Understanding and achieving brain-based instruction in the elementary classroom a qualitative study of strategies used by teachers

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UNDERSTANDING AND ACHIEVING BRAIN-BASED INSTRUCTION IN THE ELEMENTARY CLASSROOM: A QUALITATIVE STUDY OF STRATEGIES USED BY TEACHERS

by

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A thesis submitted in partial fulfillment of the requirements for the Honors in the Major in Education in the College of Teaching, Learning and Leadership and in the Burnett Honors College at the University of Central Florida Orlando, Florida

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Thesis Chair: Dr. Roberta Ergle
ABSTRACT

There are many approaches taken by teachers in order to effectively teach students the information they will need to be successful. One of these approaches is that of brain-based instruction. No one single definition is the same as another when it comes to brain-based teaching and learning. Definitions may include incorporating music and movement into lessons, using techniques to reach both hemispheres of the brain, and differentiating instruction to teach to the needs of the individual students.

This study takes a closer look at the perspective of teachers when it comes to what brain-based instruction strategies are. Teachers were given a survey to voice their opinions about brain-based instruction and how they incorporate it into their classrooms. This study gathered information about how teachers perceive and understand brain-based instruction. The use of brain-based instruction is quickly becoming vital to the education field. Understanding more about it will help teachers effectively teach students.
DEDICATION

For my mom and dad. Your support and love encourage me to do my best every day.
For Emmanuel, for his encouragement throughout this entire process. I love you so much.
For the best step-parents in the world, Sherry and Brian, for always being there for me.
For Gabrielle and M.C., for being my second family and always making me laugh.
For Chris, who has been my hero my whole life. Semper Fi, big brother.
For Aunt Kaye and Uncle Jim, for supporting me my whole life even though you are miles away.
For Mrs. Rodriguez and Mrs. Hauff, for being two of the nicest people I know.
For Leah and Minh, thank you for all of those fun-filled drives to Leesburg.
For my friends, thank you for keeping my spirits high throughout this process.
For my niece, Julie. Anything is possible if you work hard and believe in yourself.
For Ms. Walters, for encouraging me throughout my entire UCF career.
For Dr. Ergle, thank you for encouraging me to do my very best. I am so happy to have shared
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CHAPTER 1: INTRODUCTION

Problem

The purpose of education, one might argue, is to teach children to become more efficient thinkers, making smart social, emotional, and academic decisions (Brown, 2012). The role of the teacher, then, is to facilitate and encourage this process of learning. To meet the challenge, educators must have a state-of-the-art understanding of how the brain functions and people learn (Caine & Caine, 1997). The brain is involved with everything we do at school, and educators who understand take this fact into consideration in the decision-making process (Jensen, 2008).

The brain is the only organ in the body that sculpts itself from its interactions with its environment (Wolfe, 2006). The human brain differs from the brains of other species. The human brain has a larger cognitive area and the ability to use it for high-order thinking (Sylwester, 1997). This ability to think critically is highly important when students come to school.

Teachers challenge students and help them learn how to develop cognitive skills. Brain-based instruction encourages the process of acquiring knowledge and helps students fully utilize their brains so that they may become successful as adults. This study gives a basis for what practicing teachers consider to be “brain based.” Understanding their ideas about brain-based education will help further enhance the field of teaching and learning.

Purpose of this Study
The purpose of this study is to gain a better understanding of how practicing elementary school teachers understand and perceive effective brain-based strategies and utilize these techniques in the classroom. The question to be researched is:

A. How do elementary school teachers use what they know about the brain to plan lessons and teach students?
   a. How do teachers understand brain-based learning?
   b. How are teachers applying their knowledge of brain-based teaching in their classrooms?
   c. What do teachers find beneficial or difficult about applying brain-based instruction in their classrooms?

These questions were used to create a survey to discover how elementary school teachers view brain-based instruction and how they incorporate it into their daily lessons. This study will give insight into what some teachers think of brain-based education and how it is used in their classrooms.
CHAPTER 2: LITERATURE REVIEW

Learning is a process of gaining knowledge and experience that can be applied both academically and practically. Brain-based education approaches learning processes differently than traditional teaching methods. Brain-based learning is based on the idea that each part of the brain has a specific function when related to learning. This literature review for this study is based on three subtopics: the definition of brain-based education, the brain and the brain structures involved in learning, and the differences between cognitive and brain-based learning approaches to learning.

The Definition of Brain-Based Education

There are many working definitions of brain-based education. For this study, brain-based education is best defined as “the engagement of strategies based on principles derived from an understanding of the brain” (Jensen, 2008, p. 410). Teachers use strategies that they feel effectively reach all students’ individual needs. Being that all students learn differently, teachers must use their knowledge of the brain and how it learns to decide upon the strategies they consider to be brain-based.

Brain-based instruction stems from recognizing that the brain does not take logical steps down one path like a digital computer but can go down a thousand different paths simultaneously, like an enormously powerful analog computer (Neve, Hart, Thomas, 1986). The brain’s ability to multi-task leads educators to ponder the question: how can we effectively teach students when they may be focused on multiple ideas at a time? Educators must synthesize their knowledge of the brain and how it best learns in order to answer this question.
Illustration 1, *Brain/Mind Learning Principles* [See Appendix A] outlines the basic principles that are prevalent in much of the research being done in the field of brain-based learning (Caine & Caine, 1997, p. 28). This illustration gives the location of many different parts of the human brain, including the cerebrum, neocortex, corpus callosum, thalamus, pineal gland, pituitary gland, hypothalamus, amygdala, and hippocampus. Many of these aspects of the brain are directly involved in the learning process.

