowledge for action.* San Francisco: Jossey Bass.

Argyris, C., & Schön, D. (1974). *Theory in practice: Increasing professional*

   effectiveness. San Francisco: Jossey Bass.

Argyris, C., Putnam, R., & McLain Smith, D. (1985). *Action science: Concepts,*

   methods, and skills for research and intervention. San Francisco: Jossey Bass.

Babbie, E. (1995). *The practice of social research* (7th ed.). Belmont, CA: Wadsworth.

Bandura, A. (1965). Behavioral modification through modeling procedures. In L.

    Kraser & L.P. Ulmann (Eds.), *Research in behavior modification: New*

    development and implications (pp. 310-340). New York: Reinhart

    & Winston.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change.

    Psychological Review, 84, 195-215.

Bandura, A. (1996). *Social foundations of thought and action: A social cognitive*

    theory. Englewood Cliffs: Prentice-Hall.

Bandara, A. (1997). *Self-efficacy: The exercise of control.* New York: W. H. Freeman.

Barnard, J. (2000). A study of Internet & library use in an academic setting

    Dissertation Abstract International, 61(2), 577. (UMI No. 9962600).

Bransford, J., Brown, A., & Cocking, R. *How People Learn.* Retrieved on July, 13,

    2004, from http://stills.nap.edu/html/howpeoplel/ch10.html

Brink, S. (1995, May 15). Smart moves: New research suggests that folks from 8 to 80

    can shape up their brains with aerobic exercise. *US News & World Report,*

    78-82.

Bruning, R., Schraw, G., & Ronning, R. (1995). *Cognitive psychology and instruction.*

    Englewood Cliffs, NJ: Prentice Hall.

Burke, K. (1999). *The mindful school: How to assess authentic learning*. Arlington

    Heights, IL: Skylight Training & Publishing Inc.

Burton, L., Rabin, L., Vardy, S., Frohlich, J., Wyatt, G., Dimitri, D., Constante, S., &

    Guterman, E. (2004). Gender differences in implicated and explicit memory for

    affective passages. *Brain and Cognition, 54*(3), 218-224.

Caine, R., & Caine, G. (1988, January). How to think about the brain: A set of guiding

principles for moving cautiously when applying brain research to the classroom.

The School Administrator.

http://findarticles.com/p/articles/mi_m0JSD/is_1_55/ai_77195563

Caine, R., & Caine, G. (1995, April). Reinventing schools through brain-based learning.

Educational Leadership, 43-47.

Caine, R., & Caine, G. (1994). *Making connections: Teaching and the human brain.*

Menlo Park, CA: Addison-Wesley.

Caine, R., & Caine, G. (1990). Understanding a brain-based approach to teaching &

learning. *Educational Leadership, 48*(2), 66-70.

Caufield, J., Kidd, S., & Kocher T. (2000). Brain-based instruction in action.

Educational Leadership, 58(3), 62-65.

Chan, T., & Petrie, G. (1998). The brain learns better in well-designed school

environments. *Classroom Leadership, 2*(3), 1-4.

Chen, X. (2002). *Teaching undergraduates in U.S. postsecondary institutions:*

Fall 1998. (NCES 2002-209). Washington, DC: National Center for Education

Statistics.

Retrieved March 10, 2008, from http://nces.ed.gov/pubs2002/2002209.pdf

Collinson, V. (1999). Redefining teacher excellence. *Theory into Practice*, *38*(1), 4-11.

Connell, D. (2005). *Brain-based strategies to reach every learner.* New York, NY:

Scholastic Inc.

Conoley, J. C., & Impara, J. C. (Eds.). (1995). *The twelfth mental measurements*

yearbook. Lincoln, NE: University of Nebraska Press.

149

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests.

   Psychometrike, 16, 297-334.

Darling-Hammond, L. (1997). *The right to learn: A blueprint for creating schools*

   that work. New York: John Wiley & Sons.

Darling-Hammond, L., & Ancess, J., & Faulk, B. (1995). *Authentic assessment in*

   action: Studies of schools and students at work. New York: Teachers College

   Press.

Darling-Hammond, L., & McLaughlin, M. (1996). Politics that support professional

   development in an era of reform. *Phi Delta Kappan, 76*, 597-604.

Dennison, P. (1981). *Switching on: The whole brain answer to dyslexia.* Ventura, CA:

   Edu-K Inc.

Dennison, P., & Dennison, G. (1985). *Personalized whole brain integration.* Ventura,

   CA: Edu-K Inc.

Dennison, P., & Dennison, G. (1985). *Teachers Edition Revised.* Ventura, CA: Edu-K

   Inc.

Dervin, B., & Clark, K. D. (1987). *ASQ: Asking significant questions: Alternative tools*

   for information need & accountability assessments by libraries. Belmont, CA:

   A publication of the Peninsula Library System for the California State Library.

Donczik. J. (2001, December). Brain exercise improves reading and memory. B*rain*

   Gym Journal, 1-12.

Driscoll, M. (2000). *Psychology of learning for instruction.* Needham Heights, MA:

   Allyn & Bacon.

150

EIG. (2006). *Excellence in government.* Paper presented July 10-11, 2006 Washington, D.C.

