Helping All Learners Reach Their Potential

What Teachers Say About Graduate Programs That Integrate the Implications of Mind, Brain, and Education Research

NSU NOVA SOUTHEASTERN UNIVERSITY
Abraham S. Fischler School of Education

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EXECUTIVE SUMMARY

Graduates of M.S. and Ed.S. degree programs in brain-based teaching who participated in an ethnographic study said they had developed a greater understanding of brain plasticity, human potential to learn, metacognition, and the role of the body-brain system in supporting learning. They also reported student achievement gains in their classrooms.

An ethnographic study was conducted in 2011 of the NCATE-accredited Master of Science and Educational Specialist Degrees with Majors in Brain-Based Teaching, which connect implications of mind, brain, and education research to classroom practice. To examine the impact of these programs on their teaching experiences, a researcher conducted focused interviews with eight graduates. Teachers interviewed represented a wide range of years in the profession and at their current schools, subjects taught, and years since earning their graduate degrees in brain-based teaching.

Following the interviews, an analysis of the information gathered identified several converging themes:

1. Graduates understand and apply knowledge about brain plasticity and human potential to learn.
2. Graduates understand and apply knowledge about learning, thinking, and metacognition.
3. The program provides graduates with teaching strategies to assist all students.
4. Graduates understand and apply knowledge about the body-brain system, emotions, and learning—both with students and in their own lives.
5. Graduates reported greater student achievement gains.

INTRODUCTION

Graduates surveyed about the brain-based teaching degree programs said earning these degrees improved their professional practice and provided effective strategies to reach more students more often. Qualitative research was undertaken to explore these findings in greater depth.

Master of Science and Educational Specialist Degrees with Majors in Brain-Based Teaching offered through the Abraham S. Fischler School of Education at Nova Southeastern University are designed to connect implications of mind, brain, and education research to classroom practice. Approximately 3,000 educators have earned their graduate degrees through these programs, which are accredited by the National Council for Accreditation of Teacher Education (NCATE) and the Southern Association of Colleges and Schools (SACS). A June 2012 article in *Education Week* named these programs as some of the only graduate programs in the United States that offer teachers a foundation in educational neuroscience (Sparks, 2012).

This report shares the results of an ethnographic study based on structured interviews with eight graduates of these degree programs. A separate quantitative study found that these graduate programs are so effective that 93% of graduates responding to a survey (n=166) stated that they are likely or very likely to recommend the program to their colleagues (Harman & Germuth, 2012). In addition, on a scale of 1 (low) to 5 (high), respondents rated the program highly in terms of their agreement to the following statements:

- I am able to reach more of my students more of the time. (4.57)
- I am a more effective teacher. (4.61)
- [The program] helped me become a better teacher. (4.48)
- More of my students in my class are learning more of the time. (4.42)
- I have a better understanding of how my students learn. (4.74)
- I have added more teaching strategies to my toolbox. (4.80)

- [The program] benefitted me personally as well as professionally. (4.61)
- I am more excited about teaching. (4.62)
- I am more likely to stay in the teaching profession. (4.53)

Selected key components of these brain-based graduate programs are (1) Neurocognitive Plasticity, (2) the Body-Brain System, (3) the SMART Model, and (4) Thinking for Results (Wilson & Conyers, 2011a, 2011b). These programs also emphasize strategies for differentiating learning, tools for enhancing the learning of at-risk students, and teacher leadership opportunities. An understanding of neurocognitive plasticity posits that learning creates changes in both the structure and function of the human brain and in cognition. Teachers connect this important understanding to the concept of human potential to better understand how all students can make learning gains when they experience high-quality instruction. The component focused on the Body-Brain System promotes the idea that the body and brain need to work in harmony for learning to occur. Graduate students learn about the influence of exercise, nutrition, the senses, and positive attitudes on learning. The SMART Model is a framework for effective instruction and is an acronym with the letters representing:

S = **S**tates of positive engagement

M = **M**eaning (making learning meaningful in the mind of the learner)

A = Engaging focused **A**ttention with downtime, practice, and feedback

R = Using skills and strategies to ensure **R**etention and **R**ecall

T = Facilitating **T**ransfer of knowledge to the academic and real world

Teachers connect what they learn about brain plasticity and potential to better understand how all students can make learning gains when they experience high-quality instruction.

The Thinking for Results approach presents a series of cognitive strategies that teachers may use to explicitly teach their students how to become more effective learners and thinkers. These strategies are taught within the context of metacognition, which empowers learners to think about their thinking and behavior. Taken together, these program components support the disposition that all students can learn and equip teachers with practical strategies to guide all students to realize more of their learning potential.

RESEARCH QUESTIONS AND METHODOLOGY

The interviews with eight graduates focused on whether and how the brain-based teaching programs helped them be more effective as teachers, maximize their students' potential for learning, and increase student achievement.

To further examine the impact of the brain-based teaching programs on graduate's teaching experiences, a researcher conducted focused interviews with eight graduates. Using a case study approach (Stake, 1995; Yin, 1993) informed by Michael Quinn Patton's (1990) work on qualitative sampling and Sarah Lawrence Lightfoot's work on portraiture methodology (1997), the researcher interviewed each teacher using a structured interview protocol (attached in the Appendix). The seven teachers and one parent coordinator interviewed represent multiple geographic areas, years of experience, subject areas, and school levels, and were chosen because of these differences. The interviews, conducted over a four-week period in March and April 2011, address the influence of the brain-based teaching programs on their teaching and professional lives, and are summarized in the following section.

The overarching research question was whether and how the degree programs had helped them to be more effective as teachers, to maximize their students' potential for learning, and to increase their students' achievement. Critical sub-questions focused on how teachers used what they had learned through the programs with their students. To conduct these interviews a structured protocol was developed that contains 14 questions that were asked of all interviewees in the same order. The researcher conducted the interviews by phone, taping them in order to review notes as needed. Interviews lasted approximately 45 minutes to 1 hour, on average. Interviewees were allowed to answer as they wished, with the researcher further clarifying and probing responses as needed. When told that the researcher was collecting follow-up data, six participants provided papers and student grades/test scores to further illustrate their points and the impact of their graduate studies.

SUMMARY OF INTERVIEWS

As noted, seven current teachers and one parent trainer who had earned or were earning the Master of Science or Educational Specialist graduate degree through Nova Southeastern University were interviewed. Their stories follow, with names changed to protect their identity.

Results of Teacher Interviews with Graduates

Debra

Debra is a second grade teacher at a school in a suburban district in the Midwest and has been teaching for five years. She is a graduate of Nova Southeastern University's master's degree program. Debra became interested in mind, brain, and education research as she saw her students struggling in reading and believed the brain-based teaching program offered the best potential solution for helping her help them.

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Debra has "seen an explosion of growth" in her students' academic achievement in reading over the past three to four months. She believes this is due to particular teaching strategies she has applied in her classroom, such as "thinking stems" where students are required to indicate what they wonder, infer, or think will happen. Students then blog about their thoughts and a network of educators across the world comment on what students write. Debra noted that her students find this activity meaningful and motivating. It has also produced great readers—of her 23 students, only five are not reading above grade level. In fact, over a three-month period her students made gains of five months in their reading levels, representing gains she had never seen her students make previously.