**The Brain and the Brain Structures Involved in Learning**

The brain is a complex organ within the human body and has many functions, which, among the most important, involves learning. Schools present countless opportunities to affect students’ brains (Jensen, 2008). The appeal of neuroscience to growing numbers of educators is not surprising; most people assume, correctly, that our nervous system is a crucially important locus for learning and skill development, and many would go so far as to suggest that our brain is, in fact, who we are (Hruby, 2011). People learn in different ways and have very different learning styles, including visual, auditory, and kinesthetic styles (Guffanti, 2011). Visual students learn through visual representations, pictures, and written words. Auditory learners do best when concepts are presented in the form of listening, whether to music or speaking. Kinesthetic students learn best when they are able to do hands-on activities and move during learning a concept.

Illustration 2 [See Appendix A] shows the brain stem, limbic structures, and neocortex (Sprenger, 2002). The brain stem, also known as the reptilian brain, regulates function such as breathing, heart rate, metabolism, and waking and sleeping cycles. Above the brain stem is the
limbic area which controls emotions. This can be very effective with students, to have an emotional investment in what they are learning.

The next layer of the brain is the cerebrum, which is divided into the right and left hemispheres. The hemispheres are connected to each other by a band of fibers called the corpus callosum, which enables communication between the two sides of the brain. The neocortex is the thin cover of the cerebrum. It is generally referred to as the layer that does the thinking.

The hemispheres of the brain are also divided into lobes. The occipital lobes, at the back of the brain, process visual information. The temporal lobes on the side, above the ears, process auditory information and some memory. The parietal lobe, on the top of the brain toward the back, is in charge of feeling and touch. The frontal lobe, at the front of the brain, deals with decisions, planning, creativity, and problem solving. The prefrontal area, which is right behind your forehead, is an important area that deals with emotions, personality, working memory, attention, and learning (Sprenger, 2002).

The cerebellum, located at the back of the brain was originally thought to just be responsible for posture and balance, but research suggests that is stores certain memories and may have other functions as well. Many chemical messengers are responsible for carrying information in the brain. These chemicals include serotonin, norepinephrine, dopamine, acetylcholine, endorphins and enkephalins, amino acids, and glutamate (Sprenger, 2002).

These structures of the brain are thought to be the same for all normal developing students. What is different is the strategies teachers use in order to effectively teach all students. Teachers’ knowledge of each area of the brain and how these areas relate to learning can affect how the teachers perceive brain-based education and how they may use it in their classrooms.
The Differences Between Cognitive and Brain-Based Learning Approaches

Cognitive learning is a mental process for seeing, memorizing, organizing, processing, thinking, and solving for particular issues (Madar, Had, Razzaq, & Mustafa, 2011). By contrast, brain-based teaching and learning takes a holistic approach, looking at teaching developmentally, socioculturally, and in other broad ways (Caine & Caine, 1995). Brain-based learning takes into account the whole child by differentiating instruction and creating ways to meet the needs of the individual students.

Just as goals can be differentiated in terms of their sources, goals can be described in terms of the type of learning experiences intended. In this respect, we can describe goals as being concerned primarily with three domains: the development of muscular skills and coordination (psychomotor), the growth of attitudes of values (affective), or the acquisition of knowledge and intellectual skills (cognitive) (Eggen, Jacobsen, & Kauchak, 2009). Teachers using brain-based learning strategies are able to use these three domains in order to effectively teach all students and give students a deeper understanding of the information being presented.

Traditional learning includes memorizing information in order to be retrieved when necessary. Brain-based learning stresses the principles that the brain is a parallel processor; it performs many functions simultaneously (Caine & Caine, 1995). This idea of the brain being a parallel processor reinforces the definitions of brain-based research, which stresses the fact that the brain is focused on multiple ideas and concepts at any given moment.

Brain-based theory provides a sharper and deeper concept of what learning is and of how it occurs in humans (Neve, Hart, Thomas, 1986). There are many applications to brain-based learning, many provided by top educational publishers, such as Kagan, Pearson, and MacMillan.
These resources are available to teachers through Internet tools, programs, and books designed to help educators better understand a brain-based approach to education. These publishers are able to provide creative and innovative approaches to brain-based learning to help teachers reach all students. Although many of the companies provide these resources to teachers, they have very different approaches in terms of what they consider to be “brain-based.”

Kagan structures include movement, interaction among students, and hands-on manipulative. The movement and interaction, which are characteristic of Kagan structures, increases breathing rate and heart rate which in turn increases blood and oxygen supply to the brain (Kagan, 2001). Pearson and MacMillan are publishers who offer many resources concerning brain-based information for practicing teachers. Another resource to be considered when regarding brain-based approaches to education is that of Whole Brain Teaching, which began in 1999 by Chris Biffle, Jay Vanderfin, and Chris Rekstad, all of whom are teachers in California. At the root of Whole Brain Teaching is a large amount of highly structured, educational tomfoolery. Students learn the most when they are having fun. Whole Brain Teaching classrooms are full of task-focused laughter. Humor and games are used to increase the number of times students repeat core information and practice basic skills (Biffle, 2012). Students are engaged through comical, yet educational, interactions with the teacher and their peers. It is a very student-centered approach, creating accountability for the learners.

If children are literally formed by their experiences, not just by memorization, then a teacher who knows how to fascinate students into wanting to write, read, play music, and discover the physical world can create miracles (Caine & Caine, 1997). Prior to Dewey, the aim of education in the United States was facilitating a student’s acquisition of knowledge. With the
appearance of Dewey’s theories and reflective method, educators became increasingly interested in students’ ability to think about information and engage in realistic problem solving (Eggen, Jacobsen, & Kauchak, 2009). This realistic problem solving reflects students’ abilities to understand concepts and use higher order thinking skills. Brain-based education, teaching to the whole child, helps students accomplish this.