Ericsson, K., & Simon, H. (1980). Verbal reports as data. *Psychological Review, 87,* 215-251.

Flavell, J. (1971). First discussant's comments: What is memory development the development of? *Human Development, 14*, 272-278.

Flavell, J. (1979). Metacognition & cognitive monitoring: A new area of cognitive developmental inquiry. *American Psychologist, 34*, 906-911.

Flavell, J. (1963). *The developmental psychology of Jean Piaget.* New York: D. Van Nostrand.

Fowler, F. J. (2002). *Survey research methods* (3rd ed. Vol. 1). Thousand Oaks: Sage.

Freeman, C. (2000, December). A summary of a brain gym research project on reading. *Brain Gym Journal,* 3.

Fullan, M. (2000). The three stories of education reform. *Phi Delta Kappan, 81*(8), 581-584.

Gagne, R. M., Briggs, L. J., & Wager, W. W. (1992). *Principles of instructional design* (4th ed.). Fort Worth: Harcourt, Brace, Jovanovich College Publishers.

Gardner, H. (1989). Balancing specialization and comprehensive knowledge: The growing educational challenge. In T. Sergiovanni & J. Moore (Eds.), *Schooling for tomorrow* (p. 148-164). Boston: Allyn & Bacon.

Gardner, H. (1983). *Frames of mind: The Theory of Multiple Intelligences.* New York: Harper Collins.

Gay, L. R., & Airasian, P. (2000). *Educational research: Competencies of analysis and application* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Gideonse, H. D. (1993). Appointments with ourselves: A faculty argument for NCATE. *Phi Delta Kappan, 75*(2), 174-179.

Greenfield, S. (1995). *Journey to the centers of the mind.* New York: W.H. Freeman.

Greve, W. (2002). Traps ad Gaps in action theory: Theoretical problems of a psychology of human action. *Psychological Review, 108*(2): 435-451.

Guarino, C. M., Hamilton, L. S., Lockwood, J. R., & Rathbun, A. H. (2006). *Teacher qualifications, instructional practices, and reading and mathematics gains in kindergartners.* (NCES 2006-031.) Washington, DC: National Center for Education Statistics.

Hannaford, C. (1997). *The dominance factor.* Arlington, VA: Great Oceans Publishers.

Hannaford, C. (1995). *Smart moves: Why learning is not all in your head.* Arlington, VA: Great Oceans Publishers.

Hart, L. (1983). *Human brain, human learning.* New York: Longman.

Hart, L. (1975). *How the brain works.* New York: Basic Books.

Henderson, J. (1992). *Reflective teaching: Becoming an inquiring educator.* New York: McMillan.

Howard, P. (2000). *The owner's manual for the brain: Everyday applications from mind-brain research* (2nd ed.) Atlanta, GA: Bard Press.

Issacs, K. (1992). Exercise and the brain: Angiogenesis in the adult rat cerebellum after vigorous physical activity and motor skill learning. *Journal of Cerebral Blood Flow and Metabolism, 12*(1), 110-119.

Jacobson, J. (2007). In the zone: How a virtual district provides real help for really

      struggling schools. *American Educator, 31*(1).

Jensen, E. P. (2008). A fresh look at brain-based education. *Phi Delta Kappan, 89*(6),

      Retrieved March 10, 2008, from

      http://www.pdkintl.org/kappan/k_v89/k0802jen.htm

Jensen, E. (2000, April). Brain-based learning: A reality check. *Educational*

      Leadership, 76-80.

Jensen, E. (1998). *Teaching with the brain in mind.* Alexandria, VA: ASCD

      Publishing.

Jensen, E. (1995*). Brain-Based Learning: The new science of teaching & training.*

      San Diego, CA: The Brain Store.

Joyce, B., & Showers, B. (1996*). Student achievement through staff development.*

      New York: Longman.

Julien, H. (1996). A content analysis of the recent information needs and uses literature.

      Library and Information Science Research, *18,* 171-191.

Kanter, R. M. (1994). Collaborative advantage: The art of alliances. *Harvard Business*

      Review, 4, 96-108.

Kaufeldt, M. (1999). *Begin with the brain: Orchestrating the learner-centered*

      classroom. Tucson, AZ: Zephyr Press.

Kempermann, G., Kuhn, H., & Gage, F. (1997, April). More hippocampal neurons in

      adult mice living in an enriched environment. *Nature, 38,* 493-495.

Kiesler, S., & Sproull, L. S. (1986). Response effects in the electronic survey. *Public*

      Opinion Quarterly, *50*, 402-413.

Kimura, D. (2004, April). Human sex differences in cognition: Fact, not predicament

    Sexualities, Evolution & Gender, 6(1), 45-53.

King, M. B., & Newmann, F. M. (1999). *School capacity as a goal for professional*

    development: Mapping the terrain in low-income schools. Paper presented at the

    annual meeting of the Educational Research Association, Montreal, Canada.

Kirk, E. L. (1982). *Follow-up studies of teacher education program graduates.*

    National Council for Accreditation of Teacher Education.