For Debra, the benefits of choice, movement, interest level, and thinking strategies (teaching students how to think) are the areas she most feels the program emphasizes. She has used these ideas to better help her students in multiple ways. For example, she discussed teaching spelling by providing students the choice of saying the words out loud, writing them in shaving cream, writing them using colored pencils, or writing them on the back of the person in front of them. She stated that if the students choose what they do their recall improves. In a paper she wrote while in the program Debra further noted that

> thinking strategies are an important component of my classroom. For example, I model thinking aloud when solving problems ranging from math to reading. This way, students are able to see how I work things out in my mind and try to use the same strategies themselves.…Inferring is another important thinking strategy taught in class. I begin by modeling inferring while reading aloud. Next, I question students about what inferences they are making and how they arrived at them. Finally, students break into groups to see what they can infer from their text. Last we journal about what we inferred and why.

"If the teacher doesn't understand students and how they learn best, the teacher may talk all day and lose her students."

Debra noted that the program helped her understand "quite a bit" how students learn and "how things affect the brain." She finds that her new knowledge makes it "easier to tailor lessons to ways kids learn best" and also noted that better understanding how motivation and interest affect learning has changed the way she teaches; she now more effectively varies her instructional strategies to improve student engagement and learning. Debra further explained that learning has different aspects to it, such as understanding new material, being able to talk about it, using the information, and manipulating it. She commented, "people learn differently—if the teacher doesn't understand students and how they learn best, the teacher may talk all day and lose her students." Debra explained that because of what she has learned through the program she now "analyzes" her students' ways of thinking.

In a paper discussing how she teaches so students are able to attend to her classroom instruction, Debra explained that

> captivating student attention is a complicated and varied task. Students come from so many diverse backgrounds that what captures one may not work with another. Therefore choice turns out to be an important motivator.

Giving students choices about the book or subject they are reading and with whom they will group are excellent attention grabbers. Additionally, student directed learning is more likely to engage than teacher directed learning. Student directed learning is more meaningful because they are more actively involved. Not all learning can be student directed though; this is when I am sure to utilize extra energy, enthusiasm, and humor to maintain student interest. Teachers who take the time to know their students' likes and dislikes are better able to maintain student attention because they can tie their lessons into subjects students are interested in.

Mind, brain, and education research has also changed the way that Debra views students' potential to be learners. In her school, students in the second grade are assessed to see if they belong in the gifted program. Before completing her graduate degree program, Debra would provide enrichment only to those students who tested into the gifted program. Now she understands that all students have the potential to be more effective at learning and she doesn't withhold enrichment based on assessment scores. Instead, she provides as many meaningful and enriching activities as possible to all of her students using strategies and suggestions she has learned as part of her teaching education.

Debra's students exercise before Language Arts and Math class by walking around the school track.

Debra also now focuses more on integrating lessons and making connections across subjects. As an example, she noted that now she has her students exercise before Language Arts and Math class by walking around the school track. Because they are studying about Japan and have read about the recent earthquake, they decided to tie track time to raising money for Japan. They began counting the money they raised using as many different techniques as possible to connect to all learners. Students also add information about Japan to a wiki Debra has developed. The class wiki allows students to "add additional information from home on subjects we are learning in class," Debra shared. "This encourages extended learning and ensures parental involvement."

Debra has also begun to teach her students about the brain and how learning and making connections affect learning and the brain. She noted, "[It is] so important to connect what children are learning with what they already know." She described a brain that they have made out of pipe cleaners to represent axons and dendrites and how the students label axons for what

they represent. Her students are now "always thinking about what I know that connects to what I already know." Having a simple visual representation of the brain and its connections seems to aid children's understanding about meaning and how important it is to connect new with prior knowledge to increase learning.

Debra is quite positive about her experience as part of the brain-based teaching program, saying "I have trouble keeping my mouth shut about it, as you can tell." She blogs and Tweets about it and will present brain-based teaching at an education camp next month. In August she will present on using blogs with students, but as she explained, this will require talking about thinking skills and thus talking about the graduate program.

Tanya

Tanya has been an elementary school teacher for over 15 years in one of the largest school districts in the country. Despite being in a suburban district, the free and reduced lunch rate at her school is 61%; 38% of the students are non-native English speakers. Tanya earned her master's degree and specialist's degree at Nova Southeastern University, is National Board certified, and has received multiple honors and recognition for her teaching. She credits these successes to "taking struggling students and making them successful," which she in turn credits to the graduate programs in brain-based teaching.

Teaching based on mind, brain, and education research has made a difference in the lives of the students Tanya teaches; her use of teaching theories and strategies has increased their academic achievement. In a class she taught while learning about brain-based teaching, 13 of her 17 ESL students passed the Florida State assessment, whereas the year before only two of 13 had passed. Tanya noted that school administrators were surprised and pleased by this result. Tanya explained that "ESL kids love to learn even though they may not be the highest achievers...they listened to me and followed the strategies."

Tanya noted that school administrators were surprised and pleased by her students' improved performance on state assessments.

In one of her papers for a course with a focus on helping students to become more effective thinkers and learners, Tanya wrote about how a three-part information processing model helps her define and understand persistent problems that arise from a focus on testing and an overload of curriculum content:

> The first thing I learned is that there needs to be a balance of input, process, and output in order for the students to develop metacognition. High stakes testing has forced teachers to focus on the output, often skipping over the processing and input phases. We have too much content to cover in a year, causing the classroom to become a whirlwind of input without time for the students to gain a thorough understanding of what is being taught. Teachers become frustrated because their students don't seem to comprehend what has been taught. We need to cut back the amount of curriculum to allow the students to process and connect to the new information.

Tanya is a big believer in sharing what she knows about the brain and learning with her students:

> If students know some basic knowledge about the brain and how they learn that will help them in the future….[I] tell students that they will leave with lots of knowledge and strategies about the mind and brain and that they will always use this. Some teachers will be sit and get—but when you go home and study use your processing style to learn best—if you need visuals, draw out your notes so you have a visual of what's going on...[I] see this as helping them as they go up in their grades.

She noted that this way of teaching "is not the magic bullet, but feels like it. I can observe my students and figure out where they are learning and have individual lesson plans for each one….[and] have strategies that they need."

Tanya noted that her graduate studies help her better connect with her students on an individual level and differentiate her instruction.

Tanya noted that her graduate studies help her better connect with her students on an individual level and differentiate her instruction. As an example, she described using multiple paths of learning (experience-based, reading, and writing) to help her students learn the water cycle and noted that "students themselves don't realize how they learn best."

Tanya's enthusiasm for brain-based teaching also bubbles over to her colleagues. She has worked with multiple teachers, including beginning teachers, to help them employ teaching techniques she has learned in their classrooms. She gave an example of working with a teacher who had a new student and telling that teacher that she needed to build a relationship with the student. She suggested waiting 20 minutes if the student became upset and emphasized the need to acknowledge his

perspective instead of confronting him and escalating a bad situation. She also gave that same teacher teaching strategies for differentiating instruction, including strategies for helping the new student learn phonics and build his confidence level.

Tanya believes that every student can learn, so her responsibility as a teacher is to identify how to best teach her students and "key my lessons towards them." She noted that this way of teaching allows her to find the strengths in students, which she then shares with them. She credits the brain-based teaching teaching program with making her a better teacher and also with helping her to develop a greater understanding of her students and to make more meaningful connections with them.