Summary

In summary, the literature review provides the background information about brain-based education, its definition, and why it is at the forefront of education today. Many publishing companies are heading towards a more brain-based approach, focusing on the whole child, rather than the traditional cognitive model. Teachers are now challenged to find ways to reach every individual student in order to effectively teach all students.

There is much information to consider when discussing brain-based education and its impact on student success. The literature review provides encouragement for the use of brain-based education in the classroom setting and gives a broad description of how it many be used in the classroom. Differentiated instruction is an approach being used to meet students differing needs based on the three domains of learning. Movement is another tool that is being used to properly motivate students and encourage learning in a new and engaging way.
CHAPTER 3: METHODOLOGY

Subjects

This qualitative study took place in a Title 1 school located in central Florida, School A, and focused on 16 participants, all currently teaching at School A, that replied to a survey given in May of 2012. Of the 16 participants included in the study, 3 were male and 13 were female. The ages of the participants ranged from 21 years of age to 50 years of age. Years of experience of those teachers surveyed varied from 1 year to 21 years. Ethnicities of the participants included Caucasian, African American, Asian, Hispanic, and Asian/Hispanic. Figures 1, 2, 3, and 4 represent background information about the 16 participants in this study.

Figure 1: Genders of all participants included in this study.
Figure 2: Ethnicities of all participants in this study.

Figure 3: Years of teaching experience of all participants included in this study.
Instruments

The key instrument used in this qualitative study was an eleven question survey [See Survey in Appendix C] which involved multiple choice as well as free response and ordering questions. The survey was developed based on committee input and approval as well as the research question being addressed. Hard copy surveys were given to approximately 60 teachers at School A and 16 were returned to the office. The 16 surveys were picked up from School A after approximately 2 weeks.

The variables involved in this survey that were considered are gender, age, years of experience, professional development opportunities, professional learning communicates, and the involvement of principals and/or curriculum resource teachers.

The questions on the survey were generated using the research questions as a guide.

Figure 4: Grade levels taught by the participants included in this study.
Table 1: This table illustrates how the research questions were used as a guide to generate the questions used on the survey.

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Correlating Survey Questions</th>
</tr>
</thead>
</table>
| **How do teachers understand brain-based learning?** | From your understanding of brain-based teaching, circle which teaching strategy you consider to be brain-based.  
  a. Introducing new concepts to students by saying the concept aloud and providing visual models  
  b. Using alternative forms of assessment including, but not limited to, the use of portfolios, journals, and performance evaluation  
  c. Integrating movement into your lessons |
| | In 2-5 sentences, please define your understanding of “brain-based education” to the best of your abilities. |
| | If you wanted to learn more about brain-based learning principles, what resource or resources would you use?  
  a. Online  
  b. Other colleagues  
  c. Professional books  
  d. Professional learning community study group |
| **How are teachers applying their knowledge of brain-based teaching in their classrooms?** | What are some strategies that you use in your classroom that you might consider as brain-based activities or procedures? |
| | What percentage of time is devoted to brain-based learning in your classroom? |
| | How do you use your knowledge of the brain to plan lessons that involve brain-based strategies? |
| **What do teachers find beneficial or difficult about applying brain-** | What is difficult about implementing a brain-based activity or strategy? |
based instruction in their classrooms? | What is your belief that the incorporation of brain-based learning techniques has a positive or negative effect on student achievement? Use the scale below. (0 being negative, 11 being positive)
| Please explain your rating. (From the above question)

Procedures

Discovering what practicing educators consider to be brain-based education practices was the basis for this study; therefore, an eleven question survey was created and approved by the thesis committee, however, in order to disseminate the survey the following steps were taken. I completed the CITI Collaborative Institutional Training Initiative in order to move forward with my Institutional Review Board (IRB) approval [See the Human Research Curriculum Completion Report in Appendix B].

Questions asked on the survey related back to the main research question and the related subquestions being asked. Since brain-based instruction is a fairly new term used in education, the survey included a brief overview of what research had been discovered in order to give the participants information that they may require to make an informed decision regarding their answers. Basic demographic information questions, including grade level taught, grade levels taught in the past, certifications, years of teaching experience, content area taught, ethnicity, age, and gender were asked in order to gain background knowledge about the participants and explore any linkage. When completed, the final draft of the survey was examined and approved by my committee chair and the committee members [See the Survey in Appendix C].
The next step of the research process was to get the approval of School A’s principal and the Director of Evaluation and Accountability for the school district. I provided the following information to the school district for approval: an official letter from the university requesting to conduct research, a copy of IRB approval from the university, name and contact information for lead person conducting the research (and faculty advisor), the topic of the research study, a detailed description of the study, information the research is requesting to access, subjects for study, dates of study, research methods and procedures, risks and benefits to subjects, copies of consent forms, copy of survey instruments and researcher’s credentials and qualifications.

In order to complete the requirements for the district, I received IRB approval from the University of Central Florida [See IRB Approval in Appendix D]. In order to accomplish this, I created an iRIS account and added a new study. After consulting the IRB office for assistance, I submitted the information required, including the application, the protocol for the study, and the exemption forms required to avoid the use of written consent forms, since the survey was confidential. Because I am currently an undergraduate student, the Honors in the Major Coordinator for the College of Education, Sherron Killingsworth Roberts, was chosen as the Principle Investigator and I was listed as the Co-Investigator for the study. After receiving IRB approval, I submitted all of the necessary documentation to The Director of Evaluation and Accountability by email and received approval.