Kekoni, J. (1998*). Processing of stimulus repetition and change in the somatosensory*

    system: Recordings of electrical and magnetic brain responses. Retrieved

    January 8, 2004, from

    htpp://ethesis.hlsinki.fi/julkaisut/hum/psyko/vk/kekoni/etusivu.html

Köksal, M., & Yel, M. (2007). The effect of multiple intelligences theory (MIT)-based

    instruction on attitudes towards the course, academic success, and permanence

    of teaching on the topic of respiratory systems. *Educational Sciences: Theory &*

    Practice, 7(1), 231-239.

Koohang, A. & Du Plessis, J. (2004). Architecting usability properties in the e-learning

    instructional design process. *International Journal on E-Learning, 3*(3), 38-43.

Lawley, L. (1999). Making sense of doctoral student attrition in Library and Information

    Science. Unpublished doctoral dissertation, The University of Alabama.

    Dissertation Abstracts International, *61*(1), A.

Lazear, D. (1991). *Seven ways of knowing: Teaching for multiple intelligence.*

    Palatine, IL: Skylight Training & Publishing Inc.

Leary, M. (1991). *Behavioral research methods.* Belmont, CA: Wadsworth Inc.

Levine, A., & Cureton, J. S. (1998). Collegeiate life: An obituary. *Change*, 30(3), 12-17.

Linksman, R. (1996). *How to learn anything quickly.* New York: Barnes and Noble.

Little, J. W. (1994). Teachers' professional development in a climate of educational Reform. *Educational Evaluation and Policy Anaylsis*, *15*, 129-151.

Lovett, M., Greenhouse, J., & Joel, B. (2000). Applying cognitive theory to statistics instruction. *American Statistician*, *54*(3), 196-207.

MacLean, P. (1978). A mind of three minds: Educating the triune brain. In K. Rehage (Ed.), *Education and the brain* (pp. 308-342). Chicago: The University of Chicago Press.

MacLean, P. (1973). *A triune concept of the brain and behavior.* Toronto, Ontario, Canada: University of Toronto Press.

Martin, K. (2006). *Digital Dissertation. Perceptions of brain-based learning from Principals in the Bulloch County School System, Georgia. Retrieved* June 25, 2007, from
 http://proquest.uni.com.navigator-iup.passhe.edu/pqdweb?index=4&sid1...

Maturana, H. (2002). Paper on *The contribution of Humberto Maturana to the sciences of complexity and psychology.* Alfred Ruiz (Ed.).

McGilly, K. (1994). *Classroom lessons: Integrating cognitive theory and classroom practice.* Cambridge, MA: Brookline Books.

McKeachie, W. J. (1988). The need for study strategy training. In C. E. Weistein, E. T. Goetz, & P. A. Alexander (Eds.), *Learning and study strategies: Issues in assessment, instruction, and evaluation* (pp. 3-9). San Diego, CA: Academics.

155

Meisels, S., Harrington, H., McMahon, P., Dichtelmiller, M., & Jablon, J. (2002). *Thinking like a teacher.* Boston: Allyn & Bacon.

Mikels, J. (2003). Hold on to that feeling: Working memory and emotion from a Cognitive neuroscience perspective. *Digital Dissertaions*. University of Michigan. http://wwwlib.umi.com/dissertations/fullcit/3079504

Mirsky, A. F. (1978). Attention: A neuropsychological perspective. In J. S. Chall, & A. F. Mirsky (Eds.), *Education and the brain: The seventy-seventh yearbooko f the National Society for the Study of Education* (pp. 33-60). Chicago: The University of Chicago Press.

Myrah, G., & Erlauer, L. (1999, September). The benefits of brain research: One district's story. *High School Magazine*, *7*(1), 34-40.

Newmann, F. M., & Wehlage, G. G. (1995). *A report to the public and educators* (Center on Organization & Restructuring of Schools). Madison, WI: University of Wisconsin-Madison, Center for Educational Research.

Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement*. New York: Printer Publishers.

Parasuraman, R. (1998). The attentive brain: Issues and prospects. In R. Parasuraman, (Ed.), *The attentive brain* (pp. 3-15). Cambridge, MA: MIT Press.

Paris, S., & Winograd, P. (1990). How metacognition can promote academic learning and instruction. In B .F. Jones, & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (pp. 15-51). Hillsdale, NJ: Lawrence Erlbaum Associates.

Parker, B., & Plank, R. (2000). A use and gratification perspective on the Internet as a new information. *American Business Review*, *18*(2), 43-49.

Pennsylvania Association State System of Higher Education (PASSHE). (2008).

    Faculty professional development council. Retrieved May 15, 2008 from

    http://www.passhe.edu/executive/academic/Pages/FPDC.aspx

Penrose, A., & Sitko, B. (Eds.). (1993*). Hearing ourselves think: Cognitive research in*

    the college writing classroom. New York: Oxford University Press.

Perkins, D. (1997). *Smart Schools: Better thinking and learning for every child.* New

    York: The Free Press.

Pink, D. (2006). *The right brain imperative.*

    From blog.exelgov.com/2006/07daniel_pink_on_the_right_brain_l.html

Pink, D. (2009). *Living on the right side of the brain.* From

    www.cpbn.org/pressrelease/daniel-pink

Pool, C. (1997). Maximizing learning: A conversation with Renate Nummela Caine.