Brianne

Brianne has been a kindergarten teacher for 11 years and a teacher for 14 years. She currently teaches in a Title I school, working with a high minority and low income population. To better address students' early educational needs Brianne pursued a Ed.S. degree in brain-based teaching, graduating in 2009. Before Brianne entered the program she had already encouraged others to become part of it, having immediately identified with its core approach.

Brianne credits her use of teaching strategies based on mind, brain, and education research with the improvement in reading her class has shown this year relative to others.

This is the first year Brianne believes that she has been able to fully utilize everything she learned in her graduate degree program. Currently, three of her students are reading on a second grade level and only three or four students are not reading at the level they need to. She credits her use of teaching strategies based on mind, brain, and education research with the improvement in reading her class has shown this year relative to others. She also believes that her students' problem-solving in math has "really excelled" this year. She stated that she gives the program "some of the credit for it—my kids have an 'I Can' attitude. It resonates with parents and they get more involved. Failure is not really something that is in their vocabulary."

Brianne noted that plasticity of the brain was a big emphasis in the program, as well as the concept that the brain changes as one learns, allowing us to keep learning even as we get older. As she now tells her students, "the brain never stops learning even when you are 100 years old, and it changes every time you learn something new." Brianne commented that she had never studied about the mind, brain, and learning much in her prior educational programs before and that the information covered

was "new, fresh, innovative, and research-based" and "stuff you could begin applying immediately and could apply it at home." She said that with the technology now available teachers have to "change the way we were doing things to reach students" and that her program helped her do this.

Writing about the importance of teacher leadership, Brianne further emphasized this key foundational concept of neurocognitive plasticity:

> Teachers, administrators, and parents must feel empowered to take responsibility for the instructional effectiveness of the school which will impact the strength of their school, increase motivation, and increase the level of optimism for all members involved in an effort to move towards a new paradigm of parallel leadership. Neurocognitive plasticity is a term neuroscientists use to refer to the brain's capacity for change. It is also an important concept for educators to understand because they… need to be aware of the fact that everyone has the ability to learn.…This will be an important concept for educators to understand as they plan and implement instruction with the notion all children have the ability to learn. Educators and leaders will also benefit as they recognize learning never stops, regardless of an individual's age.

Brianne noted that the brain-based teaching program has deepened her understanding of how people learn.

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Teaching her students about metacognition has also helped them learn to regulate their behavior and choices. "Teaching them how to think about multiple ways to solve problems has helped students become more focused, calmer, problem-solve more, and better at working things out between themselves versus needing to get the teacher involved," she said. This way of teaching, she believes, "helps with behavior management" and has resulted in a better classroom climate where her students have "more respect for one another...work in harmony more, and work things out more than putting it back on the teacher." Brianne reinforces this positive climate by using a teaching activity where she chooses two students each week who exemplify certain characteristics (patience, respect, etc.)

and then works with her class to help them understand and learn these attributes. In this way, students are better able to see and model these characteristics.

In one of Brianne's papers she discussed different learning systems and how students are unable to fully utilize the cognitive system in certain conditions:

> The third learning system developed within the brain is the cognitive learning system, which forms an information processing system that organizes meaning. Given (2002) describes the cognitive system working most effectively when 'other systems—emotional, social, physical, or reflective—are not competing with it for attention' (p. 81). Thus, the cognitive learning system is unable to function at an optimal level without the support of the other learning systems.

Brianne now welcomes parents as partners in their children's learning: 'I'm learning the importance of establishing rapport with parents and students and that learning will come after this.'

Brianne spoke about being taught how important a positive state of mind was to learning. "When you model it and transfer positive thinking, they [students] really learn to set their goals higher, improve their self-esteem, and they learn to think more metacognitively—become better problem solvers," she said. Since she works with an at-risk population, Brianne recognizes that "for some of the kids the best part of the day is being at school. When you can make it a positive day and a goal to look forward to, it impacts their future and how positive they can be with their goals."

Perhaps due to the fact that she works with very young children, more than the other teachers who were interviewed, Brianne spoke about how her use of teaching strategies and the overall program has helped her better understand parents and be more positive in parent interactions. As she stated, "[I] welcome them more as partners and want them to know that we are on the same team...I'm learning the importance of establishing rapport with parents and students and that learning will come after this." She also believes her brain-based teaching education has provided her with greater confidence to reach out to teachers as a teacher leader: "Before, I would never have felt comfortable volunteering to present a workshop. I just realized how when we get frustrated...how everyone needs to work together towards a positive goal."

In one of Brianne's papers she articulated changes in the school where she works and why those changes were necessary:

> Our overall student achievement has dropped over the past few years as the economic make-up of our school continues to change drastically. In the six years I have been at my school I have seen a diverse change in the socio-economic make-up of the student population at my school. I have also seen the economic situation change drastically as we have gone from a 'low-income' school, to a 'targeted assisted school' and now we will be a full blown 'title 1' school….As many of our students come to us with disadvantaged home lives and bring little prior knowledge or cultural experiences to school with them, it has made an impact on their achievement and success. Our school is learning we must change the way we teach in order to reach all learners to help our students meet or exceed performance standards.

Empowered with new knowledge, in the same paper Brianne shared how she plans to collaborate with other teachers and contribute to the school professional development plan in order to create a more positive environment for learning and teaching:

> I plan to take a more active role as an instructional leader in order to make my school better for teachers and learners by sharing the knowledge I have learned about brain-based learning in order to create a climate of collaboration and positive change in my school, in which student achievement may increase. I will focus on collaborating with my colleagues as we create an environment for positive school change, and will share strategies teachers can begin using immediately in their classrooms as they add more tools and techniques to their repertoire of teaching tools. I plan to coordinate a professional development series for colleagues in order to expand my role as an instructional leader at my school and provide positive leadership contributions that may benefit our teachers and students….I will work with other colleagues to provide staff development that will be beneficial to our teachers so we may motivate student learning and boost student achievement as we learn new ways to help our students meet or exceed performance standards.

Her graduate program has made Brianne shape her class and day much differently.

Her graduate program has made Brianne shape her class and day much differently. She now provides snack time in the morning as her students do not eat lunch until 1 PM, and provides more kinesthetic (experiential) learning opportunities.

The program also taught her to focus more on recap, retention, and recall, and "opened my eyes to limiting teacher-directed activities." She thus provides more discovery and exploration opportunities for her students as well as cooperative learning opportunities. She also uses more technology in her classroom, including a mimeo board (similar to a smart board), and takes her students to the computer lab twice a week.

Brianne summed up her experience by stating, "the program helped me become a better teacher and wife and mother," and explaining that much of what she learned she applies with her own children to help them with homework, problem-solving, behavior, and so on. She also commented that the education she received helped teach her the importance of maintaining a healthy lifestyle and its effect on brain development. The program, she said, "has had a positive impact all around."

Greta

Greta teaches business education, including accounting, finance, and business foundations, to high school freshmen, juniors and seniors. She teaches at a school where students are middle class to upper middle class and Caucasian, although a population shift is occurring as more African-American and Middle Eastern students are choosing to attend her school. Greta has been teaching for 15 years, is a National Board Certified Teacher, and has earned her specialist's degree from Nova Southeastern University.

