BRAIN-TARGETED EARLY CHILDHOOD BEGINNINGS: A CASE STUDY IN INDIA

by
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Abstract

The purpose of this study was to describe the implementation of a neuroeducational curriculum model in one early childhood setting in India and to examine the efficacy of the translational curriculum model from the perceptions of administrators, teachers, and parents. An explanatory single case study model was used to shed light on the applied and contextual phenomenon of brain-compatible education within a critical case. This case study used a causal-process tracing approach, which begins with an interest in a specific outcome and focuses on questions that ask which preconditions are necessary and sufficient to make a specific kind of outcome possible. Additionally, this case study employed survey research to understand the roles of several dimensions of efficacy in the implementation process. These dimensions of efficacy include personal and general teaching efficacy, collective efficacy, and Brain-Targeted Teaching efficacy. The main findings from the research center around trust in the efficacy of the translational model and collective efficacy as the primary normative factor that contributed to the successful implementation of the neuroeducational curriculum model.

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Dedication

To my amazing parents, Bobbie Mayers Walker and Jim Walker. Thank you for always finding ways to encourage and challenge me and for your unwavering belief that somehow I could reach any goal. I could not ask for better parents. To my mother-in-law, Anita Rivera, and my stepmother, Tish Walker. Thank you for consistently offering kindness, love, and extra help through this journey.

To my beloved children, Meredith, Hannah, and Christopher. Thank you for keeping me motivated and laughing when I needed it the most. I could not be prouder of you, and I hope you are a little proud of me too!

To my best friend and husband, Luis Enrique Carpio. Thank you for being a steadfast and bright light throughout this journey. You are an amazing man, and I am so very lucky to have you as my partner in life.

I dedicate this dissertation, all 200 pages, to my family. Thank you (*y gracias*) for supporting me in so many ways.

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Executive Summary

Introduction

Neuroeducation is a burgeoning field worldwide (Goswami, 2008). New conferences, books, curriculums and degree plans have all surfaced as a result of the international efforts to forge tighter links between neuroscience researchers and educational practitioners (Fischer et al., 2007). However, even though the overall aim of neuroscience is to enhance our understanding of how we learn and to leverage this information to create more effective teaching methods, curricula, and educational policy, the scientific base for such programs and policies is largely absent (Goswami, 2008). Additionally, guidance for schools on how to transform current practices and implement a neuroeducation framework is missing from current literature. An even greater gap in the literature exists when educators seek advice for application of brain sciences into the early childhood context (Davis, 2009).

The years from birth to age 8, know as early childhood, are marked by significant developments in a person's life and are generally considered the foundation upon which the rest of a lifetime is composed (McAdams & Olsen, 2010; Mustard, 2000; Rutter, 2002; Vandell, Belsky, Burchinal, Steinberg, & Vandergrift, 2010). Yet the early years are those that have traditionally received the least attention from the education world (Organization for Economic Co-operation and Development (OECD), 2006; Shonkoff & Levitt, 2012).

The expanding field of neuroscience played an important role in shaping early childhood policy. However, the value of that relationship is approaching a plateau that demands thoughtful examination (Shonkoff & Levitt, 2012). Thus far, neuroscience has

focused on answering “why” questions about the relationship between early childhood education and later academic, social, and health outcomes in life. The challenge to build a continuing role for neuroscience in early childhood programs, policy, and practice must shift to confront the complex questions about ‘‘what’’ should be done to increase the effectiveness of early childhood programs and ‘‘how’’ schools can integrate learning sciences into daily practice (Shonkoff & Levitt, 2010).

Purpose of Study

The purpose of this research study is to explore the “what” and “how” questions of translating brain research into the early childhood context, to deeply describe the implementation of a neuroeducational curriculum model in one early childhood school, and to examine the efficacy of the translational curriculum model from the perceptions of administrators, teachers, and parents.

Theoretical Alignment

This study is grounded in the sociocultural theory that operates on the assumption that development appears twice: first on the social plane, and later on the individual plane (Vygotsky, 1962,1978). This applies to engagement, memory, and concept attainment. The sociocultural perspective is an appropriate lens through which to consider the literature surrounding curriculum development in early childhood because the aim of quality early childhood education is founded on promoting children's social and intellectual development in responsive social contexts (Berk & Winsler, 1995). Moreover, a sociocultural perspective is useful for an examination of Intellitots because child rearing in India is grounded in social activity (Gupta, 2002). The high population density of India, especially urban areas, contributes to the importance of the social

dimension to knowledge construction. In India, knowledge construction is closely melded within social interaction (Gupta, 2013; Sharma, 2003).

Literature Review

What factors account for the rapid growth of the Intellitots organization and contributed to the successful implementation of a translational brain research based curriculum? Before beginning a case study to explore this question, a literature review is presented to analyze research documenting: (1) issues surrounding translating brain research into sound educational practice, (2) unique considerations for curriculum development within an early childhood context, (3) significance of teacher efficacy when implementing new initiatives and structures, (4) education in India, and (5) benefits of case study as a research model.

The Brain-Targeted Teaching Model (BTT) (Hardiman, 2012) is a framework for instruction designed to guide teachers in planning academic environments, units, and lessons based on research in neuro- and cognitive sciences. BTT serves as a bridge between researchers and classroom practitioners to effectively translate brain research into classroom practice. The curriculum at Intellitots was built on the design template and research contained within the Brain Targeted- Teaching Model.

The context of this study is within an early childhood context. Early childhood is commonly defined as birth through third grade. Key research surrounding early childhood is based on the Developmentally Appropriate Practices (DAP) developed through the National Association for the Education of Young Children (NAEYC). Grounded in the research from developmental psychology and the learning sciences, the "12 Principles of Child Development and Learning that Inform Practice" (Copple &

Bredekamp, 2009) from NAEYC is a foundational resource for early childhood providers that outlines environments, systems, and strategies that promote young children's optimal learning and development.

The construct of integrated teacher efficacy has been defined as "teachers' situation-specific expectation that they can help students learn" (Ashton & Webb, 1986, p. 3). In this study, teachers' efficacy beliefs are considered through an if-then lens that connects teaching inputs to student outcomes. Collective efficacy beliefs influence organizational norms and outcomes through expectations for action that are socially transmitted (Sampson, Morenoff, & Earls, 2000; Edmondson, 2002).

Methodology

An explanatory single case study model was used to shed light on the applied and contextual phenomenon of brain-compatible education within a critical case (Yin, 2013). This case study used a causal-process tracing (CPT) approach, which begins with an interest in a specific outcome (Blatter & Haverland, 2014). Using this CPT approach, the researcher focuses on questions that ask which preconditions are necessary and sufficient to make a specific kind of outcome possible. This approach is interested in the various causes of an effect rather than the various effects of a specific cause. This research is grounded in the assumption that there is a plurality of factors working together to produce the outcome of interest.

Additionally, this case study includes quantitative methods through survey research. Teachers were asked to complete the Gibson and Dembo (1984) Teacher Efficacy Survey and the Goddard, Hoy, and Hoy (2000) Collective School Survey. In addition, teachers were asked to complete a researcher-developed survey to investigate

beliefs about the efficacy of translating current research from the learning sciences into classroom practices through the Brain Targeted-Teaching Model (Hardiman, 2012).

The combination of methods is designed to meet the needs of discovery and verification, as well the need to understand actors' meanings and intentions while measuring objective and quantitative distributions of outcomes (Gable, 1994). The purpose for the mixed methods design is to combine quantitative and qualitative measures to provide both depth and breadth to the analysis.