    Educational Leadership, 54(6), 11-15.

Promislow, S. (1999). *Making the brain body connection.* West Vancouver, British

    Columbia, Canada: Kinetic Publishing Co.

Rauf, D. (2004). Life on campus. *Careers & Colleges, 24*(4), 6-11.

Reschly, D., & Wilson, M. (1990). Cognitive processing versus traditional intelligence:

    Diagnostic utility, intervention. *School Psychology Review*, *19*(4), 143-159.

Richardson, D.   (2003). Embodied cognition: The psychological process of a situated

    mind. *Digital Dissertaions.* Cornell University. Retrieved on January 6, 2004.

    from http://proquest.umi.com.navigator-iup.passhe.edu/pqdweb?

    did=765690371&sid=2&Fmt=2&clientld=63512&RQT=309

    &VName=PQD

Samples, B.   (1987). *Open mind/whole mind.* Rolling Hills Estates, CA: Jalmar.

Sanders, T. (1993). A state superintendent looks at national accreditation. *Phi Delta Kappan, 75*(2), 165-170.

Senge, P. (1990). *The fifth discipline.* New York, NY: *Doubleday*.

Sibley, B., & Etnier, J. (2003). The relationship between physical activity and cognition in children: A meta-analysis. *Pediatric Exercise Science, 15*, 243-256.

Sifft, J. (1991). *Educational Kinesiology Foundation Research Report.* Ventura, CA.

Smith, R. (1997). *Philosophical shift: Teach the faculty to teach information literacy*. Paper presented at the ACRL National Conference, Nashville, TN. Retrieved from http://www.ala.org/ala/acr/bucket/nashville1997pap/smith.htm

Smart, J. (2005). Attributes of exemplary research manuscripts employing quantitative analyses. *Research in Higher Education*, *46*(4) June 2005.

Sousa, D. (2003). *The leadership brain*. Thousands Oaks, CA: Corwin Press.

Sprenger, M. (1999). *Learning and memory: The brain in action.* Alexndria, VA: Association for Supervision and Curriculum Development.

Slywester, R. (1995). *A Celebration of neurons: An educator's guide to the human brain.* Alexandria, VA: Association for Supervision and Curriculum Development.

Stevens, J., & Goldberg, D. (2001). *For the learners' sake.* Tucson: Zephyr Press.

Strick, P. (1995). Introducing. *The Psychologist, 38*(6), 288.

Sykes, G. (1996). Reform of and as professional development. *Phi Delta Kappan, 77*, 464-467.

Thomas, K. (2003). Cognitive mapping and spatial navigation in patients with anterior

      temporal lobectomy. *Digital Dissertations.* The University of Arizona.

      Retrieved January 6, 2004. from

      http://proquest.umi.com.navigator-iup.passhe.edu/pqdweb?

      did=765957671&sid=2&Fmt=2&clientld=63512&RQT=309

      &VName=PQD

Ucak, E., Bag, H., & Usak, M. (2006). Enhancing learning through multiple

      intelligences in elementary science education. *Journal of Baltic Science*

      Education, 2(10), 61-69.

U.S. Department of Education. (2007). *No Child Left Behind.* Retrieved March 10,

      2008, from http://www.ed.gov/nclb/landing.jhtml

VanMeter, P., Yokoi, L., & Pressley, M. (1994). College students' theory of

      note taking derived from their perceptions of note taking. *Journal of Educational*

      Psychology, 86, 323-338.

Viadero, D.   (1995, July). Counter intelligence. *Education Week*, *14*(40), 35-37.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological*

      processes. Cambridge: Harvard University Press.

Wagmeister, J., & Shifrin, B. (2000, November). Thinking differently, learning

      differently. *Educational Leadership,* 45-48.

Weick, K. E. (1995). *Sensemaking in organizations.* Thousand Oaks, CA: Sage.

Weiss, R. (2000, July). Brain-based learning. *Training & Development*, *54*(7), 20-24.

Wheatly, M. (1993). *Leadership and the new science.* San Fransisco: Berrett-Koehler.

Wiggins, G. P. (1993). *Assessing student performance: Exploring the purpose and limits of testing.* San Francisco: Jossey-Bass.

Willingham, D. (2004). Reframing the mind. <u>*Education Week.*</u> *4*(3), 19-24.

Witelson, S., Kigar, D., & Harvey, T. (1999, June). The exceptional brain of Albert Einstein. *Lancet,* 353(9170), 2149-153.

Winkelmann, P. (2001, July). The growth of brain gym in developing countries. *Brain Gym Journal*, *15*(1&2), 8-9.

Wolfe, P. (2001). *Brain matters: Translating research into classroom practice.* Alexandria, VA: ASCD.

Wong, H., & Wong, R. (1998). *How to become an effective teacher: The first days of school.* Mountain View, CA; Harry Wong.

APPENDICES

Brain-Based Learning Survey Questionnaire

BRAIN-BASED LEARNING SURVEY QUESTIONNAIRE (BBLSQ)

1. **What is your gender?**

   ____Male

   ____Female

2. **What is your age?**

   ____ younger than 30

   ____ 30-39

   ____ 40-49

   ____ 50-59

   ____ 60 or older

3. **Are you in the College or School of Education Faculty?**

_____ Yes

_____ No

If you answered No, to Question #3, please stop and do not continue.