Greta "absolutely" credits her graduate studies based on mind, brain, and education research with helping her understand how her students learn.

Greta "absolutely" credits her graduate studies based on mind, brain, and education research with helping her understand how her students learn. Although for many years Greta taught students in an elective of their choice, in the last two years more students have been mainstreamed into her class, pushing her to work to make lessons more "accessible and interesting." Brain-based teaching, she said, "helped me differentiate instruction and see the value in differentiation," and also taught her basics about the brain and learning.

When asked whether the program helped her to maintain a more optimistic, motivated, and positive state as a teacher, she noted that the program "explained to me a lot of the things I was having trouble getting my students to do….[It] gave me renewed hope." Although her class is not one that has a state test associated with it, Greta's class test grades are all the proof she needs to know that her students are doing better academically. Greta attributes their increased success in comparison to

students that she taught before earning her graduate teaching degree to students wanting to be in her class and the influence the mind, brain, and education research has had on her teaching.

Greta explained that she has "always believed that any kid who wants to learn can learn" and that her graduate education has made her a more patient teacher. She noted that if she stands back and looks from where students are coming to her, "it changes my view of them" such that "if I explain something the same way twice then I have to put my brain together and figure out another way to explain it." She noted that before she earned her Ed.S. degree she always had trouble understanding why kids couldn't learn, but that brain-based teaching helped her understand that there are different ways of learning. She credits her program cohort with also helping her identify ways to be a more effective teacher.

Greta works with students to teach them some of the cognitive strategies suggested in her program of study, including note-taking skills, the ability to compare and contrast, how to follow directions, and reading for information. One of the lessons Greta still uses about reading directions was developed as part of a class project while at Nova. Greta also reported that she works on making her classroom "student-led" and "interactive" versus "teacher-led." One example she gave was teaching students how to compute values on the 1040 tax document by having them do research on the computer instead of providing the basic information they needed. As she stated, "it was far more successful than when I led them through it."

One example Greta gave was teaching students how to compute values on the 1040 tax document by having them do research on the computer instead of providing the basic information they needed.

Miriam

Miriam is a veteran teacher, having taught K-5 English for Speakers of Other Languages (ESOL) for almost 20 years. Most of her students come from Eastern Europe (Romania, Bosnia, etc.) or from Mexico. In the recent past she has been voted as teacher of the year at her school. Miriam earned her Ed.S. degree two years ago from Nova Southeastern University.

Overall, Miriam noted that she is "more confident about what I feel works for students and being more flexible about making things change as needed. You have to help them [students] differentiate the way that they participate—but they still participate."

Utilizing theories and strategies taught through the brain-based teaching program, Miriam has seen her students' academic achievement increase noticeably. After the interview, Miriam provided test score data that showed how four second-grade classes receiving supplemental instruction from her improved their reading comprehension skills and writing skills over the course of the year, with virtually every student meeting or exceeding expectations in each category by year's end. Her English as a Second Language students in first through fifth grades also showed significant improvement over the year. For example, at the beginning of the year 72% of her ESOL students did not meet reading comprehension standards; by the end of the year, only 17% did not meet these standards. Miriam noted that "teaching Latin/Greek prefixes, suffixes, and roots in an engaging brain-based way increases vocabulary, spelling, reading, and writing skills across academic curriculum."

'Once you learn how you think, you know better what you need to do to help yourself,' Miriam says of her student's developing metacognitive abilities.

Regarding her own metacognition as a teacher, she commented that because of the program "I was able to be more consistent about how and when to use strategies and recognize what works for different kids, and this shows in [test] scores."

When asked whether she tried to teach students aspects of what she learned from her graduate education, Miriam noted that "metacognition is huge. We talk about rote memory and really thinking about thinking, like how do I solve this problem, thinking through things, processing things.…Once you learn how you think, you know better what you need to do to help yourself." She further noted trying to help students to visualize things and make links across subject areas.

Miriam discussed multiple ways in which her studies have influenced her thinking and teaching. "… teaching helped me understand how kids learn—and how adults learn. [I] did have some previous experience with this, but [my program] provided me more recent research and made use of all senses." She noted that two things that really influenced her were the ideas of brain plasticity and the power of positive thinking:

> One of the most fascinating things [we learned] was brain plasticity—the finding that the brain is pretty elastic even as you get old. In essence, you can teach an old dog new tricks.…Another thing was the power of positive thinking—it was a very big component along with health. … [You] have to teach kids these things—even adults don't realize that to learn you have to be in the right frame of mind.

Her graduate studies also gave Miriam the confidence to try new pedagogical techniques when teaching.

For Miriam, her graduate studies gave her new pedagogical techniques to use with students. "I was really able to build upon [what I was already doing]…I still have challenging students, but other…things come into play—building relationships, positive thinking, creating a positive environment, and giving students power to make choices." Her graduate studies also gave Miriam the confidence to try new pedagogical techniques when teaching. "[My program] taught me to think outside of the box—or at least more comfortably. [I am] more confident with taking what I learn and using it to get started and extending it. [I] was willing to try more strategies [after earning my degree]."

Miriam described how her classroom looks different than others because she uses many of the activities and pedagogical practices she was taught through the program:

> Many of the brain-based teaching activities are not very traditional. So our classroom doesn't look like an average one. Learning that these strategies work [using music, body language, or colors] makes you more confident to try it. It increases student engagement and makes it [subject] relevant to the learner.

After learning about the neurotransmitter dopamine and its role in learning, Miriam wrote about her understanding of the importance of positive conditions in the classroom:

> As one of my former language arts connections students said: 'I like your class, but not because of friends. I like it because of activities that we do in your class, and I thought I would tell you what I like. I like the daily grammar practice we do because I can interact without the fear of being wrong. In my other Language Arts class, the fear is always there, so I don't interact with the class. I like doing all the projects in your class with other students on the computer because the students and me can really learn things about each other.'

Miriam went on to write that "this student realized that a positive environment where he was willing to risk being wrong helped him learn. He also realized that he enjoyed group work….He later mentioned in his note that projects were really important to him."

Her program also empowered Miriam on a personal level. "I had personal struggles" when starting the program, she explained:

> The whole component on positive thinking and working to be a positive thinker really helped me as a person get through a difficult time and helps me help other teachers. Especially learning how to help teachers to think positive: save success, deal with problems, delete the negative. You can control the save and delete keys in your life. It's a good tool for teachers and students.

Miriam noted that the program helped her be more patient with other adults and teachers and spoke about her role as a teacher leader and mentor:

> Fortunately, most of my experiences in mentoring have been positive and reciprocal. I learned that many new teachers understand the foundation and structures of teaching and learning, but lack the ability to apply what they've learned. If we can continue to help new and experienced teachers learn more about brain-based teaching, I believe they will be happier and more effective. New educators also need a strong socio-emotional support group from their peers rather than a competitive stance from veteran teachers. Often, I get to see the school, our staff, and students from a new perspective when mentoring. I have to remember to be positive and open-minded. I do believe that using what works well for students in the classroom will work well for my mentees. It should be interesting this year, because although I am considered an automatic mentor for anyone teaching ESOL students in their classrooms, we are all new to this school and will be creating a new foundation together. I always learn something from them as well and continue to apply my signature strength of life-long learning in doing so.