Results

This results section summarizes both qualitative and quantitative data. The temporal events and core decisions that shaped the Brain-Targeted Teaching Model (BTT) (Hardiman, 2012) implementation progression are explored. The high degree to which BTT is implemented into daily classroom practice and school structures is discussed through the results of open-ended questionnaires, focus group responses and on-site observations. The perceptions of parents and school staff about the implementation of BTT are triangulated and unifying themes identified: (1) Setting a positive emotional climate for learning, (2) Aligning local cultural values and the enacted curriculum (3) Hiring procedures that prioritize a willingness to learn over traditional credentials, (4) Confidence in Brain-Targeted Teaching Model, (5) Development of high collective efficacy. (6) Creating structures that support a learning organization, (7) Vision driven leadership.

A statistical analysis was used to understand the role of efficacy in the BTT implementation process. Regression results indicate when years of experience at Intellitots and BTT efficacy were jointly entered to predict collective efficacy, both

variables were statistically significant predictors of collective efficacy, F (2,37) = 11.437, $p < .0001$. Further, $R^2 = .382$ indicates that 38% of the variance in collective efficacy is explained by years of experience at Intellitots and BTT implementation efficacy. Examinations of beta weights indicate that both years of experience at Intellitots and BTT efficacy uniquely contribute to the prediction of teachers' collective efficacy. These results suggest that teachers who have lengthier terms of experience at Intellitots and higher levels of BTT efficacy feel more efficacious about the collective talents of the staff at Intellitots.

Findings and Discussion

This case study reports on what took place, what was learned, and what other potential curriculum reformers can expect if they, too, embark upon implementing a Brain-Targeted Teaching framework. In this manner, the study aims to be a resource for other early childhood educational institutions interested in either improving or completely revamping their curriculum. There are three main findings from the research. (1) Trust in the efficacy of the Brain-Target Teaching (BTT) translational model was essential to strong implementation fidelity. (2) Collective efficacy was the primary normative factor that contributed to the successful implementation of the BTT framework. (3) Alignment between the tenets of child development valued by Intellitots and the understanding of the role of culture on development and learning embedded in the Brain-Targeted Teaching Model, especially through Brain Target One: Create an emotional climate for learning, and Brain Target Two: Create a physical climate for learning, was a key factor in the successful implementation of a translational brain targeted curriculum.

Chapter One- Overview of Study

Introduction

Neuroeducation is a burgeoning field worldwide (Goswami, 2008). Some branded this emerging field of translational research as "mind, brain, and education," "brain-based learning," and "brain-targeted teaching," among other names. Prestigious journals such as *Science* and *Neuron* have published reviews on neuroeducation (Albus et al., 2007; Carew & Magsamen, 2010). In 2007, IMBES established an international peer reviewed journal called *Mind, Brain, and Education* exclusively to publish the research that integrates neuroscience, psychology, and education. Moreover, universities across the world are establishing degree and research programs to explore neuroeducation. New conferences, books, curriculums, and degree plans have all surfaced as a result of the international efforts to forge tighter links between neuroscience researchers and educational practitioners (Fischer et al., 2007).

Even though the overall aim of the new field of neuroeducation is to enhance the understanding of how people learn and to leverage this information to create more effective teaching methods, curricula, and educational policy, the science base for such programs and policies is largely absent (Goswami, 2008). Additionally, guidance for schools on how to transform current practices and implement a neuroeducation framework is missing from current literature. An even greater gap in the literature exists when educators seek advice for application of brain sciences in the early childhood context.

The years from birth to age 8, known as early childhood, are marked by significant cognitive, biological, and social developments, and are generally considered

the foundation upon which the rest of a lifetime is composed (McAllen & Olsen, 2010; Mustard, 2000; Rutter, 2002; Vandell et al., 2010). Research findings from economics (Calman & Tarr-Whelan, 2005; Shonkoff, 2009), political science (Bennett, 2008), health (Alderman, Hoddinott & Kinsey, 2006), and neuroscience (Shonkoff et al., 2012) indicate that investments in early childhood offer significant returns both to individuals and to society. A preponderance of research demonstrates the importance of high quality early childhood education programs to the development of healthy, happy, and productive individual children (Espinosa, 2002; Friendly & Browne, 2002; Shonkoff & Phillips, 2000). High quality early childhood programs correlate with overall positive benefits to society such as the general health of children, educational achievement, labor market volume and flexibility, and community engagement (Shonkoff & Levitt, 2012). Yet, the early years are those that traditionally have received the least attention from the education world (Organization for Economic Co-operation and Development, 2006; Shonkoff & Levitt, 2010).

The burgeoning field of neuroscience played an important role in shaping early childhood policy (Phillips & Shonkoff, 2000). However, the value of that relationship is approaching a plateau that demands thoughtful examination (Shonkoff & Levitt, 2010). Thus far, neuroscience has focused on answering "why" questions about the relationship between early childhood education and later academic, social, and health outcomes in life. The challenge in building a continuing role for neuroscience in early childhood programs, policy, and practice must now shift to confront the more complex questions about ‘‘what’’ should be done to increase the impacts of early childhood programs and

‘‘how’’ can early childhood schools and teachers integrate learning sciences into daily practice (Shonkoff & Levitt, 2010).

Purpose of the Study

The purpose of this research study is to address the “what” and “how” questions of translating brain research into the early childhood context, to deeply describe the implementation of a neuroeducational curriculum model in one early childhood school, and to examine the efficacy of the neuroeducational translational curriculum model from the perspectives of administrators, teachers, and parents.

This case study reports on what took place, what was learned, and what other potential curriculum reformers can expect if they, too, embark upon implementing a brain-targeted teaching framework. In this manner, the study aims to be a resource for other early childhood educational institutions interested in either improving or completely revamping their curriculum. The general goals of this case study are to explore procedures, issues, solutions, and outcomes associated with implementing a brain-targeted teaching curricular framework. It relates the efforts and story of one unique case and attempts to uncover commonalities, pass on lessons and observations, and serve as a reference for early childhood schools wanting to embark upon a similar reform journey.

Site Selection

The purpose of this research study is to address the “what” and “how” questions of translating brain research into the early childhood context, and to describe in depth the implementation of a neuroeducational curriculum model in one early childhood school. For this study Intellitots Early Childhood Center in Gurgaon, India was chosen as the research site for four key reasons. The first is because this study focuses on the

application of brain-research in the early childhood context, and Intellitots Early Learning Centers serve children from 6 months to 8 years of age. Second, Intellitots was selected because it is currently using the Brain-Targeted Teaching Framework (Hardiman, 2012) to build their curriculum, and this framework aligns with the study focus on translational research models. The third reason Intellitots was selected is that it has a reputation as a successful school, as evidenced by winning several prestigious awards, a stable staff, and a thriving enrollment. Finally, Intellitots was chosen as the research site for this case study because they have three years of experience with the implementation of a brain-research translational model. This three-year history provides Intellitots staff with sufficient experience from which to draw conclusions.

Research Questions

Curriculum Implementation Process

RQ1- What was the impetus for changing the curriculum at Intellitots Early Childhood Centers?

RQ2- What was the process used in changing the curriculum at Intellitots Early Childhood Centers?

RQ3- What specific changes were made to the curriculum?

Current State of Implementation

RQ4- To what extent do teachers at Intellitots Early Childhood Centers practice or integrate indicators of Brain-Targeted Teaching in their daily instruction?

RQ5- What factors do parents identify as most essential in their decision to send their children to Intellitots?