4. **How many years have you been teaching in Higher Education?**

_____ Less than 5

_____ 5-10

_____ 11-15

_____ 16-20

_____ More than 20 years

5. Highest Degree Earned?

    ____ Bachelor of Science   ____ Ph. D./Ed.D.

    ____ Bachelor of Arts   ____ Other (please specify)_____

    ____ Masters Degree

Please read the following definitions before completing the questions which follow:

Brain-Based Learning is a learning approach that is more aligned with how the brain naturally learns best. Brain-Based Learning is a way of thinking about the learning process. It is learning with the brain in mind.

Brain-Based Learning is providing for differences in learning. Encouraging students to learn with music, mind maps, role plays, journals, model building, movement, community projects, theater, art, etc. (Jensen, 2000).

Brain Gym is a series of twenty-six simple movements to enhance the experience of whole-brain learning (Dennison & Dennison, 1989).

Indicators of Brain Gym are relaxation techniques, cross lateral movements,

stretching techniques, and drinking plenty of water.

Please indicate

      1- Strongly Disagree
      2- Disagree
      3- Neither Agree or Disagree
      4- Agree
      5- Strongly Agree

(Knowledge of Brain-Based Learning)

6. I have sufficient understanding of how the brain learns.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

    ____   ____   ____   ____   ____

7. I am comfortable with the use of various learning strategies as part of my

    classroom teaching.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

    ____   ____   ____   ____   ____

8. I am knowledgeable about the use of providing frequent, non-judgmental

    feedback as a useful tool.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

9. I feel the need to be more adequately trained in the area of how the brain learns

   best.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

10. When evaluating students, I evaluate in a way that accounts for the fact that

   students learn differently.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

Please indicate

   1- Never
   2- Rarely
   3- Occasionally
   4- Often
   5- Always

11. I pre-expose my students to content & context of a topic at least one week before

introducing it.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

---

12. I have attended worthwhile workshops or conferences which dealt with the topic

of a certain type of learning strategy.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

13. I have sought the advice of colleagues concerning the implementation of a

certain type of learning strategy.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

---

14. I support the use of real-life, immersion-style multi-path learning over

traditional learning in my classroom.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

167

15. Our University has encouraged workshops, conferences, or in-service training on the topic of the newest strategies in classroom teaching.

(Please check one answer)

1 Never	2 Rarely	3 Occasionally	4 Often	5 Always
____	____	____	____	____

Please indicate

      1- Strongly Disagree

      2- Disagree

      3- Neither Agree or Disagree

      4- Agree

      5- Strongly Agree

(Beliefs about Brain-Based Learning)

16. Different learning approaches are a waste of time in a University setting.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

    ____   ____   ____   ____   ____

17. The purpose in my classroom is to create a supportive, challenging, and complex environment where questions are encouraged.

 (Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

_____   _____   _____   _____   _____

18. I view how students will learn best, more important than, what should I teach.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

_____   _____   _____   _____   _____

19. I feel that how one learns, plays an important role in classroom learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

_____   _____   _____   _____   _____

20. I would be more willing to initiate various learning strategies if there were more

time to do so.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

_____   _____   _____   _____   _____

21. Brain-based learning is a fad in education which will pass as many other

so-called "reforms" have done.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

22. I believe I already do brain-based learning in my classroom.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

23. I would be more willing to initiate brain-based learning if I knew more about it.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

24. Brain-based learning is a very positive way to learn.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

25. I feel all college of education faculty should know how to implement brain-based

    learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

(Practices of Brain-Based Learning)

26. It is not important to practice various learning strategies in my classroom.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

27. I should teach all my students the meaning and purpose of various styles of

learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

28. I have been successful; therefore I will not change my teaching strategy.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

Please indicate

1- Never
2- Rarely
3- Occasionally
4- Often

5- Always

29. I am willing to change my teaching style.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

30. I utilize some form of brain-based learning strategy (e.g. students: drawings, charts, lists, dialogues, actions, demonstrations, debates, or mind-maps) on a weekly basis.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

31. I use new and updated information in all my education classes.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

32. It is important to demonstrate and show educators new ways of teaching.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

33. I use the newest technology in my classroom.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

   ____   ____   ____   ____   ____

34. I currently attend educational conferences and workshops about the latest

   trends in education. (Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

   ____   ____   ____   ____   ____

(Indicators of Brain Gym)

35. I feel the need to be more adequately trained in relaxation, movement, and

   crossing the midline activities and strategies for my classroom to enhance

   learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

   ____   ____   ____   ____   ____

I use or encourage some form of movement in my classroom to help with focus,

   attention, or learning readiness.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

36. I view movement, relaxation, and cross lateral stretching a valid form of

readiness for learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

I encourage my students to use some form of cross lateral movements or

crossing the midline for concentration or thinking skills.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

37. I feel that movement, relaxation, and cross lateral stretching should play an

important role in classroom learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

38. I feel that drinking water is a very important aspect that enhances learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

39. I use or encourage some form of movement in my classroom to help with focus attention, or learning readiness.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

40. I encourage my students to use some form of cross-lateral movements or crossing the midline for concentration or thinking skill.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

41. I have attended workshops or in-services which dealt with the topic of relaxation, movement, and crossing the midline activities and strategies for my classroom to enhance learning.