I contacted the principal about speaking at a faculty meeting in order to meet the exemption requirements placed forth by IRB. The principal informed me concerning the date and time of the final faculty meeting of the school year and gave me permission to speak to the staff. I arrived at School A with copies of the survey, a manila envelope to place completed surveys in,
and copies of the explanation of exemption forms [See the Explanation for Exempt Research in Appendix E], and the script that I used in order to obtain consent without having the participants fill out any written documentation [See the Written Script used in Appendix F]. I read the script and waited until the faculty meeting was finished to pass out the surveys to the staff. The principal informed them the completed surveys were to be placed in the designated manila envelope that was to be left with the school secretary. The teachers were told they had one week to finish the surveys and turn them in to the school secretary.

After one week, I returned to the school after the school day was finished in order to pick up any completed surveys. Three completed surveys were turned in, so I emailed the principal asking if I could come to School A on June 11, the last day teachers were at the school, to distribute any additional surveys and to collect completed ones. I arrived at School A on the morning of June 11 and the school secretary led me to the media center where the faculty meeting was held in order to obtain more surveys. After a little over an hour, I received 13 additional surveys for a total of 16 surveys.

**Analysis**

For this qualitative study, data was collected using a survey. The data was analyzed using the constant comparison method (Glaser & Strauss, 1967). These analysis methods, based in grounded theory methods, included initial coding and categorization of data, memo writing, and focused coding using inductive logic (Birks & Mills, 2011).

I labeled the participants with the numbers 1-16. I created an Excel spreadsheet containing the background knowledge obtained through the surveys. This spreadsheet helped me
group the participants into the following groups: age, gender, ethnicities, years of experience, content areas taught, and grade level taught. This spreadsheet yielded the following results as shown in Table 2.
Table 2: This table details the background information about each participant.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Grade Level Taught</th>
<th>Grade Levels Taught in Past</th>
<th>Certifications</th>
<th>Years of Teaching Experience</th>
<th>Content Area Taught</th>
<th>Ethnicity</th>
<th>Age</th>
<th>Gender</th>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>5th</td>
<td>4th</td>
<td>ESOL</td>
<td>4</td>
<td>All Content</td>
<td>White</td>
<td>-</td>
<td>Female</td>
</tr>
<tr>
<td>3</td>
<td>3rd VE</td>
<td>-</td>
<td>ESE K-12, Elem. Ed K-6</td>
<td>1</td>
<td>Reading and Math</td>
<td>African American</td>
<td>22</td>
<td>Female</td>
</tr>
<tr>
<td>4</td>
<td>2nd VE</td>
<td>Pre-K, K, 1st, 2nd, 5th, ASD, Computers</td>
<td>K-6, ESE, ASD, ESOL, Pre-K</td>
<td>16</td>
<td>Reading and Math</td>
<td>White</td>
<td>42</td>
<td>Female</td>
</tr>
<tr>
<td>5</td>
<td>5th</td>
<td>K, 2nd, 3rd, 4th, 5th, Music</td>
<td>Elem. Ed K-6</td>
<td>15</td>
<td>All Content</td>
<td>African American</td>
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<td>Female</td>
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<tr>
<td>6</td>
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<td>10</td>
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<td>2nd, 3rd</td>
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<td>4th, 5th</td>
<td>Elem. Ed K-6, ESOL, Reading</td>
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<td>-</td>
<td>ESE K-12, Pre-K-3, ESOL</td>
<td>Pre-K, ESE</td>
<td>Hispanic</td>
<td>30</td>
<td>Female</td>
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</tr>
</tbody>
</table>
CHAPTER 4: RESULTS

Through the process of analyzing data within the surveys, I was able to categorize the participants into groups concerning different questions on the survey. These groups are designed to explore the research questions being addressed.

How do teachers understand brain-based learning?

The first question in the survey was a multiple choice question in order to get an idea of general ideas that teachers may have about brain-based teaching. The question stated:

From your understanding of brain-based teaching, circle which teaching strategy you consider to be brain-based.

a. Introducing new concepts to students by saying the concept aloud and providing visual models

b. Using alternative forms of assessment including, but not limited to, the use of portfolios, journals, and performance evaluation

c. Integrating movement into your lessons

The results from this question are as follows in Figure 5. Integrating movement into lessons was the most popular strategy that teachers consider to be brain-based with alternative forms of assessment as a close second. Very few teachers felt that the use of visual aids during verbal lecture was brain-based.
When teachers were asked to articulate their understanding of brain-based instruction in written form, the answers varied greatly from one another. Participant 8, the Physical Education teacher, did not provide a definition.

Table 3: The full definitions that the participants provided regarding brain-based education.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“Brain-based education happens when the student explores a topic using their own thoughts that are guided by the teacher. Students are free to explore different avenues of thought to deepen their understanding of the topic.”</td>
</tr>
<tr>
<td>2</td>
<td>“Movement to help relieve stress on the brain.”</td>
</tr>
<tr>
<td>3</td>
<td>“Brain-based learning is closely related to how ESE teachers differentiate instruction. Through the use of various strategies such as technology, manipulatives, and visual learning styles.”</td>
</tr>
</tbody>
</table>
| 4           | “Brain-based education can be through music, visual aids, and manipulatives. It is

Figure 5: Teaching strategies that teachers consider to be brain-based
differentiating instruction for each child.”