RQ6- What factors do teachers identify as most essential to effective classroom instruction?

Reflection on Curriculum Implementation

RQ7- To what extent did teacher efficacy support the implementation of the Brain-Targeted Teaching Model?

RQ8- To what extent is the original Brain-Targeted Teaching Model adapted for implementation within an early childhood setting in India?

Rationale of Study

The decades since the 1990's resulted in an extraordinary number of articles, dissertations, research studies, and conferences that summarize the significance of understanding the structures and functions of the brain (Miller & Cummings, 2007; Whalen & Phelps, 2009). Extensions between these findings from the learning sciences and their relationship to early childhood education have further kindled the conversation about the importance of a strong foundation through quality early education (Bergen & Coscia, 2001; Rushton & Juola-Rushton, 2008).

The National Scientific Council on the Developing Child (2007) cites two changes that merged to produce a modified landscape for early childhood policy, service delivery, and parenting. The first is an upsurge of research coming out of the learning sciences that led to significant advances in understanding the factors that influence whether children get off to a "promising or a worrisome start in life" (Shonkoff, 2003). These scientific gains are centered around the following four major themes: (1) the worth of early life experiences and the inseparable and highly collaborative influences of genetics and environment; (2) the primary role of early relationships as a source of either

safety and adaptation or danger and dysfunction; (3) the multifaceted emotions, foundational cognitive capabilities, and essential social skills that develop during early childhood; (4) the capacity to increase the potential of favorable developmental outcomes through targeted and explicit interventions. Second, the capacity to use this knowledge constructively has been restrained by a number of socioeconomic circumstances under which families with young children are living. Young children are spending substantial time in childcare facilities. This is often a result both parents in the workplace, parents working longer hours, and nuclear families living far away from extended families. Childcare settings reflect highly diverse structure and quality. Thus, there is inequitable application of new findings from neuroeducation into early childhood facilities and inequitable opportunity for children to access the benefits of the instruction based on the findings from neuroscience.

The effects of early childhood education on young children in the United States, and on 400 million young children currently growing up in India, deserve committed, systematic, and thoughtful consideration. The convergence of evolving knowledge from the learning sciences and changing family circumstances calls for a reexamination of the responses to the needs of young children and their families, many of which were drafted several decades, ago (NSCDC, 2007).

Pretending that the early years have little impact on later life outcomes is no longer a credible position (Shonkoff, 2009). Simple funding of early childhood programs is also not a viable option. The concept of early intervention as a strategy for improving life outcomes for young children is reinforced in the biological and social sciences, but the translation of that research into programs that generate strong returns on funding is

still evolving (Shonkoff, 2009). It is important that there be clearly understood frameworks and models if we are to be sure not to misapply or overextend the findings from the learning sciences. There is an abundance of information about connections between research from learning science and early childhood, but a significant gap in the literature exists about how schools should proceed to design and implement a curriculum to integrate these findings into daily lessons and practice within an early childhood context. The rationale for this study is to close the gap between research and practice and offer an implementation example for early childhood centers and schools.

Theoretical Framework

Theoretical foundations of knowledge generation provide the anchor points for research and scaffolds for scientific discourse (Scardamalia, Bransford, Kozma, & Quellmalz, 2012). Additionally, curriculum development is a human endeavor, and as such is braided together with cultural values, assumptions, and the language of its creators. Demarcating curriculum is a task of identifying not only content, but also the cultural values and theoretical constructs on which it has been based (Edwards, 2003). This is especially true in early childhood education where there is an entrenched belief that what students are capable of learning is directly linked with developmental level (Spodek & Saracho, 1991). For example, the first version of Developmentally Appropriate Practices (DAP) published in 1986 by the National Association for the Education of Young Children (NAEYC) was heavily reliant on the work of Piaget and included curriculum guidelines to:

> Identify a range of appropriate behaviors, activities and materials for a specific age group ... which can then be used [sic] in conjunction with understanding about

> children's growth patterns, strengths, interests and experiences to design the most appropriate learning environment (Bredekamp, 1987, p. 3).

This first version of DAP reflected the theory that all children progress through a uniform timeline of ages and stages. This early version of DAP was criticized for being reflective of primarily a white and middle class male population and not reflecting the developmental experiences of all children (Kessler, 1991). The two main theoretical concerns were rooted in the idea that development preceded learning and in the argument against the cultural appropriateness of a singular developmental theory for all children.

Evolving theoretical perspectives, including those of Bruner (1991), Bandura (1977), Vygotsky (1978), prompted NAEYC to revise the DAP. The current 2009 version of the DAP Position Statement now shifts from the static individual child's perspective to a more comprehensive viewpoint, including an individual child's cultural context as well as the interactional social patterns that characterize learning in a unique cultural context. The revised DAP guidelines frame curriculum as a decision making process that teachers and schools follow. According to the 2009 DAP statement (Copple & Bredekamp, 2009), these decisions should consider 1) general knowledge about child development and learning, 2) each child as an individual, 3) the social and cultural context for each child. Consideration of early childhood from this sociocultural perspective lets cultural experiences of children serve as the basis for curriculum decision-making.

This study is grounded in the sociocultural theory that operates on the assumption that development appears twice: first on the social plane and later on the individual plane (Vygotsky,1978). This applies to engagement, memory, and concept attainment. The

sociocultural perspective is an appropriate lens through which to consider the literature surrounding curriculum development in early childhood.

Moreover, a sociocultural perspective is useful for a close examination of Intellitots because child rearing in India is grounded in social activity thus reflecting a strong social shaping of worldview (Gupta, 2002). Indian thought aligns with the view described by Geertz (1973) that "human thought is consummately social in its origins, social in its functions, social in its forms, social in its applications. At its base, thinking is a public activity — its natural habitat is the house yard, the marketplace, and the town square" (p.360). The high population density of India, especially urban areas, contributes to the importance of the social dimension to knowledge construction (Gupta, 2013; Sharma, 2003). According to the sociocultural perspective, construction of knowledge is not only cognitive but also social in nature and connected to the belief that higher order thinking and development of reasoning happens first on a social level and then is consolidated at the individual cognitive level (Vygotsky, 1962,1978). In India, knowledge construction is closely melded within social interaction (Gupta, 2013; Sharma, 2003).

The sociocultural learning theory is based on the idea that we are not empty vessels to be filled with a "real" knowledge that is external the learner. Each learner constructs knowledge from his or her own experiences (Ertmer & Newby, 1993). This is a shift from the cognitive perspective, for which there is a correct knowledge that learners acquire, to a belief that a learner's internal understandings are open to constant revision as a result of social and individual experiences and reflections.

Assumptions

Several assumptions were present during the study, including:

a) It was assumed teachers answered survey and interview questions based on their implementation of Brain-Targeted Teaching at Intellitots Learning Center and expressed their perceptions, attitudes, and concerns of brain-targeted learning honestly.

b) It was assumed that participants' teaching strategies and perceptions, attitudes, and concerns remained consistent during the study.

d) It was assumed teachers did not alter their lessons to misrepresent them in the study.

e) It was assumed researcher bias was effectively limited throughout the course of this study.

Limitations

The limitations of this study include:

a) This study was conducted within one school system. Therefore, generalizations cannot be directly made to other systems.

b) This study was conducted only with early childhood teachers, administrators and parents. Therefore, generalizations cannot be directly made to other levels of schooling.

(c) The presence of an investigator can change the dynamics of the phenomena, observations may be intrusive, interview responses may be filtered, and documents may be incomplete (Creswell, 2003).