(Please check one answer)

1 Never   2 Rarely   3 Occasionally   4 Often   5 Always

____   ____   ____   ____   ____

175

(Please check all that apply)

42. What would you use or teach learning readiness skills for?

____ **focus/attention**

____ **academics**

____ **relax/calm**

____ **readiness**

____ **creative thinking**

43. What specific movement or activity do you feel most benefits student learning?

(Please choose at least one answer)

____ **Relaxation Techniques**

____ **Cross Lateral Movements**

____ **Water Breaks**

____ **Stretching Techniques**

____ **Strategies for Focus & Attention**

____ **Other (Please specify)**_____

Please answer by filling in response

44. Have you ever heard of brain gym?

____ Yes ____ No

If yes, please specify?

45. Have you ever taken courses, workshops, or in-service training about Brain Gym? If yes, please specify?

____ Yes ____ No

---

46. Please indicate your level of agreement with the following statement: (Teaching Style) – It is important to take an inventory or scale to determine what my teaching style is (e.g., right-brained, left-brained, middle-brained).

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

---

47. Please indicate your level of agreement with the following statement: (Teaching Style) - It is important to give an inventory or scale to all my students to determine what theirlearning style is (e.g., right-brained, left-brained, middle-brained).

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

____   ____   ____   ____   ____

---

48. Please indicate your level of agreement with the following statement: (Teaching Style) – I believe that both the left and right hemispheres of the brain need to be activated to enhance learning.

(Please check one answer)

1 Strongly Disagree 2 Disagree 3 Neither Agree or Disagree 4 Agree 5 Strongly Agree

_____   _____   _____   _____   _____

---

49. Which of the following best describes you? (Check all that apply)

_____ I like to lecture.

_____ I expect my students to listen quietly and take notes.

_____ I need to have order in my day

_____ I follow a precise schedule

_____ I like using structured lessons.

_____ I prefer giving assignments and activities such as research papers, debates,

and book reports that are written.

_____ I get annoyed when others are late.

50. Which of the following best describes you? (Check all that apply)

_____ I like hands-on projects.

_____ I see the whole picture first.

_____ I incorporate art, manipulatives, visuals, and music in my lessons.

_____ I prefer a busy, active and noisy classroom environment.

THANK-YOU VERY MUCH FOR YOUR TIME FOR COMPLETING THIS

SURVEY!

APPENDIX B

Methods and Procedures Flowchart

Obtain IRB approval and permission from all PSSHE University Provosts and IRB Chairs for conducting research with college of education Faculty participants

---

Participants for Study

Participants: College of education faculty in all 14 PSSHE Universities. This will contain approximately 800 participants.
Inclusion Criteria: Participants can be full-time or part-time college of education faculty.
- Provide a brief overview of the research study and describe instructions for participating in study
- Review criteria for inclusion.
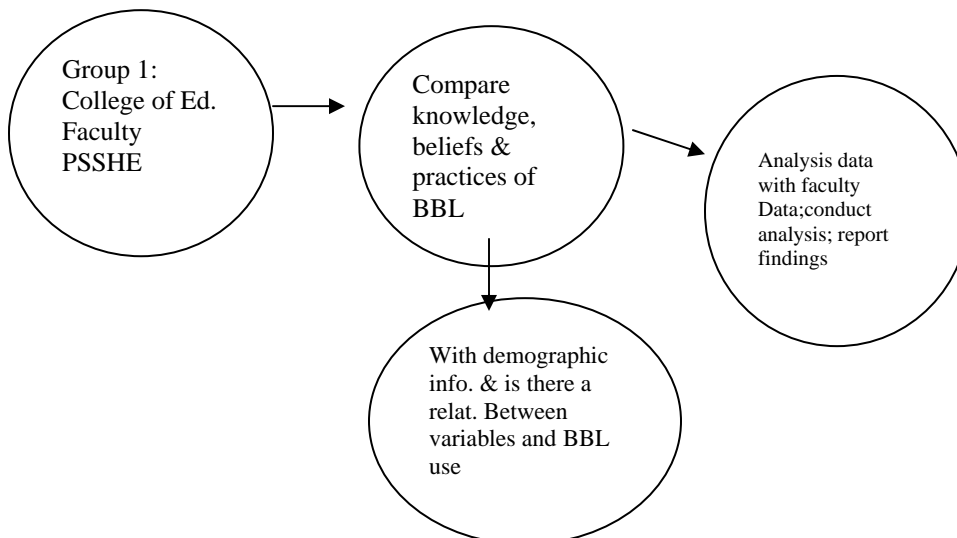

Conduct Analysis

Analysis: Faculty knowledge, beliefs and practices of brain-based learning will be evaluated through analysis of the survey results.