Miriam noted that the program helped her be more patient with other adults and teachers and spoke about her role as a teacher leader and mentor.

While summarizing her experience, Miriam seemed almost surprised at her teaching, saying,

> It's not just me—it's the brain-based ideas. The idea that they are out of their seats—they are moving … , they're having fun but they know what it is to connect to someone else. I really believe that it's [these teaching methods] that powerful….Once you apply this you don't want to do anything else. I've tried to explain this to

other teachers, how easy it is…tell them once they see how well it works they won't want to go back to the old way—nor will the kids.

Carol

Carol is a resource teacher for seventh and eighth grade special education students in a Title I school. She has been a teacher for 17 years, all of them in special education. In 2008 she earned her master's degree from Nova Southeastern University and in 2010 earned her specialist's degree. She was recently voted as teacher of the year for her school and "definitely" credits her graduate programs for that achievement.

Carol began by explaining why she chose the brain-based teaching graduate program:

> Part of why I wanted to go back [to school] was because I wanted to be the best teacher I could be. [I] felt like I didn't know enough. [What I learned in my program] is not all curriculum-based but focuses on psychology and physiology—you learn how to deal on a social and emotional basis as well. [I] work with a more fragile type population.

Brain-based teaching, Carol said, "helped me understand that kids come with baggage—days they are receptive and days not—and that's when you have to pull in…strategies to get them activated and excited."

Brain-based teaching, she said, "helped me understand that kids come with baggage—days they are receptive and days not—and that's when you have to pull in…strategies to get them activated and excited."

She identified some of the research foci of education, mind, and brain teaching as (1) proper nutrition, (2) exercise, and (3) optimism. She noted that "students need to come prepared [to learn] physically and mentally—but they don't always come that way." She explained that her studies allowed her to focus on "where you were interested and where it was relevant." Her focus on the work of Martin Seligman and others taught her that "you have to respect the child as an individual and you also have to model positive emotions. They [students] look at you to see how you handle frustration or react to certain situations. You want to invite them to reciprocate that in the classroom." The program also encouraged her to "build my own confidence about what I can do as a representative of the school." To that end, she noted that she is more confident and said "[I] think my peers have noticed that. I now feel I can speak up and be a child's advocate and have information to share with other persons." She added, "I've always believed

Carol especially appreciates strategies that engage students' interest and assist them to become more effective thinkers who are in charge of their learning process.

that there are no definitive limits to what a child can learn under the right circumstances….Regardless of the curriculum you tailor it to their interest and make connections."

In terms of how her graduate studies have impacted her effectiveness as a teacher, she noted, "when they [students] come to us we make the assumption that they know study strategies, how to pay attention, how to learn. They don't come that way—they have to be taught." Carol was able to speak about multiple strategies she uses that she learned as part of the graduate teaching programs: systematic search and planning, strategies for study skills, practical optimism, developing the cognitive assets (metacognition), attention/retention strategies, and transfer techniques. In summary, the strategies Carol spoke of in the interview ranged from those that "hook" and engage student interest to those that assist students to become more effective thinkers who are in charge of their learning process.

Following the interview, Carol provided data on seven students who had taken Language Arts with her for two years in a row after she'd completed her degrees. By eighth grade, six of the seven students were posting higher Language Arts scores on a state test than they had in sixth grade—in some cases, significantly higher. The one student who did not post higher scores showed almost identical scores in sixth grade and eighth grade.

In addition to strategies, Carol described engaging students' various processing skills to increase learning and thus achievement. Most recently she employed such skills when teaching mythology to eighth graders. First, she had her students study mythology using the Internet. Next, they developed a rap song about one of the heroes. The students then recorded their song and added pictures to the presentation using technology. As she noted, "to get eighth grade boys to be excited about learning is the most incredible feeling ever."

Carol shared that one of the main strategies she uses when planning lessons is the understanding by design process she learned in her program. She described identifying the essential question and thinking backwards as she plans lessons. She believes this approach "helps get kids who lack inferential thinking skills and helps them know what to focus on." She also noted that she has learned to make her lessons more experienced-based.

Carol shares what she has learned through the brain-based teaching programs with her peers and recently conducted a school-wide professional development event showcasing various teaching techniques to improve learning. In summary, Carol commented that her graduate education

> has given me the confidence to challenge myself as well as my students as learners and made me a good role model for them. [It] gave me confidence to speak up about what is right for each student. [I] feel more professional than before. I truly hope I never feel like I am finished learning—this is a gift I want to give my students as well—there's always more they can learn.

Nancy

Nancy has been invited to speak in her school and district on using cognitive strategies with students and stress reduction techniques for parents and colleagues.

A former Exceptional Children's teacher, Nancy has been a K-5 pull-out teacher at the same school for over ten years. She teaches a diverse group of learners, including students with learning disabilities, autism, behavior disorders, other disorders such as ADHD, and physical impairments. In 2008 Nancy earned a master's degree in brain-based teaching at Nova Southeastern University. She has used this education to develop her own curriculum, strategies, and games, earning multiple grants from a local education foundation. A few years ago, Nancy was given the award "Best Brain Teacher" by one of her students.

Nancy's decision to earn another degree was based on her desire to better work with her at-risk students. As she put it, mind, brain and education research was the "missing piece" she needed to better reach her students.

Nancy sees academic gains among her students on a daily basis as well as in their other classes that she attributes to her brain-based teaching work with them. In addition, she has seen her students adopt a more positive view of themselves as learners, gain greater confidence, and take greater academic risks because of the success they feel. In one case, a student who in the past had not even attempted to respond to long writings prompts was coaxed into responding to the fourth grade writing assessment—and passed. Because of this success, she has been invited to speak both within her school and across the district, including presenting on motivating cognitive belief strategies to fourth graders at other schools. In addition, she has presented stress reduction skills to parents and colleagues.

"I truly believe that cognitive assets are the missing link in today's content-focused educational curriculums," Nancy wrote.

Along with knowledge about the mind, brain, and learning, Nancy focuses on the various strategies she learned from the program, noting that brain-based teaching divides them into input, processing, and output strategies. In a paper that she wrote for one of her classes in the program, she described how she assessed one group of her Resource Room students according to their input, processing, and output thinking skills, noting their strengths and weaknesses in each area. In the process phase, for example, she recognized that her students needed to improve their recognition of cues to solve problems. To start addressing this weakness, she is working on developing lessons to help them pick up on social cues more readily. In the output phase, on the other hand, she noted that they displayed a strength in displaying appropriate courage—after memorizing a song to assist them in remembering state assessment strategies during a test, they sang it for the entire school. She recognizes that these types of cognitive skills will help them learn and grow throughout life. "I truly believe that cognitive assets are the missing link in today's content-focused educational curriculums," she wrote.

Describing the importance of helping her students to develop an understanding of time and to learn to use it wisely, Nancy wrote the following in a paper:

> As we travel through each critical day of our lives, time passes, whether we use it resourcefully or not. On a daily basis, teachers expect their students to use time wisely, but when they do not, the students are simply told to work more quickly or slow down and concentrate. Does this method of telling really work?…most students do not learn to manage their time, or even value it, while at school. Cognitive skills should be directly taught and are essential for student achievement.