Chapter Two - Review Of Literature

Introduction

What factors account for the rapid growth of the Intellitots organization and contributed to the successful implementation of a translational brain research based curriculum? Before beginning a case study to explore this overarching question, this literature review analyzes research documenting (1) issues surrounding translating brain research into sound educational practice, (2) unique considerations for curriculum development within an early childhood context, (3) significance of teacher efficacy when implementing new initiatives and structures, (4) education in India, and (5) benefits of case study as a research model.

Translating Brain-Research into Effective Educational Practice

This case study aims to explore how findings from neuroscience can be effectively implemented in an early childhood setting. This first section explores the legitimacy and efficacy of brain-targeted instruction. Areas of significant brain research are examined followed by description of the Brain-Targeted Teaching Model (Hardiman, 2012), a practical framework for translating brain research into educational practice.

Brain Maturation

Previous research held that physical neural connections formed in infancy and childhood were fixed and could not regenerate or strengthen. Studies on neural plasticity have cast new light on this idea (Boaler, 2010). Extensive evidence exists supportive of brain plasticity. Some of this evidence derived from people who have suffered brain lesions and went on to relearn literacy skills (reading, speaking, and writing), bike riding, and other abilities that required the brain to grow in response to effort (Bunge & Wallis,

2007; Beilock, 2011). What neuroscientists understand about brain plasticity has implications for teaching and grouping structures, especially those that are based upon ideas of fixed ability and limited student potential (Boaler, 2010). Current research suggests that the relationship between genes and the environment is a choreographed dance extending from conception to adulthood. Genes provide the basic outline of brain development, but experiences with the environment shape the brain's specific functionality (Ratey, 2002).

Several developmental changes of the brain have been well documented. From birth to about age 3, there is a period of rapid synaptic development. The brains of very young children are thickly packed with neural circuitry. At about age 10, synaptic pruning occurs and the density of neural circuitry begins to decline (Tau & Peterson, 2010). Brain volume increases until about age 14 and then declines over the lifespan (Courchesne, Campbell, & Solso, 2000). Brain research does support the existence of sensitive periods for vision and language (Bruer, 1999; Kotuak, 1996; Sousa, 2011); however, data on neural sensitive periods are often misconstrued to suggest that opportunities lost during a specific critical period can never be recouped and the early childhood period warrants greater educational emphasis than other time periods across a lifetime (Alferink & Farmer-Dougan, 2010).

Link Between Emotion and Cognition

Historically, emotion and cognition have been viewed as largely separate; however, over the past two decades an expanding body of work points to the interdependence between the emotions and cognition. The brain stem, limbic system, and cerebral cortex are areas in the brain responsible for emotional regulation (LeDoux,

1996). Incoming sensory information is filtered through the brain stem, which monitors involuntary activity and sustains a basic level of attention. The limbic system, primarily responsible for processing memory and emotion, is closely connected to other parts of the brain including the frontal lobes in the cerebral cortex. The frontal lobes are the part of the brain linked with the executive functions of planning, organizing, and prioritizing what the brain will attend to as well as rational judgment and evaluation (Radin, 2005). Emotion is classified as "powerful enough to override both rational thought and innate brain stem response patterns" (Sylvester, 1994, p. 63).

Recent brain research has shown that emotional states can have a strong impact on learning. This understanding has come to be a factor in considerations of classroom design and instruction. Leamnson (2000) suggests that learning is enhanced or sped up as a result of student positive engagement and attention. Further, it is suggested that emotion is the launchpad for attention, which guides learning and memory (Sylvester, 1995). Goleman (1995) suggests that a student's emotional quotient is a more powerful predictor of happiness and success in school and life than a person's intelligence quotient. Teachers play a central role in creating a healthy classroom emotional environment. Making a classroom emotionally safe, accepting, and supportive is the foundation for creating a desire for learning (Given, 2002; Smilkstein, 2003).

A positive emotional climate is especially important in early childhood settings. The social, emotional, and cognitive development of 733 children was examined in a longitudinal study that traced their growth and progress from age 4 to 8. The quality of classroom practices was found to be positively related to language and cognitive development. Stronger effects than those from the quality of classroom practices were

observed from the closeness of the teacher-child relationship on the development of language, cognitive skills as well as social skills (Peisner-Feinberg et al., 2001). The effects of close teacher-child relationships were the strongest longitudinal predictors of the children's social skills.

Enrichment and the Physical Environment

Research with animal models and enriched environments illustrates the importance of the physical environment on development, learning, and memory. The research on physical environment is of special consideration for early childhood where young children learn new skills through their interactions with the classroom environments. In one particular study (Diamond, 1988), rats from the same litter were randomly assigned to either a plain "impoverished" environment or an enriched environment with colored panels, music, comfortable temperature, and an assortment of toys. After 80 days, the brains of the rats were dissected; thicker visual cortexes and more dendritic growth spines were found in the rats from the enriched environment.

Beyond animal models, the importance of the physical environment on children was explored in the work of Ramey and Ramey (2003) as a follow up to the earlier Abecedarian Study (Ramey, 1974). Children from low-income and high-risk environments were divided into two groups: one attended an intervention in an enriched early education center from age six months to kindergarten age while the control group attended no intervention. The researchers followed these two groups for 12 years, and IQ tests showed that the students from the enriched environment had significantly higher scores than their peers from the control group. Finally, follow up studies showed that students from the enriched environment were three times more likely to attend a four-

year university than students in the control group.

In a classroom, elements of an enriched environment include a clean, well-lit and comfortable classroom that is well organized for multiple uses. In addition, the classroom should be visually pleasing, appear uncluttered, and showcase student work. Multiple resources should be available to support current units under study (Kovalik & Olsen, 1998; Hoge, 2002). Slavkin (2002) asserts: "Failure to produce stimulating learning environments and take advantage of students' interests and knowledge are likely to result in passive memorization, weak pedagogical practices, and limited learning" (p. 22).

Classroom physical environment is a crucial component of an enriched classroom; however, it is not the only component. Enrichment is based on academic and intellectual challenge, feedback, novelty, coherence and time, as well as physical space. Jensen (2000) suggests that if given a choice between a pretty classroom and a great teacher, parents should always choose the effective teacher.

Other Established Links Between Brain-Research and Instructional Practice

Beyond the role of emotions and an enriched classroom, brain research provides some insight into other areas of classroom practice. Musical training impacts the brain and behavior (Hyde et al., 2009); hormones impact cognition (Lupien, Maheu, Tu, Fiocco, & Schramek, 2007) experiences influence brain plasticity throughout a lifespan (Markham & Greenough, 2004; Rosenzweig & Bennett,1996); timing and pacing of instruction impacts retention (McGaugh, 2000; Roediger & Butler, 2011); sleep and nutrition play a crucial role in brain development (Winick, 1969; Georgieff, 2007; Lupien, McEwen, Gunnar, & Heim, 2009). Although brain research suggests that many of these factors or conditions may positively impact student achievement, teachers often

need trustworthy guidance to effectively translate research findings into explicit classroom practice. Educators request guidance in how to prioritize research findings and also how to integrate research findings into current practice. Lacking this trustworthy guidance, educators, in eagerness to support student growth, may fall prey to false claims by commercial products and consultants. The Intellitots program tries to avoid this by staying up to date with current research and forming relationships with researchers in the field.