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>“I believe that brain based education involves studies performed to determine what best works for children to learn new concepts.”</td>
</tr>
<tr>
<td>6</td>
<td>“It is teaching the students with their learning style in mind. Students are given choice of their learning, activities, and assessments.”</td>
</tr>
<tr>
<td>7</td>
<td>“Brain-based education allows students to choose what method they wish to choose to learn and demonstrate their learning of content.”</td>
</tr>
<tr>
<td>8</td>
<td>Blank response</td>
</tr>
<tr>
<td>9</td>
<td>“Brain-based education looks at the actual functions of the brain and what’s going on as students are learning. It focuses on having students in their ‘optimal learning range’ by adjusting the environment.”</td>
</tr>
<tr>
<td>10</td>
<td>“Brain based is used for non verbal instruction. It also helps diffuse certain situations as well as get the students to move around.”</td>
</tr>
<tr>
<td>11</td>
<td>“Brain based education incorporates all aspects of the brain and student to maximize student learning.”</td>
</tr>
<tr>
<td>12</td>
<td>“Brain based education incorporates whole child and uses a lot of metacognition strategies and scaffolding.”</td>
</tr>
<tr>
<td>13</td>
<td>“Brain-based education incorporates the use of the whole brain so tapping into different modalities.”</td>
</tr>
<tr>
<td>14</td>
<td>“All students own their knowledge and understanding.”</td>
</tr>
<tr>
<td>15</td>
<td>“Brain-based education begins with effective use of classroom environment, instruction, and curriculum strategies for student engagement. This also helps manage stress actions for all and promotes a learning atmosphere which fosters creativity.”</td>
</tr>
<tr>
<td>16</td>
<td>“Using movement of the body while learning.”</td>
</tr>
</tbody>
</table>

From these definitions, I was able to code the responses and create larger headings in order to group specific participants together. Only 15 participants are displayed because Participant 8 did not provide a definition. Key words were chosen out of each of the participants’
given definitions and they were grouped together based on the words that I felt similarly related to each other. Table 4 details how the participants were grouped. The groups are further illustrated in Figure 6.

Table 4: Participants and key words chosen from given definitions about brain-based education

<table>
<thead>
<tr>
<th>Participant</th>
<th>Key Words Chosen from Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“Free to explore”</td>
</tr>
<tr>
<td>2</td>
<td>“Movement”</td>
</tr>
<tr>
<td>3</td>
<td>“Differentiate instruction”</td>
</tr>
<tr>
<td>4</td>
<td>“Differentiating instruction”</td>
</tr>
<tr>
<td>5</td>
<td>“Determine what best works for children”</td>
</tr>
<tr>
<td>6</td>
<td>“Learning style”</td>
</tr>
<tr>
<td>7</td>
<td>“Allows students to choose”</td>
</tr>
<tr>
<td>8</td>
<td>Blank response</td>
</tr>
<tr>
<td>9</td>
<td>“Actual functions of the brain”</td>
</tr>
<tr>
<td>10</td>
<td>“Move around”</td>
</tr>
<tr>
<td>11</td>
<td>“Aspects of the brain”</td>
</tr>
<tr>
<td>12</td>
<td>“Whole child”</td>
</tr>
<tr>
<td>13</td>
<td>“Whole brain”</td>
</tr>
<tr>
<td>14</td>
<td>“Own their knowledge”</td>
</tr>
<tr>
<td>15</td>
<td>“Classroom environment”</td>
</tr>
<tr>
<td>16</td>
<td>“Movement”</td>
</tr>
</tbody>
</table>
Differentiating instruction and incorporating the different aspects of the brain were the most popular responses when teachers were asked to give their own definitions of “brain-based education,” with each group having four teachers. Effective use of the classroom environment and students having to own their knowledge were the least popular, with one teacher in each of these.

The final question in this category was: If you wanted to learn more about brain-based learning principles, what resource or resources would you use? You may choose more than one. This was a multiple-choice question with an opportunity for the participants to write in an “Other” category. The choices provided were: online, other colleagues, professional books, and professional learning community study group. Participant 2 did not provide an answer for this question.
The most popular resource that teachers indicated they would use to learn more about brain-based learning principles were online and other colleagues. Only one teacher responded indicating that he would not use an online resource at all and would only rely upon professional books to learn more information.

How are teachers applying their knowledge of brain-based teaching in their classrooms?

The first question in the category regarding applications of brain-based teaching asked teachers to provide examples of strategies that they use in their classrooms that they consider to be brain-based. Certain participants belonged to more than one group, but based on their answers, I clustered them according to the group that catered to their most mentioned response.
For example, Participant 13 mentioned color-coding thinking maps, playing music, hand movements, Kagan structures, and sign language as strategies used as brain-based strategies. Being that she mentioned both movement and music, I grouped her with that category. Figure 8 represents the numbers of participants that fall into each group.

The most popular strategies that teachers use in their classrooms are the use of movement and/or music in their lessons, followed closely by differentiating instruction. Kagan structures and manipulatives came in third, tied with two teachers in each. Teachers that had responses that were unique to themselves were a 60 second relaxation period, trial and error, computer based, and thinking maps.

![Bar Chart: Different Strategies Used by Teachers]

**Figure 8: Different strategies used by teachers**
The participants were asked to identify what percentage of time is devoted to brain-based learning in their classrooms. The percentages were grouped into 0-25%, 25-50%, 50-75%, and 75-100%. Figure 9 represents the percentage of time that the participants determined they spend on brain-based education.

A total of 8 teachers responded indicating that 50-75% of their class time is dedicated to brain-based learning. This was the most popular, followed by four teachers indicating 25-50% and two teachers indicating 0-25% and 75-100%, respectively.
The final question in this category was: How do you use your knowledge of the brain to plan lessons that involve brain-based strategies? This was an open-ended question and I was therefore able to code their answers based on similar key words throughout their responses. The results are indicated in Figure 10. The majority of teachers indicated that, when planning lessons, movement is important when incorporating brain-based strategies. This was followed closely by the use of Kagan structures and differentiating activities, each with three participants in each category. Professional development and based on the students’ skill level tied for third, each with two participants indicating this as a tool during lesson planning. One teacher indicated that the use of the curriculum pacing map was very important when planning lessons involving brain-based strategies.

![Bar chart](image)

**Figure 10: Lesson planning involving brain-based strategies**
What do teachers find beneficial or difficult about applying brain-based instruction in their classrooms?