Analyze Data and Report Findings

Data Analysis & Reporting: Analysis data and report findings
- Analyze faculty knowledge, beliefs and practices outcome data for significance using SPSS software
- Analyze participants data using constant data method
- Report findings of study

Stage 1: Select Subjects   Stage 2: Document Analysis

Group 1: College of Ed. Faculty PSSHE

Compare knowledge, beliefs & practices of BBL

Analysis data with faculty Data;conduct analysis; report findings

With demographic info. & is there a relat. Between variables and BBL use

APPENDIX C

Letter to Provost for Permission to Conduct Study

IUP E-mail

Dear Provost:

I am writing this letter to introduce you to a study that I will be conducting as part of my completion of my doctoral dissertation through Indiana University of Pennsylvania. I will be conducting a research study that will identify college of education faculty's knowledge, beliefs and practices of brain-based learning in their classroom.

Their knowledge, beliefs and practices will be determined by utilizing an internet survey that has been developed and hopefully will be completed by professionals in the field.

I am writing you to specifically request participation in my study. Enclosed is a copy of my IRB.

A maximum of 3 e-mails will be sent to participants. All e-mail addresses will be destroyed at the completion of the research study. Your confidentiality will be protected.

Results will be made available to your university for agreeing to participate. I feel that this information can be used to improve the learning and teaching skills of university students.

Thank you very much for your time and consideration.

Please e-mail this form back ASAP.

Shelly R. Klinek, MA   Faculty Sponsor: Dr. George Bieger
Primary Researcher   Professor Professional Studies in Education
Indiana University of Pennsylvania   114 Davis Hall, Indiana University of PA
E-mail: S.Klinek@iup.edu   Phone: (724) 357-3285
Phone: 814-449-7419

(PLEASE DO FORM ON YOUR OFFICIAL UNIVERSITY LETTERHEAD)

VOLUNTARY CONSENT FORM:

(Please check one)

___ Yes, I give permission for you to send a survey to all the College of Education

       Faculty.

___ No, I do not give you permission to send a survey to all the College of Education

       Faculty.

_____ Provost or acting Provost Name

_____ University Name

_____ signature _____ date

(Typing in your name and date is the same as signing)

Thank you very much for your time and consideration.
(Please send your official letterhead completed form ASAP to: sportshell@hotmail.com)

APPENDIX D

Letter to IRB Chairs for Permission to Conduct Study

IUP E-mail Dear IRB Chair:

I am writing this letter to introduce you to a study that I will be conducting as part of my completion of my doctoral dissertation through Indiana University of Pennsylvania. I will be conducting a research study that will identify college of education faculty's knowledge, beliefs and practices of brain-based learning in their classroom.

Their knowledge, beliefs and practices will be determined by utilizing an internet survey that has been developed and hopefully will be completed by professionals in the field.

I am writing you to specifically request participation in my study. Enclosed is a copy of my IRB.

A maximum of 3 e-mails will be sent to participants. All e-mail addresses will be destroyed at the completion of the research study. Your confidentiality will be protected.

Results will be made available to your university for agreeing to participate. I feel that this information can be used to improve the learning and teaching skills of university students.

Shelly R. Klinek, MA   Faculty Sponsor: Dr. George Bieger
Primary Researcher   Professor Professional Studies in Education
Indiana University of Pennsylvania   114 Davis Hall, Indiana University of PA
E-mail: S.Klinek@iup.edu   Phone: (724) 357-3285

(PLEASE DO FORM ON YOUR OFFICIAL UNIVERSITY LETTERHEAD)

VOLUNTARY CONSENT FORM:

(Please check one)

___ Yes, I give permission for you to send a survey to all the College of Education

      Faculty.

___ No, I do not give you permission to send a survey to all the College of Education

      Faculty.

_____ IRB Chair or acting Chairs Name

_____ University Name

_____ signature   _____ date

(By typing in name and date is the same as signing)

APPENDIX E

Letter to College of Education Faculty

Thank you very much for your time and consideration.

Dear College of Education Faculty Professional,

I am currently working on my doctoral degree and I would appreciate your precious time and effort in assisting me in my study of brain-based learning. This study is in partial fulfillment of completion of my doctoral dissertation research which I am conducting through Indiana University of Pennsylvania. Each participant will automatically be in a random drawing for a chance to win a GPS.

This study will focus on the knowledge, beliefs and practices related to brain-based learning in the classroom. I will use survey that I would like you to complete about brain-based learning. The survey will take approximately 10 minutes to complete. Your participation in this survey will contribute to our knowledge of brain-based learning in the classroom.

Your participation in this study is completely <u>voluntary</u>. You are free to decide not to participate in this study or to withdraw at anytime. Your decision will not result in any loss of benefits to which you are otherwise entitled. If you choose to participate, all information will be held in strict confidence and will have no bearing on your academic standing or services you receive from your University. Your responses will be considered <u>only in combination</u> with those from other participants. The information obtained in the study may be published in educational journals or presented at conferences but your identity will be kept strictly confidential.

If you are a college of education faculty member in the Pennsylvania State System of Higher Education, and would like to participate in the study, please click on the following link:
<u>http://www.</u>
Thank you very much for your time and consideration.