Misunderstanding and Misapplication of Brain-Research

The proliferation of brain-based ideas about learning, some valid and some not, places educators in a difficult position as they try to decipher which claims and strategies will indeed improve educational practice and which claims are neuromyths or overgeneralizations based on faulty translation of brain-research. Although there is substantial research support for the application of brain-targeted learning strategies into classroom settings, there are also critics. Some critics suggest that brain-targeted learning is still in its infancy, and extensive educational implementation applications may be premature even though some brain-targeted methodologies are not new, having been advocated by other disciplines for more than 30 years (Bruer, 1999). Critics call the educational applications of neuroscience “speculation” and "a leap of faith” (Covino, 2002). Others say that research from neuroscience can be misinterpreted and over-extended as a “bridge too far” (Bruer, 1997). Brain-based education appeals to the public and is easy to expand beyond actual science (LeDoux, 1996). These misapplications and over-generalizations of brain research frequently result in the formation of neuromyths that misinform and mislead educators and school administrators.

Some of the most common neuromyths surround the ideas of lateralization (Hardiman, Rinne, Gregory, & Yarmolinskaya, 2012), critical periods (Bruer, 1999), and brain-research support for learning styles (Alferink & Farmer-Dougan, 2010). Education is not the only field impacted by neuromyths. Neuroeconomics and neurolaw are two such examples of disciplines trying to incorporate brain research into existing practice to move forward (Hardiman et al., 2012).

Brain-Targeted Teaching Model for 21st Century Schools

The Brain-Targeted Teaching Model (BTT) (Hardiman, 2012) is a framework for instruction designed to guide teachers in planning academic environments, units, and lessons based on research in neuro- and cognitive sciences. BTT serves as a bridge between researchers and classroom practitioners to effectively translate brain research into classroom practice. BTT is built around six core components and describes the research that supports each target. The six Brain Targets include the following: (1) Establish the emotional connection to learning. (2) Develop the physical learning environment. (3) Design the learning experience. (4) Teach for the mastery of content, skills, and concepts. (5) Teach for extension and application of knowledge. (6) Evaluate learning. Intellitots aims to incorporate these targets in their codified school curriculum through strategic unit design and planning and frequent staff development.

The first Brain Target encourages teachers to proactively establish a classroom emotional climate that is safe and relatively threat-free. Within this target, teachers are encouraged to help students form emotional connections to academic content through arts and problem-based learning experiences. The importance of authentic and supportive teacher and student relationships is also highlighted.

In the second Brain Target, teachers are encouraged to consider how the physical environment of the classroom impacts attention and engagement in learning. Novelty is introduced as a powerful way to garner and orient student attention. Beyond the classroom walls, teachers are encouraged to consider the use of other physical spaces to support academic objectives, like outdoor spaces, theaters, libraries, and museums.

Designing the learning experience itself is the focus of Brain Target Number Three. The purpose of this Brain Target is to guide students to understand how global ideas, themes, and topics fit together. The "Big Picture" of learning is emphasized through the development of concept maps. The overall purpose of this Brain Target is to ensure instruction reaches a conceptual level rather than remaining at a superficial or disjointed skill level.

Brain Target Four guides teachers to proactively plan for mastery of content, skills, and concepts. Using current brain research on consolidation of memories and long-term potentiation, specific strategies are shared with teachers so they can effectively determine which activities, experiences, and presentations support retention of essential content.

Current classroom practice, often driven by high-stakes testing pressure, frequently focuses on enabling students to meet only minimum academic standards needed to pass state assessments. In Brain Target Five, teachers are advised to move beyond minimum expectations so that students will be able to extend and apply knowledge. The fine arts and authentic problem-solving experiences help students generate creative and original uses for previously learned content.

The final Brain Target centers on evaluation of learning. Evaluation is

traditionally associated with the assignment of a numerical or letter grade. However, in this Brain Target, assessment is considered as half of the equation with feedback making up the other half. Both sides of the coin are essential in promoting profound learning and understanding.

Other Neuroeducation Translational Resources

The Brain-Targeted Teaching Model (Hardiman, 2012) is unique among a vast number of books and publications on brain-research aimed at educators because it offers a comprehensive and step-by-step pedagogical framework. Other publications by such authors as David Sousa (2011) and Eric Jensen (2000) translate research findings into suggestions for teachers, but lack a framework to move suggestions into usable codified curriculum and teaching units.

All Kinds of Minds (Levine, 2012) is a translational intervention and staff development program that is focused on establishing a strong model of inclusion that "labels the phenomenon and not the child" (Prescott, 2000). It aims to join current research from multiple disciplines into a neurodevelopmental framework to help teachers better understand how students are diverse in their learning. In staff development sessions, teachers evaluate case studies and identify eight areas of brain functioning. The goal is that by developing a precise common vocabulary to use when identifying behaviors, teachers are able to discover, through observation and use of the program's protocols and terminology, that the child's dysfunction ties into specific skill deficits, which can become a point of explicit intervention. Unfortunately, *All Kinds of Minds* has been criticized as being too dependent on anecdotal evidence rather than supported by scientific research (Lewin, 2011). Additionally, the focus of *All Kinds of Minds* is on

meeting the needs of children with diverse learning needs. It does not address how to apply current research from the learning sciences into regular classroom practice and curriculum.

Brain U is a professional development program that teaches educators about neuroscience principles and lessons for teaching neuroscience in the middle to high school classroom. Brain U's web site contains professional development resources and materials for middle and high school science teachers. Content ranges from extended teacher training sessions to 1-hour student assemblies, hands-on activities, student/teacher guides, handouts, and other materials. This translational resource does not offer support for teachers wanting to integrate findings from neuroscience into the regular curriculum nor address the specific needs of early childhood educators.

Quantum Learning Network also provides teacher and administrator staff development as well as summer camp experiences for students known as Super Camp. All of their trainings aim to help participants to integrate brain research into their daily experience within schools (Quantum Learning, 2011). The curriculum includes strategies to build stronger relationships, memorize content, and give and receive feedback. Unfortunately, although the workshops are high energy and engaging, little specific research is cited to support the main tenets and strategies of the framework. Additionally, participant are all asked to complete various questionnaires to determine if they are a "left-brained" or "right-brained" learner and whether their learning style is auditory, visual, or kinesthetic. Such activities promote neuromyths and result in distortions and overgeneralizations of findings from neuroscience.

Early Childhood Education

This case study seeks to explain how findings from neuroeducation can be translated into effective practice within an early childhood context. This section examines the overlap between the principles of Developmentally Appropriate Practices (DAP) in early childhood and current understandings from the learning sciences. Research on how the developing mind learns seems to support DAP's constructivist approach to early childhood learning environments, which was developed on the premise that children are social learners who actively construct meaning as they interact with their learning environment.

In 2009 the National Association for the Education of Young Children (NAEYC) published a revised policy statement that outlines their core "12 Principles of Child Development and Learning that Inform Practice" (Copple & Bredekamp, 2009). Institutions seeking NAEYC Accreditation must provide evidence for various accreditation criteria, including the "12 Principles of Child Development and Learning". NAEYC Accreditation of programs for young children exemplifies the mark of quality for early childhood education. NAEYC Accreditation began in 1985 to provide an accrediting system that would raise the level of early childhood programs. Today, over 7,000 programs are NAEYC Accredited. A brief description of the 12 principles with supporting research from the learning sciences is presented below.

Principle One

"All the domains of development and learning—physical, social and emotional, and cognitive—are important, and they are closely interrelated. Children's development

and learning in one domain influence and are influenced by what takes place in other domains" (Copple & Bredekamp, 2009, p.11).