The next group is the difficulties teachers have when implementing a brain-based activity or strategy. A large majority of teachers had the same response even though they did not confer with each other during the survey. Table 5 represents the results when asked about the difficulty that the participants have when implementing brain-based activities in their classrooms. The most popular responses given about difficulties faced by teachers when implementing brain-based activities were that of time and/or materials and planning, with four teachers in each. Teaching the concept, students’ behavior, and lack of knowledge followed, with two teachers in each. Involving all students was the least popular response, with one teacher indicating it as a difficulty.

Table 5: Difficulties faced by teachers when implementing brain-based activities

<table>
<thead>
<tr>
<th>Difficulties Teachers Have When Implementing Brain-Based Activities</th>
<th>Teaching the Concept</th>
<th>Time and/or Materials</th>
<th>Students’ Behavior</th>
<th>Planning</th>
<th>Lack of Knowledge</th>
<th>Involving All Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

The final questions in this category go together as one is a rating question and the other asks for an explanation of the rating. The first asks: What is your belief that the incorporation of brain-based learning techniques has a positive or negative effect on student achievement. Use the scale below.

Negative  Positive

---
Based on this scale, 0 being the most negative and 11 being the most positive, Figure 1 illustrates the number of teachers and the rating that they gave on the above scale. The most popular response given was that of a rating of 11, indicating that brain-based education has a highly positive effect on student achievement. This response was followed closely by a rating of a nine, also indicating a positive effect on student achievement. The least popular ratings were that of ratings of six, seven, and eight, indicating mid- to high positive effect on student achievement.

The previous question was expanded by a follow-up question, asking for teachers to explain the rating that they gave it. Of the 16 participants, Participants 8, 11, 13, and 14 did not respond to this question. Figure 12 represents the other participants’ rating explanations. The most popular responses were that of indicating the importance of deepening understanding and
positive student learning. Choice in learning and nonverbal communication were tied as the second explanation, each with two teachers. The least popular responses were helping with all students and the teacher being interested in learning more about brain-based education.

Figure 12: Rating explanation from previous question
CHAPTER 5: DISCUSSION

The basis for this study was to determine how elementary school teachers use what they know about the brain in order to plan lessons and teach students. For this study, brain-based education is best defined as “the engagement of strategies based on principles derived from an understanding of the brain” (Jensen, 2008, p. 410). Teachers use strategies that they feel effectively reach all students’ individual needs.

Understanding how teachers perceive brain-based education was essential in order to discover how they implement it into their classrooms and what they find beneficial or difficult about implementation. There were overwhelming responses from teachers stating that brain-based education incorporates movement as well as teachers stating that differentiated instruction was brain-based.

When given choices asking that the participants best identify brain-based strategies, over half the teachers said integrating movement into their lessons was their idea of brain-based instruction. When teachers were asked to give a free response answer about the strategies that they use in their lessons that they consider to be brain-based, the majority of teachers also referred to movement. Based on the results of this survey, the majority of teachers understood brain-based instruction to mean teaching concepts with the strategy of physical movement.

Movement

The majority of teachers understand brain-based education to mean that they are integrating some sort of movement into their lessons. Movement was mentioned more by teachers than any other strategy throughout the survey. Movement was also shown to have been
the most popular strategy that teachers use when considering their knowledge of the brain to plan lessons.

A strategy mentioned by six teachers, Kagan structures, incorporates a great deal of movement into the delivery of information. Many of the teachers from this study mentioned Kagan strategies, which are taught by the Kagan company at professional development seminars in school districts across the United States.

Four teachers specifically mentioned the aspects of the brain and how that knowledge affects their lesson planning in regards to brain-based education. Many of those that mentioned movement stated that it increases student achievement because students need to be moving around in order to retain information.

Participant 2 defined brain-based education to be “movement to help relieve stress of the brain.” Participant 10 states, “brain-based is used for non verbal instruction. It also helps diffuse certain situations as well as get the students to move around.”

Incorporating movement into their lesson plans, teachers found students to be more engaged in the learning process. Movement can be seen as addressing a particular learning style, which ties movement with differentiating instruction as a broader topic.

Differentiating Instruction

Second only to movement was the mention of differentiating instruction when understanding what teachers consider to be “brain-based.” Differentiating instruction in this context incorporates the understanding of many different learning styles, kinesthetic, visual, and auditory, and how addressing those individual learning styles is considered to be brain-based. Teachers explain that, through the use of differentiating instruction, they are able to determine
what strategies work best for each individual student. Participant 4 explained in her definition that “brain-based education can be through music, visual aids, and manipulatives. It is differentiating instruction for each child.” By considering the different learning styles of students, teachers are able to determine which brain-based strategies work best for all students.

Using alternative forms of assessment was the close second to movement when it came to teachers identifying what strategy they consider to be brain-based. Participant 7 wrote her definition as “brain-based education allows students to choose what method they wish to choose to learn and demonstrate their learning of content.” Participant 1 explained that brain-based education means that “students are free to explore different avenues of thought to deepen their understanding of the topic.”

Time Devoted to Brain-Based Teaching

The majority of teachers stated that they use brain-based strategies 50 to 75% of the time. One of the main difficulties that teachers said that they have when implementing brain-based activities was the time and/or materials that it takes; thus, insinuating that they feel brain-based instruction will take more time to teach a concept than teaching more traditionally. The other difficulty expressed by teachers was that of the planning that goes into creating a lesson they deem to be “brain-based.” Many mentioned that the two go hand-in-hand, where the time it takes to plan and deliver a brain-based lesson takes a great deal of time that they do not necessarily have.

Although teachers indicated that they are only able to spend 50 to 75% of their time using brain-based strategies, all of the teachers surveyed expressed that brain-based education has had a positive effect on student achievement, when rating on a scale from zero to eleven. Participants
8, 11, 13, and 14 did not explain their ratings; but overall, teachers indicated that the positive aspects of using brain-based instruction includes a deeper student understanding of concepts and a positive student learning environment.