Later in the paper Nancy described one of a number of mini lessons in which she guides students to begin to independently use time more effectively:

> I set a timer so they could experience what one minute in time feels like. Students raised their hands when they thought the minute had passed. Many anxiously raised their hands after thirty seconds. Students were then asked to visualize themselves as either a fast cheetah or a slow turtle when it comes to how they do things. The varying answers served as a precursor for the time management

> assessment rating scale. For instance, students rated whether they arrive to functions early, on time, or late. After adding up scores, we noticed that the larger the number, the more time management was needed.

Nancy further wrote that

> As a result of my study of cognitive thinking skills, [previously discussed] I plan to continue sharing my new-found learning at school-based meetings. I will be giving a presentation this week at a school zone meeting, to share the importance of explicitly teaching cognitive thinking skills to all students. I also plan to propose an entire cognitive thinking skills program to my administrators and have developed a PowerPoint presentation of the proposal. Furthermore, I plan to extend the lessons to parents, by sending home an 'Ask An Adult (AAA)' sharing page. Parents and children can discuss how the cognitive strategies are used at home and in their workplace. This will help students generalize the skills and see their importance in real life.

Nancy credits brain-based teaching with deepening her understanding of how students learn through its focus on educating teachers about the human brain.

Whereas she has always believed in the "learning potential" of her students, Nancy credits the mind, brain, and education program with helping her students both realize and reach their potential by making her a more effective teacher. As a graduate student, "[I] would get so much neat info and think 'I will try that tomorrow,'" she recalled. She noted that using various strategies learned in the program "gives them [students] a head start" regarding learning how to be thinkers, and noted, "teaching them how to think is so powerful."

Nancy credits her graduate studies with deepening her understanding of how students learn through its focus on educating teachers about the human brain. Nancy believes this is a critical foundation for teaching and "was a great jumpstart" for the rest of the educational program. Nancy commented that learning about the brain "should be required for every teacher" and that teachers should share this knowledge with their students. She takes this to heart and teaches all of her students about the brain using a variety of props such as Jell-O molds of the brain, a cotton-stuffed brain, a Styrofoam brain, and squeezable rubber brains. She uses pipe cleaners to represent neurons and engages students in activities where they connect pipe cleaners with other students to simulate learning.

Nancy has taken many of the concepts presented as part of her brain-based teaching program and "made them her own."

Nancy also regularly works with students to help them think of ways that they can use the strategies that she employs in her class in their other classes, and noted that the focus of her class is now on strategies versus subjects. As she explained, "every strategy is related to home, life, or friends" and described making a game called "Be The Brain" in which students select one of four "situation" cards related to a concept (e.g., taking initiative) and explain how they would apply that concept. In some cases, students might choose an "Ask an Adult" card and interview a non-teacher adult about how they take initiative at work, for example.

Nancy has taken many of the concepts presented as part of her brain-based teaching program and "made them her own." As an example, she adapted a memory strategy of connecting words to parts of the body through visualization into "Rainbow Recall" in which students connect words to the seven colors of the rainbow. She also likes to link different acronyms or words into actions. One example is "SUCCESS" or "Surely You Can Catch Every Shooting Star." She believes that positive words and the image of reaching for the stars helps reduce frustration among her students.

Finally, Nancy credits what she has learned about mind, brain, and education research with helping her personally as well as professionally. She had begun to question her own ideas about learning, goal setting, and taking risks, but started using key teaching strategies as she continues to pursue other goals in her life.

Results of Interview with Graduate Parent Trainer

A special interview was conducted with a graduate who was using principles he learned related to mind, brain, and education research in his work with parents. The interview was designed to understand how his graduate studies have shaped how he works with parents to help them be better advocates for their children's learning.

Andrew

Andrew works at a Title I school as a parent instructional support coordinator and operator of the parent center. The parent center makes resources available for parents to empower them to better serve their own children. Prior to this

role, Andrew worked as an elementary school teacher for 15 years. He decided to earn his master's degree from Nova Southeastern University due to his interest in research about learning and implications for education.

Andrew believes that the biggest barrier to parental involvement is that parents do not always know how they can be involved. To help parents understand ways that they can be involved and support their children's learning, Andrew uses multiple strategies he learned as part of his graduate program and has even developed a workshop that is "completely dedicated to the principles that I've learned" from his graduate degree program. He professed to using education, mind, and brain principles in all of his workshops except those on bus and Internet safety.

Andrew noted to this parent that she and her daughter were in an endless loop of failure, but added "this is not a matter of if she will learn, it's a matter of when, especially once we start applying some of these things that I want you to do for her."

As an example, Andrew recounted working with a parent whose child was struggling to learn multiplication. He noted to this parent that she and her daughter were in an endless loop of failure, but added "this is not a matter of if she will learn, it's a matter of when, especially once we start applying some of these things that I want you to do for her." He worked with the parent on such things as state of mind and meaning (to address retention issues), and then proceeded to teach this parent simple math games that could help her child learn multiplication in a way that would resonate with her, leading to changes in learning and thus to better retention.

Andrew recounted another example of working with a grandparent of a fifth grader. He used a story from a book in his graduate program—the story of a trash collector and a treasure hunter:

> The treasure hunter goes through life collecting treasure and as he meets new people he shares his treasure with them, and they also share their treasures with him, so he collects even more treasure. And as he goes through life, he continues to share his treasures, continues to collect treasures, and then at some point he looks back and he's got a life filled with treasures and he's got all of this that he's collected. And this is an example of how we want a person to be positive, as opposed to the trash collector—somebody who does not see the positive in anything and instead collects nothing but trash, in the same surroundings that the treasure hunter had walked through, meets the exact same people that the treasure hunter had met, but the trash collector collects only trash.

By sharing this story with her granddaughter, the grandmother was able to better reach out to her granddaughter and help her with her attitude and learning.

Andrew further explained how the principles he learned in his program work well with parents:

> I can take any parent and empower them to be an effective partner in their child's education, not just in kindergarten and first grade, second, third, but throughout elementary, secondary, in college and beyond. The things that I share with parents are not things that they're only going to use for this one period of time. They are tools that they'll use every year, things that they're going to use themselves, just modeling for their children, modeling problem solving. When I'm really able to spotlight to a parent how important that is, that they model problem solving for their children, all of a sudden they say, 'I've seen the difference, I've seen changes in what my child is doing.'

Andrew said providing parents with an awareness of how people learn has been "the greatest bang-for-your-buck that I've ever seen in my 15 years in education."

He also noted that providing parents with an awareness of how people learn has been "the greatest bang-for-your-buck that I've ever seen in my 15 years in education." He feels that the best compliment about what he shares with parents is that he can "make parental involvement accessible to all."

Andrew has found that sharing the content from his brain-based graduate program with parents gets them more involved and excited about what they can do to help their kids learn. Andrew closed his interview by noting that he is now never at a loss for a strategy with which to help a parent, "because it's always something to do with State, something to do with Meaning, something to do with Attention, something to do with Retention, or Transfer." The program, he said, has "made my job easier, and more fun!"

FINDINGS AND DISCUSSION

Data gathered from these interviews were qualitatively analyzed to identify the following emerging and converging themes:

1. Graduates understand and apply knowledge about brain plasticity and human potential to learn.

For most teachers this information was new and eye-opening, as it is not shared or taught in most traditional education programs.