The NAEYC position statement (2009) states that "children are thinking, moving, feeling, and interacting human beings." Development in one domain will affect development in another domain. For instance, learning to walk increases a child's mobility and ability to explore their world, which in turn accelerates their cognitive development. Additionally, there is an ever-growing body of research that connects a child's emotion and cognitive development (La Paro & Pianta, 2000; Howes & Sanders, 2006).

Principles Two and Three

(2) **"**Many aspects of children's learning and development follow well-documented sequences, with later abilities, skills, and knowledge building on those already acquired" (Copple & Bredekamp, 2009, p.11).

(3) "Development and learning proceed at varying rates from child to child, as well as at uneven rates across different areas of a child's individual functioning" (Copple & Bredekamp, 2009, p.11).

Research on the formation of synaptic connections and plasticity supports these principles of Developmentally Appropriate Practices. Children gain specific concepts, skills, and abilities by building on prior development and learning that results in new and strengthened synaptic connections (Bransford, Brown, & Cocking,1999 ; Shonkoff & Phillips, 2000). Wolfe and Brandt (1998) state that the physical structure of the brain changes as a result of experience by either creating new dendrites or strengthening synaptic connections between new information and prior understandings. Additionally,

research from fMRI scans reveals that no two brains are identical or growing and changing at the same pace or path (Rushton & Larkin, 2001).

Principle Four

"Development and learning result from a dynamic and continuous interaction of biological maturation and experience" (Copple & Bredekamp, 2009, p.12).

There is increasing evidence that environmental factors play a vital role in synchronizing the timing and pattern of gene expression, which in turn determines brain architecture (Friederici, 2006). Wolfe and Brandt (1998) state: "The environment affects how genes work, and genes determine how the environment is interpreted" (p. 10). A child's genetic makeup may predict a healthy growth, but malnutrition may inhibit this potential. Alternatively, a child's predisposition for a learning disability may be minimized through targeted early intervention (Plomin, 1994).

Principle Five

"Early experiences have profound effects, both cumulative and delayed, on a child's development and learning; and optimal periods exist for certain types of development and learning to occur" (Copple & Bredekamp, 2009, p.12).

As stated through Principle Five, development hinges on the interaction between biology and experience. Because specific experiences potentiate or inhibit neural connectivity at major developmental stages, these time points are referred to as sensitive periods (Knudsen, 2004). Evidence on brain plasticity is evolving and where these sensitive periods were once considered to be windows into development that open and close at specific times over a lifetime, we now understand that brain plasticity occurs over a lifetime (Fox, Levitt & Nelson, 2010).

Principle Six

"Development proceeds toward greater complexity, self-regulation, and symbolic or representational capacities"(Copple & Bredekamp, 2009, p.12).

A common belief within the development of language, social interaction, physical movement, problem solving, and cognitive skill development is that functioning begins at a simple level and becomes increasingly complex (Copple & Bredekamp, 2009). As memory capacity increases children are able to combine simple routines into more complex tasks and strategies (Ornstein, Haden, & Hedrick, 2004). Additionally, Jerome Bruner's Modes of Representation support Principle Six (Bruner, 1991). This theory attempts to explain how information or knowledge is encoded and stored in memory. The first stage is Enactive where action based information is stored in memory. The next stage, Iconic, increases in complexity where information is stored visually in the form of images. The last stage of representation is Symbolic where information is stored in the form of a code or symbol. In this last complex stage, knowledge is encoded and stored as primarily words, mathematical symbols, and other symbol systems.

Principles Seven and Eight

(7) "Children develop best when they have secure, consistent relationships with responsive adults and opportunities for positive relationships with peers" (Copple & Bredekamp, 2009, p.13).

(8) "Development and learning occur in and are influenced by multiple social and cultural contexts" (Copple & Bredekamp, 2009, p.13).

The basis for Principles Seven and Eight is the creation of a positive emotional climate for learning. This includes peer and adult relationships. Positive teacher-student

relationships correlate with increased learning and achievement, as well as social competence and emotional development (Howes & Ritchie, 2002). This is a theme that will be developed later through Brain-Targeted Teaching framework. At the crux, is the idea that emotion shapes and is shaped by cognitive processing (Hinton, Miyamoto, & Della-Chiesa, 2008). Information that reaches the brain is processed first in the limbic system, or emotional center, before being processed in the cognitive, or thinking center, located in the frontal lobes of the brain. Principle Eight focuses on culture and the idea that educators need to be aware of how their personal cultural experience shapes their perspective and realize that multiple perspectives are essential in reaching decisions about children's development and learning (Copple & Bredekamp, 2009).

Principles Nine and Ten

(9) "Always mentally active in seeking to understand the world around them, children learn in a variety of ways; a wide range of teaching strategies and interactions are effective in supporting all these kinds of learning" (Copple & Bredekamp, 2009, p.14).

(10) "Play is an important vehicle for developing self-regulation as well as for promoting language, cognition, and social competence" (Copple & Bredekamp, 2009, p.14).

In early childhood, children take in information from their environments, experiences, and relationships and use that sensory information to form a personal hypothesis about how the world works. Young children then test out these personal hypotheses through social interactions, physical manipulations, and internal thought processes. Play is an essential element of this process. During play, children make observations and reflections that lead to deeper cognitive and social understanding. Links

are correlated between play and core abilities such as memory (Diamond, Barnett & Munro, 2007), self-regulation (Brosnson, 2000; Elias & Berk, 2002), oral language abilities (Davidson, 1998), social skills (Johnson, Christie & Wardle, 2005), and success in school (Zigler, Singer & Bishop, 2004).

Principle Eleven

"Development and learning advance when children are challenged to achieve at a level just beyond their current mastery, and also when they have many opportunities to practice newly acquired skills" (Copple & Bredekamp, 2009, p.15).

Principle Eleven is grounded in the theory of Zone of Proximal development by Vygotsky (1978). This work is supported through learning science research by Subban (2006) that finds that children who experience failure and pressure to reach inappropriate goals may not feel safe. Students must be secure enough to accept the challenge of new learning, through content that is nether neither too difficult nor too easy. Additionally, young children need repeated opportunity to practice and consolidate new learning and skills. Through this repetition, students will reach a level of mastery that will facilitate transference of knowledge and skills to new situations (Copple & Bredekamp, 2009).

Embedded within Principle Eleven is the concept of feedback as an essential tool to challenge students to achieve at a level just beyond their current mastery. Hattie (2009) reported a synthesis of over 800 meta-analyses on a variety of influences on student achievement. The average or typical effect of schooling was 0.40 (SE = 0.05), and this provided a benchmark figure to judge influences on achievement, such as that of feedback. The average effect size for feedback was 0.79 (twice the average effect). This places feedback among the highest influences on achievement in Hattie's (2009)

synthesis. Thus, feedback is among the most critical influences on student learning. It can increase effort, motivation, and engagement.

Principle Twelve

"Children's experiences shape their motivation and approaches to learning, such as persistence, initiative, and flexibility; in turn, these dispositions and behaviors affect their learning and development" (Copple & Bredekamp, 2009, p.15).

This last principle values young children's feeling about learning such as their motivation, interest, and pleasure. Differences in these approaches to learning affect school readiness and school success (Copple & Bredekamp, 2009). Children who begin school with more interest in learning perform better on later math and reading assessments (NCES, 2002), and young students with stronger attention, persistence, and initiative develop stronger language skills later in school (Fantuzzo, Perry, & McDermott, 2004).