**Gaining More Knowledge**

When teachers want to learn more about brain-based instruction, 93% said that they would use either online alone or combine online with another resource or resources. Only one teacher, a K-5 physical education teacher that has been teaching 10 years, would rather use professional books to find more information. Age did not have an impact on professional development ideas. Most participants would search online to learn more about brain-based education.

**Implications for Teachers and School**

Research into brain-based education may increase student achievement and encourage teachers to think more in depth about lesson planning and implementation of brain-based strategies. Student achievement can be positively impacted if teachers go to many different conferences on different ways to incorporate brain-based education. Teachers would benefit from more professional development on the incorporation of brain-based instruction to help them overcome the difficulties of planning and time effectiveness.

**Future Implications**

This limited survey had only 27% of response from the faculty in one elementary school. Future research is needed on a larger scale for a better understanding of teachers’ perceptions about brain-based education. Future studies may take into consideration of school population, diversity, or socio-economic differences. Future research might also include studies of
administrative impact on teacher use of brain-based instruction and the impact of professional development on the understanding and use of brain-based instruction.
CHAPTER 6: CONCLUSION

“Every day teachers enter their classrooms with lesson plans, experience, and the hope that what they are about to present will be understood, remembered, and useful to their students. The extent that this hope is realized depends largely on the knowledge based that these teachers use in designing those plans and, perhaps more important, on the instructional techniques they select during the lessons. Teachers try to change the human brain every day. The more they know about how it learns, the more successful they can be” (Sousa, 2006, p. 3).

This study posed questions in order to create the survey that was eventually used in order to gather data for this study. The research questions asked for the purposes for this study were:

A. How do elementary school teachers use what they know about the brain to plan lessons and teach students?
   - How do teachers understand brain-based learning?
   - How are teachers applying their knowledge of brain-based teaching in their classrooms?
   - What do teachers find beneficial or difficult about applying brain-based instruction in their classrooms?

This study offered a new perspective when understanding how teachers perceive and use brain-based education techniques in their classroom. Many current perspectives of brain-based education are from the viewpoint of researchers, expanding their knowledge of the brain and how it functions in order to better understand how to teach children. This study went to the people who instruct students on a daily basis and asked them to provide their understanding of the brain and how they use their own knowledge in order to better plan and teach lessons.
Sixteen participants were involved in this study and teachers were able to reveal their perceptions and understanding of brain-based instruction. Results and conclusions were drawn through the process of coding the data and grouping the participants. Through the use of movement and/or music, 63% of teachers feel that they are effectively reaching all students because student achievement seems to be higher when these techniques are being utilized. Approximately 44% of teachers involved in this study referenced differentiating instruction as a brain-based strategy that they turn to often when planning lessons and teaching students. The most difficulties teachers have when implementing brain-based instruction is the planning, time, and materials that are to be included in brain-based education lessons. In order to learn more about brain-based education, 93% of teachers included that they would rely on an online resource to discover more about brain-based education.
APPENDIX A: ILLUSTRATIONS
Appendix A: Illustrations

Illustration 1 (Sprenger, 2002, p. 18)

Illustration 2 (Caine & Caine, 1997, p. 19)
APPENDIX B: HUMAN RESEARCH CURRICULUM COMPLETION REPORT
Appendix B: Human Research Curriculum Completion Report

CITI Collaborative Institutional Training Initiative

Human Research Curriculum Completion Report
Printed on 4/6/2012

Learner: Amy Siercks (username: amysiercks03)
Institution: University of Central Florida
Contact Information: Department: STLL
Phone: 352-978-1988
Email: amysiercks@knights.ucf.edu

Group 2. Social / Behavioral Research Investigators and Key Personnel:

Stage 1. Basic Course Passed on 01/27/12 (Ref # 7366948)

<table>
<thead>
<tr>
<th>Required Modules</th>
<th>Date Completed</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>01/27/12</td>
<td>no quiz</td>
</tr>
<tr>
<td>History and Ethical Principles - SBR</td>
<td>01/27/12</td>
<td>4/4 (100%)</td>
</tr>
<tr>
<td>Defining Research with Human Subjects - SBR</td>
<td>01/27/12</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>The Regulations and The Social and Behavioral Sciences - SBR</td>
<td>01/27/12</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>Assessing Risk in Social and Behavioral Sciences - SBR</td>
<td>01/27/12</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>Informed Consent - SBR</td>
<td>01/27/12</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>Privacy and Confidentiality - SBR</td>
<td>01/27/12</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>Research with Prisoners - SBR</td>
<td>01/27/12</td>
<td>4/4 (100%)</td>
</tr>
<tr>
<td>Research with Children - SBR</td>
<td>01/27/12</td>
<td>4/4 (100%)</td>
</tr>
<tr>
<td>Research in Public Elementary and Secondary Schools - SBR</td>
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<td>4/4 (100%)</td>
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<td>4/5 (80%)</td>
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<td>Conflicts of Interest in Research Involving Human Subjects</td>
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<td>4/5 (80%)</td>
</tr>
<tr>
<td>UCF</td>
<td>01/27/12</td>
<td>no quiz</td>
</tr>
</tbody>
</table>

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator
APPENDIX C: FINAL DRAFT OF THE SURVEY
Appendix C: Final Draft of the Survey

Survey

The purpose of education, one might argue, is to teach children to become more efficient thinkers, making smart social, emotional, and academic decisions (Brown, 2012). The role of the teacher, then, is to facilitate and encourage this process of learning. To meet the challenge, educators must have a state-of-the-art understanding of how the brain functions and people learn (Caine & Caine, 1997). The brain is involved with everything we do at school, and educators who understand take this fact into consideration in the decision-making process (Jensen, 2008).