Many teachers began the interviews by talking about the program's emphasis on learning about the brain and mind, and the implications for learning and teaching. For most teachers this information was new and eye-opening, as it is not shared or taught in most traditional education programs. Miriam, for example, remarked that "one of the most fascinating things [we learned] was brain plasticity—the finding that the brain is pretty elastic even as you get old. In essence, you can teach an old dog new tricks." Brianne similarly emphasized that brain plasticity is "an important concept for educators to understand because educators need to be aware of the fact that everyone has the ability to learn.…Educators and leaders will also benefit as they recognize learning never stops, regardless of an individual's age." This information is critical for teachers to learn as it provides the foundational understanding that as adults their brains are still plastic, thus, they are able to continue to learn current important knowledge in both their personal lives and careers as teachers. Further, it is key for teachers to understand that virtually all students are able to learn if provided with effective instruction.

Almost all of the teachers who were interviewed spoke about students' potential more positively now that they understand ways to help students learn better. For Debra this was such an eye opener that she was no longer interested in how her

students scored on an assessment to test into the gifted program—she now wanted to provide all of her students enrichment that in the past she had only offered her gifted students. Other teachers also noted that they now believed in their students' potential and that the new strategies that they employed helped unlock their students' potential. Nancy, for example, shared that she learned many useful strategies in the program—"[I] would get so much neat info and think, 'I will try that tomorrow,'" she said—and felt that the program helped her students reach their potential by making her a more effective teacher.

2. Graduates understand and apply knowledge about learning, thinking, and metacognition.

Many of the graduates of the brain-based teaching program shared that the program helped them think differently about their teaching and empowered them to choose and evaluate instructional techniques more effectively.

a. Graduates report becoming more metacognitive about their teaching and learning.

Many of the graduates shared that the program helped them think differently about their teaching and empowered them to choose and evaluate instructional techniques more effectively. Greta explained that her graduate education has led her to stand back and consider the point of view of the student: "It changes my view of them," she said, adding that "if I explain something the same way twice then I have to put my brain together and figure out another way to explain it." Miriam shared that she is "more confident about what I feel works for students and being more flexible about making things change as needed. You have to help them [students] differentiate the way that they participate—but they still participate."

Carol described how her planning process has changed. Previously she assumed that students would already know how to pay attention and learn; now she realizes that they have to be taught these skills. When planning lessons, she works back from her end goal, identifying the steps she and the class will need to take to get there. This approach, she said, "helps get kids who lack inferential thinking skills and helps them know what to focus on."

b. Graduates teach students to become metacognitive.

All teachers noted working with students to help them learn cognitive and metacognitive strategies to enhance students'

potential to be academically and personally successful. Cognitive strategies included those that help students to better access, understand, remember, respond to, and make connections across the myriad of information that is presented to them on a daily basis at school. Nancy is focusing on teaching her students cognitive assets that will enable them to become smarter learners throughout life; Greta, too, focuses on cognitive strategies like note-taking skills, comparison/classification skills, following directions, and reading for information.

Nancy is focusing on teaching her students cognitive assets that will enable them to become smarter learners throughout life; Greta, too, focuses on cognitive strategies like note-taking skills, comparison/classification skills, following directions, and reading for information.

At the metacognitive level, students are taught how and when it is important to use the cognitive strategies. As one teacher stated, "students themselves don't realize how they learn best. Give them brain facts and help them see their way of learning and help them feel as much a learner as anyone." Each teacher has begun to teach students about how the brain works and how they learn, helping them become better thinkers and learners. For example, both Debra and Nancy have taught students the basic science behind how the brain works, using pipe cleaners and other props to illustrate how the brain makes connections. Debra reported that students are now "always thinking about what I know that connects to what I already know." Students feel empowered by this new knowledge. Brianne, Greta, and Nancy all described greater student enthusiasm and belief in their ability to learn. Nancy shared that her students were more willing to take academic risks because of this new confidence in themselves.

The interview with Andrew, the parent trainer, suggests that applying the principles learned in graduate school has helped him reach parents and teach them ways that they can help their children learn. Andrew has found that using the program content and sharing it with parents gets parents more involved and excited about what they can do to help their kids learn. As he noted, "I have not had a single parent come through my doors with a problem that I did not feel BrainSMART principles and strategies could not knock out of the park."

3. The program provides graduates with teaching strategies to assist all students.

For every teacher, completion of one or both of the brain-based teaching programs has led her to change her own practice in the classroom. All seven teachers shared that they now

acknowledge the fact that it is important to vary their instruction more effectively, using teaching strategies that provide opportunities for students to learn concepts in a number of ways. For many teachers, understanding the brain helped them "diagnose" their students, allowing them to link strategies to the students' processing styles or learning preferences. Debra, Tanya, and Carol each provided specific descriptions of the variety of strategies they use to teach certain topics or concepts. Carol, for example, had her students study mythology by using the Internet, developing a rap song about one of the heroes, and using technology to add pictures to their presentations.

Almost all teachers also reported modifying their instruction to include more student-directed activities. Greta reported that she now makes her classroom "student-led" and "interactive" versus "teacher-led"; when she teaches students how to compute values on the 1040 tax document, for example, she directs them to find the information they need on the computer, rather than providing it for them. Brianne also described how she has reduced teacher-led activities in favor of more cooperative and interactive learning opportunities. Carol makes her lessons more experience-based and uses teaching strategies to get kids excited about the material. For many teachers, the rewards of such changes are not just in students' success but in their more positive attitude and behaviors.

Teachers used these strategies and activities with multiple types of learners. Especially refreshing was that teachers of diverse learners, ESOL students, and students with special needs found the graduate programs to be as effective as teachers working with a more traditional population. This finding further supports the assertion that the mind, brain, and education programs are equally valuable for all types of learners.

Since graduates who were interviewed included teachers of different subjects, it appears that these trans-disciplinary studies can be useful to teachers regardless of grade and subject taught.

Furthermore, since graduates who were interviewed included teachers of different subjects, it appears that these trans-disciplinary studies can be useful to teachers regardless of grade and subject taught. This is an important finding; few programs exist that are applicable to all teachers and all subject areas. As one teacher who used these strategies to support students struggling in different areas noted, she now focuses on teaching the thinking and learning skills that the program promotes over actual remediation in the subject area in which a child is struggling, with positive results.

4. Graduates understand and apply knowledge about the body-brain system, emotions, and learning—both with students and in their own lives.

Many teachers learned for the first time about the "body-brain connection," or the link between mental thoughts and physical behaviors.

Many teachers learned for the first time about the "body-brain connection," or the link between mental thoughts and physical behaviors. Brianne, for example, now provides snack time in the morning since her students eat lunch late in the day. Teachers also learned about the need to be in a positive state of mind and body to learn. For most, they saw improved behavior among their students as they promoted a positive state of mind. Miriam shared the story of one student who said he liked her classroom because he wasn't afraid to make mistakes there. Brianne said that she chooses two students each week who exemplify various positive characteristics and helps the rest of the students understand how they can develop these characteristics. She feels that her students have more respect for one another now.

Many graduates reported using the same strategies that they taught their students to promote their own positive energy, thus refreshing themselves as teachers and learners. Indeed, the programs were viewed across all study participants as rejuvenating to their teaching. Miriam and Carol both feel more confident about the work they're doing. Greta spoke about having "renewed hope" about her ability to reach her students. While teachers were quick to note that the strategies didn't solve all of their classroom problems and were not a "magic bullet," many of them cannot fathom teaching how they did before they entered into their degree programs.