Conclusion

Grounded in the research from developmental psychology and the learning sciences, the "12 Principles of Child Development and Learning that Inform Practice" (Copple & Bredekamp, 2009) outlines environments, systems, and strategies that promote young children's optimal learning and development. It supports the idea that development does not occur in discrete stages but rather on a continuum where children's cognitive abilities vary by task and day, not just by age and individual developmental stage (Willingham, 2008). Since its first adoption in 1986, this framework has been known as Developmentally Appropriate Practice (DAP) and has served as the backbone for beliefs, practices, and decision making for early childhood caregivers and schools. As

presented above, there is a strong overlap between early childhood developmentally appropriate practices and Brain-Targeted Teaching. The next section turns from the content of instruction to consider teachers' beliefs about their ability to effectively deliver instructional content.

Teacher Efficacy

Reforming a curriculum is a sustained, complex process, requiring input and consensus from many stakeholders, especially teachers. Teachers' efficacy beliefs about their own capability and the capability of their colleagues to organize and execute the courses of action required to successfully educate students have been linked to numerous educational outcomes, including curriculum transformation (Forman, 2014; Edmondson, 2002). This case study seeks to tell the story of how one early childhood institution transformed its systems and structures to implement a curriculum based on current findings from neuroscience. Such a story would be incomplete without examining the role of teacher and collective efficacy in the transformation. High efficacy teachers participate in more professional development activities (Geijsel, Sleegers, Stoel, & Kruger, 2009; Ross & Bruce, 2007), are more likely to make use of a teaching coach or teaching network (Cousins & Walker, 2000), and place higher value on educational innovations (Tschannen-Moran & Barr, 2004). Participation in professional development, respecting feedback and valuing innovations are all-essential for school change and transformation. This section provides a brief history of the evolution of the construct of teacher efficacy and relates individual teacher efficacy to collective school efficacy.

Rotter and RAND Research

In 1976, RAND researchers, as a part of a research project to identify characteristics of effective teachers, included two survey items crafted to capture teachers' beliefs about whether they had control over student motivation and performance or whether the control over student motivation and performance was anchored in the environment. (A) "When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment" and (B) " If I try really hard, I can get through to even the most difficult or unmotivated students." These two questions were based on the social learning theory of locus on control (Rotter, 1966). Teacher scores on these two items correlated to variations in reading achievement among minority students, percentage of project goals achieved, and amount of teacher growth over time (Tschannen-Moran, Hoy, & Hoy, 1998; Forman, 2014). This first construct of teacher efficacy was defined as "teachers' beliefs about their ability to control positive student outcomes in spite of circumstances external to the teacher or school" (Fives, 2003; Forman, 2014). The key difference between locus of control and self-efficacy, as defined by Rotter (1966) and the RAND researchers at this time was that locus of control was concerned with contingencies on a global level or the degree to which outcomes can be contributed to a teacher's own actions or by factors outside of their control while, in contrast, self-efficacy is a judgment about a specific action in a specific context (Bandura, 1977; Tschannen-Moran et al., 1998). The work of Bandura goes on to explore the relationship between self-efficacy and outcome expectancies.

Albert Bandura

The work from the RAND researchers and the linkage between locus of control and teacher efficacy was extended by the work of Albert Bandura. Bandura defined teacher efficacy as a unique form of self-efficacy derived from social cognitive theory (1977). Within this theory, an individual's cognition, behavior, and environment constantly influence each other and shape teachers' belief about their personal capacity to performance at a given level of attainment and guide how much energy and persistence teachers will expend to reach their expected goal. Efficacy beliefs are the primary drivers of human agency (Bandura, 1997).

Bandura (1997,1998) cited four sources of information that contribute to a teacher's task-specific efficacy perceptions: (1) past mastery experience, (2) vicarious experience, (3) social persuasion, and (4) psychological or affective states. Mastery experience is when a teacher independently does the task. This is considered to be the most compelling source of efficacy information because it provides the most convincing evidence that a teacher will be able to repeat the performance successfully in the future (Bandura, 1982, 1997). The second most powerful source identified by Bandura is vicarious experience where a teacher observes the skill in question being modeled by someone else and uses the experience to project information about what the teacher is capable of achieving: "If they can do it, I can do it too." The third source of efficacy beliefs is social or verbal persuasion, which can be anything from performance feedback to motivating or dispiriting chatter from teaching peers to pieces in the media about the ability of teachers to have an impact on student learning. The final source of efficacy-shaping information stated by Bandura is psychological or affective states. These include

the emotional or physiological responses a teacher experiences when enacting a teaching performance, such as increased heart rate, "butterflies," or an enjoyable adrenaline rush (Bandura, 1982; Fives, 2003; Tschannen-Moran et al., 1998; Forman, 2014).

Current Perception of Teacher Efficacy

The work of Bandura separated "agent-means" (A teacher's belief that they have the ability to organize and execute a specific teaching action) and "means-end" (A belief that a specific teaching action will result in desired results). Several theorists (Tshannen-Moran, Woolfolk, Hoy, & Hoy, 1998; Tshannen-Moran & Johnson, 2011) extended this concept into an integrated model that defines teacher efficacy as an "individual's future-oriented assessment of his or her capability to accomplish a specific teaching task in a particular context that will bring about desired outcomes." Additionally, the construct of integrated teacher efficacy has been defined as teachers' "belief in their ability to influence valued student outcomes" (Wheatley, 2005, p. 748), "teachers' situation-specific expectation that they can help students learn" (Ashton & Webb, 1986, p. 3). In this integrated model of teacher efficacy, teachers' efficacy beliefs are considered through an if-then lens that directly connects teaching inputs to student outcomes.

Collective Efficacy

This case study aims to explore how findings from neuroscience can be effectively implemented in an early childhood setting. As educators and administrators seek approaches for school improvement and transformation that can improve academic outcomes for all students, it is important to consider how schools can be empowered to exert control over their specific circumstances. The power of collective efficacy beliefs to influence organizational norms and outcomes rests in the expectations for action that are

socially transmitted by collective efficacy beliefs (Sampson, Morenoff, & Earls, 2000; Edmondson, 2002). Collective efficacy beliefs are important to group functioning because they help to explain how organized capacity for action is recruited to produce desired school and student level outcomes.

There is substantial empirical evidence for the significance of collective efficacy beliefs. Bandura (1993) observed that collective efficacy beliefs of faculty were positively and significantly related to between-school differences in student achievement in both reading and mathematics, exceeding the impact of student socioeconomic status. Similarly, collective efficacy beliefs were positively and significantly related to student achievement in mathematics and reading in elementary, middle, and high schools (Goddard, Logerfo, & Hoy, 2004; Goddard & Goddard, 2001), even after controlling for demographic variables. A 2004 study (Tschannen-Moran & Barr) quantified that collective efficacy beliefs accounted for 18%, 28%, and 14% of the variance in middle school math, writing, and English language arts scores, respectively.

Collective teacher efficacy mediates through its impact on the social norms of the school—"this is the way things are done here"—and individual teachers come to evaluate their competence relative to these group norms (Goddard & Goddard, 2001). So collective efficacy can influence individual teacher efficacy by shaping individual interpretation of teaching events and performance standards as well as directing attention to factors that might otherwise have been overlooked (Goddard, Hoy, & Hoy, 2004).

Education in India

Improving schools involves change. Change, however, is not an isolated process. It occurs within some context. For this specific case study, the context is an early

childhood center in India. This section provides context for the Indian case study by exploring the development of education in India through a historical perspective. The separate developmental path of early childhood education is also considered and current issues surrounding education in India are summarized.