Sincerely,

Ms. Shelly R. Klinek   Dr. George Bieger
Primary Researcher   Faculty Sponsor
Indiana University of Pennsylvania   114 Davis Hall
Indiana, PA 15701   Indiana, PA 15701
Email: <u>S.Klink@iup.edu</u>   Email: <u>grbieger@iup.edu</u>

*This has also been approved b*y *the following Universities of PA.: Bloomsburg,*

California (Calu proposal #08-017), Clarion (project #09-08-09), Cheyney, East

Stroudsburg, Edinboro, Indiana, Kutztown, Lock Haven, Millersville, Shippensburg,

Slippery Rock & West Chester.

APPENDIX F

Expert Panel

Becky Gregory- Physical Therapist, Cleveland Municipal School District,

Cleveland, Ohio.

Daphnie Fredericks, Physical Therapist, Cleveland Municipal School District,

Cleveland, Ohio.

Jo Holtz, Ph.D.- Professor, Secondary Education Department,

Edinboro University of Pennsylvania, Edinboro, Pa

Charlie Reed-Mundell- Librarian, Media Specialist, Cleveland Municipal School District,

Cleveland, Ohio.

Hollis Munoz, Ph. D.- Administration Cleveland Heights School District,

Cleveland, Ohio.

Angela Settembrino- Occupational Therapist, Cleveland Municipal School District,

Cleveland, Ohio.

Mary Shinko- Physical Therapist, Cleveland Municipal School District,

Cleveland, Ohio.

APPENDIX G

Letter to Expert Panel

Hi since you said on the phone you would participate as my expert
panel here is the survey. Please e-mail me with any corrections,
additions, deletions, or any
changes.

Also, let me know how it was. Was it easy to understand?
Here is a link to the survey:
http://www.surveymonkey.com/s.aspx?sm=bX_2fj_2fwYcnEnzVgWclr5ZPg_3d_3
d

This link is uniquely tied to this survey and your email address,
please do not forward this message.

Thanks for your participation!

Please note: If you do not wish to receive further emails from us,
please click the link below, and you will be automatically removed
from our mailing list.
http://www.surveymonkey.com/optout.aspx?sm=bX_2fj_2fwYcnEnzVgWclr5ZPg
_3d_3d

|　　　　　　　　　|　　　　　　　　　|

Comment Copies of Expert Panel

From :   <DaphnePT@aol.com>

Sent :   Monday, July 9, 2007 9:57 PM

To :   sportshell@hotmail.com

Subject : survey

#s 11, 18 and 37 have typos. I don't quite understand #2. Are you saying that there's a

process in brain learning that helps students assess knowledge in any subject? If you are,

then the question is clear, if you are saying that students should be able to assess their

knowledge in brain learning, then it's not clear.

#20--both student and teacher are plural, are you talking about student teachers, or students

and teachers?

#23, the sentence shouldn't end in "is" but, I tried to reword it and came up with nothing, so

good luck. Otherwise it looks good to me and makes sense.

Daphne

Shelly,
Sorry about SRU. They don't know what they are missing.

I took the survey. I have just a few comments.
All of it looked good until I got to Q 39. Since I don't use brian gym, none of the items applied. Mayb you could have one that states: " I do not use brain gym at all." FOr Q 39, can they only select one item or all that apply? Q 40 gave me the same problem.Maybe you need a g. "don't know"

For your open ended questions you make the assumption that the respondent has done these things. Maybe you need to qualify the statements. "If you ..... (e.g. have taken any courses, workshops . . .).

Those were the only issues I had. I thought the format was easy to use and easy to access. It was also easy to get out of the survey.

I hope this helped. Good luck. Let me know if there is anything else I can do.
Jo

From :   Hollis Munoz <hkmunoz@ameritech.net>

Sent :   Tuesday, July 10, 2007 9:24 AM

To :   Shelly Klinek <sportshell@hotmail.com>

Subject :   Re: Survey

done. The survey is comprehensive and should be able to differentiate across several variables. However, if

you want people to do it, you may want to shorten it. Thrilled you are on the road to completion! Hey to Tina

and Katie. Holly

OK, took the survey. Here are some comments:

opening paragraph: ... in the <u>area</u> of brain-based learning...

I think 60 or more should be 60 or older

<u>Master's</u> Degree

explanatory paragraph: questions <u>that follow</u>

paragraph after question #5: More aligned than what? Also, don't use the word learning in the definition of brain-

based learning.

#6 was N/A for me, but that wasn't a choice

#13 awkward wording

#15 ...if there <u>were</u>...

#20 students teachers? Should it be student teachers?

#23 misspelling in answer b

#24 move comma before therefore

#26 was N/A for me

Results of pre-pilot study

Two college of education faculty members said yes to question 1, one said no, and one skipped the question of, Is the instrument for completing the survey clear & unambiguous? One faculty member said yes and two faculty members said no and one faculty member skipped question #2 which stated, Are the questions on the survey clear and unambiguous? Question #3- Do questions on this survey encourage respondents' honesty in admitting lack of uncertainty of knowledge? Three responded yes, and one skipped the question. Question #4- Are questions on this survey free from obvious? One faculty member indicated yes, and two indicated no and one member indicated that some do not allow for my answer.