Teachers' success with the graduate program gave many of them the confidence to reach out to other teachers to share strategies and information about the brain, teaching styles and strategies, and so on. In this way, all of the graduates have grown as teacher leaders. Some have been invited to present to teachers, parents, and even students at other schools to teach them about the mind-body connection and brain-based learning. One teacher has become so enthralled by her training that she has developed additional strategies, many modeled on the strategies she learned, and has written grants to buy classroom materials to support these strategies.

Finally, for many, the program had a positive impact personally as well as professionally—some teachers reported being more positive overall in their lives and being more confident in pursuing personal goals. For one teacher, for instance, it was the idea of keeping positive that supported her while going through a time of transition. It seems that learning about the brain's plasticity and how it relates to human potential—particularly how it makes clear that people truly can learn and grow throughout their lives—gives these teachers a positive framework from which to approach some of the challenges of work and life.

5. The graduates reported greater student achievement gains.

Six of the seven teachers reported that student achievement, in terms of classroom work and/or test scores, had risen since they'd completed their program. All these teachers, regardless of subject, ages taught, or background of teacher and students, credited the degree programs with positively impacting these student learning gains. All teachers further credited the teaching of cognitive and metacognitive skills as a major reason that student achievement went up.

Although teachers believe the programs helped them in many other ways, including improving the classroom climate and increasing their leadership, the positive influence on students' academic success is the number one reason why teachers love it. All also noted improved behavior and increased engagement among their students as the students themselves became more academically interested and successful.

The material resonates with multiple types of teachers because the theories, models, and strategies it promotes are research-based, easy to use, intuitive, and effective in promoting academic achievement.

As was noted earlier, the teachers interviewed teach a variety of subjects and grade levels; their students are racially and ethnically diverse; and they teach traditional learners, ESOL students, and special needs students. Despite this great variety, every teacher found the graduate degree programs to be relevant and valuable. The material resonates with multiple types of teachers because the theories, models, and strategies it promotes are research-based, easy to use, intuitive, and effective in promoting academic achievement. The programs also increase teachers' confidence, and often they want to share what they have learned with other teachers. Many graduates are therefore developing into teacher leaders, reaching out to

other teachers, administrators, parents, students, and the public at large to help them understand brain-based learning and its impact on students. Finally, the programs have had an impact personally on many teachers, providing them with a better understanding of others, spurring them to take risks with their own learning, and helping them remain more positive.

Limitations of the study

This study is a snapshot in time rather than a longitudinal study, and thus addresses better what teachers perceive about the brain-based degree programs than how they develop these perceptions and how they change as teachers. It is also limited to seven teachers and one parent coordinator.

Although care was taken to identify educators that varied greatly across multiple dimensions such as years as a teacher, years at their current school, school setting, subject taught, and years since earning their graduate degree, it does not allow for the kind of generalizability one can attribute to statistical survey findings. However, the findings are consistent with data from the Harman and Germuth study (2012) mentioned earlier. In addition, some teachers who were studied have been using what they learned via the program for months while others have been using what they learned for years, providing evidence of its immediate and long-term effectiveness. This study also provides a deeper look into teachers' perceptions and how these perceptions evolved, thus distinguishing critical components of the program as identified by teachers themselves. Finally, this study addresses the critical question of whether a program based on mind, brain, and education research helps students achieve academically, finding this to be the case across a varied set of teachers.

This study also provides a deeper look into teachers' perceptions and how these perceptions evolved, thus distinguishing critical components of the program as identified by teachers themselves.

REFERENCES

Bransford, J., Brown, A., & Cocking, R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school.* [Expanded Ed.] Washington D.C: National Academies Press.

Donovan, M. S., & Bransford, J. D. (Eds.). (2005). *How students learn: History, mathematics, and science in the classroom.* Washington D.C: National Academies Press.

Harman, A., & Germuth, A. (2012). *Bridging the gap: The impact of graduate degree programs connecting mind, brain, and education research to teaching and learning.* Orlando, FL: BrainSMART.

Lawrence-Lightfoot, S., & Davis, J. H. (1997). *The art and science of portraiture.* San Francisco, CA: Jossey-Bass.

Patton, M. Q. (1990). *Qualitative evaluation and research methods.* Newbury Park, CA: Sage.

Sparks, S. (2012, June). Experts call for teaching educators brain science. *Education Week, 31*(33), 16-17.

Stake, R. (1995). *The art of case research.* Thousand Oaks, CA: Sage.

Wilson, D. L. (2012, February). *Strengthening teacher effectiveness with implications from neuroeducation: A qualitative study of K-12 teachers focusing on higher needs students.* Paper presented at the American Association of Colleges for Teacher Education Annual Meeting, Imagine the Impact: Providing a Learning Journey for All, Chicago, Illinois.

Wilson, D. L. (2012, April). *Improving students' health and cognitive skills: An examination of the impact of education, mind, and brain research on teachers' interactions with parents.* Paper presented at the Sixteenth Roundtable of the International Network on School, Family, and Community Partnerships, Vancouver, British Columbia.

Wilson, D. L., & Conyers, M. A. (2011a). *BrainSMART 60 strategies for increasing student learning* (4th ed.). Orlando, FL: BrainSMART.

Wilson, D. L., & Conyers, M. A. (2011b). *Thinking for results: Strategies for increasing student achievement by as much as 30 percent* (4th ed.). Orlando, FL: BrainSMART.

Yin, R. (1993). *Applications of case study research.* Beverly Hills, CA: Sage.

APPENDIX

1. Interview protocol

Teacher Interview Questions

1. Please provide some background information about yourself as a teacher, including what grade and subject you teach, how long you have been teaching, when you graduated from the BrainSMART graduate program, and how long you have been teaching at your current school? Also, how would you describe the population you currently teach?
2. Did the program help you deepen your understanding about how students learn? Please explain.
3. The BrainSMART program is based on a strong research foundation. What were the research themes that you found most useful?
4. How has the program influenced your view of the potential of students to learn and become more academically successful? Please explain.
5. Has this program of study helped you become a more effective teacher or had a neutral impact? If it has helped you become more effective, explain how.
6. The BrainSMART program includes practical models and strategies that teachers can apply to increase student learning in their classroom. Do you use these models or strategies? If so, please give a couple of examples of the impact of these models and strategies.
7. Did the program share thinking skills that you feel your students need to know to do well academically and in life? Please give some examples.

8. Have you taught your students information about how learning changes the brain? Elaborate with what did you teach and how have your students responded.
9. Did the program help you to maintain a more optimistic, motivated, and positive state as a teacher? Has this had an impact on your classroom? Explain.
10. Did you learn strategies for working with students who have trouble learning through traditional teaching methods? Please give some examples.
11. Has the program helped you make your lessons more meaningful? Please explain.
12. Has the program helped you enhance the academic achievement of some of your students? Please give some examples.
13. Has the program equipped you with concepts that you can share with colleagues? Please explain.
14. What else would you like to tell us about how the program has influenced your teaching and student learning or other aspects of your life?

Helping All Learners Reach Their Potential

What Teachers Say About Graduate Programs That Integrate the Implications of Mind, Brain, and Education Research

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