There are currently many working definitions of brain-based education. Multiple approaches are being made to better define the term “brain-based.” For this study, brain-based education is defined as: using strategies and activities that utilize all parts of the brain, in order to help students learn more effectively.

<table>
<thead>
<tr>
<th>Grade Level Taught:</th>
<th>Grade Levels Taught in Past:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certifications:</td>
<td>Years of Teaching Experience:</td>
</tr>
<tr>
<td>Content Area Taught:</td>
<td>Ethnicity:</td>
</tr>
<tr>
<td>Age:</td>
<td>Male/Female:</td>
</tr>
</tbody>
</table>

From your understanding of brain-based teaching, circle which teaching strategy you consider to be brain-based.

a) Introducing new concepts to students by saying the concept aloud and providing visual models
b) Using alternative forms of assessment including, but not limited to, the use of portfolios, journals, and performance evaluation
c) Integrating movement into your lessons

What are some strategies that you use in your classroom that you might consider as brain-based activities or procedures?

What percentage of time is devoted to brain-based learning in your classroom?

0-25%  25-50%  50-75%  75-100%

Please rank the following to indicate which subject area is easiest and hardest to implement brain-based learning activities? (1-5 with 1 being the easiest subject and 5 being the hardest subject to implement brain-based learning activities)

_____ Math
_____ Reading
_____ Writing
_____ Science
_____ History
How do you use your knowledge of the brain to plan lessons that involve brain-based strategies?

What are your observations after implementing a brain-based activity?

What is difficult about implementing a brain-based activity or strategy?

What is your belief that the incorporation of brain-based learning techniques has a positive or negative effect on student achievement? Use the scale below.

Negative | | | | | | | | | | Positive

Please explain your rating.

In 2-5 sentences, please define your understanding of “brain-based education” to the best of your abilities.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

If you wanted to learn more about brain-based learning principles, what resource or resources would you use? You may choose more than one.
Online
Other colleagues
Professional books
Professional learning community study group
Other: ________________

Please turn in completed surveys to the designated envelope located in the front office.
Thank you very much for your participation.
APPENDIX D: IRB APPROVAL FORM
Appendix D: IRB Approval Form

Approval of Exempt Human Research

From: UCF Institutional Review Board #1
FWA00000351, IRB00001138

To: Sherron E. Roberts and Co-PI: Amy M. Siercks

Date: May 18, 2012

Dear Researcher:

On 5/18/2012, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review: Exempt Determination
Project Title: Understanding and Achieving Brain-Based Instruction in the Elementary Classroom: A Qualitative Study of Strategies Used by Teachers
Investigator: Sherron E. Roberts
IRB Number: SBE-12-08476
Funding Agency: Grant Title:
Research ID: N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in IRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 05/18/2012 02:31:48 PM EDT

IRB Coordinator
APPENDIX E: EXPLANATION FOR EXEMPT RESEARCH
EXPLANATION OF RESEARCH

Title of Project: Understanding and Achieving Brain-Based Instruction in the Elementary Classroom: A Qualitative Study of Strategies Used by Teachers

Principal Investigator: Sherron Killingsworth Roberts, Ph.D.

Co-Investigator: Amy M. Siercks

You are being invited to take part in a research study. Whether you take part is up to you.

- The purpose of this research study is to understand how elementary school teachers perceive brain-based instruction.
- The participants will receive the surveys at a faculty meeting where the principle investigator will give a short presentation about the research to be done. The participants will be asked to complete the surveys within one week.
- The surveys will be completed within one week, at the discretion of the teacher. The time needed to complete the surveys is estimated at less than half an hour. The co-investigator will supply an envelope to be located in the front office for the teachers to place completed surveys in.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints: Amy Siercks, Undergraduate Student, Elementary Education Program, College of Education, (352) 394-8770 or Dr. Sherron Killingsworth Roberts, Faculty Supervisor, School of Teaching, Learning, and Leadership at (407) 823-2016 or by email at amysiercks@knights.ucf.edu or Sherron.Roberts@ucf.edu.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.
Appendix F: Written Script

Written Script

I would like to start by thanking everyone for their time. My name is Amy Siercks and I’m an undergraduate student pursuing my Bachelor’s of Science degree in Elementary Education from the University of Central Florida. I’m involved in an undergraduate thesis writing process called Honors in the Major. This process involves undergraduate students, with the assistance of their Committee Chair person, researching a topic of their choice and writing a thesis concerning that topic. The topic that I chose for my research regards brain-based instruction in the elementary school classroom.

My research centers on you, the teachers, by inviting you to share your knowledge and experience in the form of an anonymous survey that discusses how you use brain-based instruction in your classroom. This study is completely voluntary and refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. The purpose of this research is to understand how elementary school teachers perceive brain-based instruction.

I brought the surveys with me today and I will be collecting them in one week’s time although you may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. At your own discretion within the next week, please complete the survey. Once you have completed the survey, please place it in the designated envelope that will be located in the front office. After a week, I will come to the front office to collect the surveys.

If you need to contact me for questions, concerns, or complains about the research, my phone number is (352) 394-8770 and my email address is amysiercks@knights.ucf.edu. If you
would prefer to contact someone independent of the research team for questions, concerns, complaints about the research, to obtain information, or to offer input, the Honors in the Major coordinator for the College of Education is Dr. Sherron Killingsworth Roberts. Her phone number is (407) 823-2016 and her email address is Sherron.Roberts@ucf.edu. All of this information is also available on the explanation of research form that I will hand out to you at the end of this speech.

Again, I would like to thank you for your time and I greatly appreciate your knowledge in order to help me complete this research for my Honors in the Major thesis. Are there any questions at this time?
REFERENCE LIST