Education in India- Underlying Philosophy

The foundational philosophy of education in India is based on Hindu tradition. Max Mueller noted in 1882: "There is, in fact, an unbroken continuity between the most modern and the most ancient phases of Hindu thought, extending over more than three thousand years" (cited in Nehru, 1991, p.88). The core tenets of *Veda*, the oldest Sanskrit literature and the oldest scriptures of Hinduism, form the scaffold for the basic values and beliefs of a diverse Indian culture. Traditional values permeate daily lives, rituals and customs, as well as the formal and informal curriculum that is taught to young children. Community pageants and dramas based on mythology and legends are performed during holidays, and these same myths and historical legends form much of the foundation for Indian children's literature.

Today the Indian way of life reflects age-old values with a world-view that is deeply rooted in the teachings of the *Upanishad*, a collection of texts that contain some of the central philosophical concepts of Hinduism, and in the concepts of *dharma* and *karma*, mixed with the modern thinking of younger cultures (Gupta, 2003). *Karma* is the belief that a person's actions in life will determine their fate in the next life. *Dharma* is the moral force that is believed hold order within the universe.

Education in India- Historical Overview

The changes in education in India occurred over several historic periods and illustrate the complex nature of education in India, much of it stemming from the influences of different cultures and philosophies.

The earliest records for education detail the Vedic influence from 2000 B.C- 700 A.D. During the early part of this period, Hindu education was available to all and focused on deep philosophical reflection, spiritual and secular learning, and intellectual exploration. As the caste system developed during this period, educational opportunities became more discriminatory (Gupta, 2003). Another early influence on the Indian education system can be traced from 600 B.C- 200 B.C and has its roots in Buddhist religious philosophies. The core ideas of *dharma* and *karma* are rooted in Buddhist philosophy. The main influences of the Buddhist philosophy include the rejection of caste discrimination. Education was made available to all who wanted to learn, including women. The curriculum of education was entrenched in the writing of the *Veda, Upanishad,* as well as Buddhist scriptures (Gupta, 2003). The Asrama system of education is the most documented system of education from this time. In this system, a guru or teacher would have several students, beginning at the age of seven, come live in his home. The teacher instructed the students for many years using sacred scriptures. Most of the education from this period is thought to be oral in nature (Viruru, 1998). This broad description depicts only generalizations about a period of time that stretched over a thousand years; however, parts of the system, especially the system of oral learning, seem to still be valued in Indian education today. Further historical reflections suggest that

Hindu and Buddhist influences are not the only religious influences upon Indian education.

Muslim influences can be seen between 1100 A.D. and 1600 A.D. During this time India was ruled by the Mughal dynasty, and schools were closely aligned to Muslim mosques. Islamic religious teaching was a core tenet of education, and the lives of women became more sheltered and educational opportunities for women more sparse (Viruru, 1998).

Beginning around 1600 A.D. European influences emerge. Missionary schools were formed in India with the goal of promoting Roman Catholic beliefs and Christian salvation (Gupta, 2003). As the British gained control over India, Protestant forms of Christianity and education in the progressive and scientific methods of Europe were enacted. One of the biggest impacts of British influence was the integration of English as the language of instruction in all schools founded by the British (Gupta, 2003). Colonial administration is credited for several other strong influences in the mid 19th century. Among these are the bureaucratic school governance system that controls all aspects of teaching including curriculum, textbook resources, and teacher training. Also, the colonial system acculturated Indian children in European attitudes and perceptions, and prepared them to work at lower and mid –level colonial administrative service. Centralized exams were developed as the tool to determine eligibility of students for promotion and scholarships. Indigenous schools were required to conform to colonial government prescripts if they wanted to receive government funding (Kumar, 1992). Around the time of Indian independence, numerous educators and philosophers aspired to bring the importance of traditional Indian philosophy back to education. Given the

political climate of the time, this is not surprising. However, much of British influence remained strongly entrenched in the Indian educational system. Several of the schools and universities established during this time are still popular today.

Education in India Today

The constitution of India provides for "…free and compulsory education for all children until they reach the age of fourteen years" (Article 45). The Central and State governments both play a role in the educational system, especially at the secondary level. Today there are about 888,000 educational institutions in India with an enrollment of about 179 million students. At the elementary level, there are 149.4 million students between the ages of 6 and 14 supported by about 2.9 million teachers (Metroha, 2006).

A wide variety of school offerings exist in India, reflective of the nation's diversity. There is a Central Board of Education, but each state controls details of state education, such as local policies and curriculum. In addition to this extensive network of public schools, there is also a vast network of private schools, especially in urban areas. In contrast, rural areas are often served through small one-room schoolhouses (Gupta, 2003). A high percentage of high school graduates go on to college and university studies, but a high percentage of these college graduates struggle to find jobs because of the employment shortage resulting from large population growth. One consequence is that secondary and university level educational systems are marked by a high degree of competitiveness.

Early Childhood Education in India

Amita Verma, an early childhood pioneer in India, provides background on the context of early education in India by describing the situation in 1951 as a "No-man's

land" (Bhavnagri, 1995). There were no national policies or legislation concerning early childhood education. She goes on to cite several milestones in the development of the early childhood movement in India, one of which was Maria Montessori's visit to India in 1939. In 1974, the Indian parliament developed a new policy on children and established a National Children's Board. Numerous conferences were held in India, such as the *Organization Mondiale Pour L'Education Prescolaire*, helping to move the early childhood agenda forward. India now has both a Department of Women and Child Development and a Ministry of Human Resource Development. Current government plans include early childhood education as a top priority. One area of needed improvement, as cited by Verma, is the need for governmental oversight of early educational programs (1995). There are no mechanisms to ensure that programs are of high quality and no large-scale school inspections.

Beyond accreditation and site inspection, other issues affecting early childhood education in India include: increased enrollment of women in the workforce and the diminishment of the extended family system, thus increasing the number of preschool students being educated outside the home; the ability of early education to enable caregivers, usually an older girl sibling, to attend school; and adequate training for teachers (Pattnaik, 1996). The expansive population growth, combined with more women in the workforce, means that more families are looking for early childhood education opportunities for their children rather than educating them solely at home until they reach six years of age. Historically, as long as young children remained at home, their social and emotional development was fostered in the home by immediate and extended family members. Academic training, and not social and emotional development, was the domain

of schools. As schools assume more responsibility for the early education of young children, the boundaries between home and school domains begin to blur. With more students in public and private preschool, and increased expectations with respect to both the scope and depth of the curriculum, recruiting and training early education teachers is a new challenge. Currently, the basic training for early childhood teachers is only one month, and the minimum educational level required of early childhood teachers is 8th grade (Pattnaik, 1996).

Tension Between Indian Cultural Beliefs and Euro-Western Education Philosophy

The ideal vision and goals for education and beliefs surrounding "good teaching" varies across different cultures (Delpit, 1995). Most research defining child development theory and developmentally appropriate practice is based on Western child development theories. This emphasizes the individualistic nature of child development (New & Mallory, 1994). This common developmental pathway view does not consider that the "significance of developmental milestones and behaviors is determined by the value and expectation of specific culture" (Bowman & Stott, 1994). It is logical that there would be tension between specific cultural values and singular Western child development theories and milestones.

One of the most significant tension between traditional Indian culture and Euro-Western educational philosophy is rooted in the idea of *self*. In India, the development of *self* is important, but typically viewed through a social context (Dave, 1991). The idea of *other* is given more significance than *self*. In an early education classroom, a child is expected to share toys and materials rather than have the right to keep toys to himself (Gupta, 2003). Beyond expectation for the hierarchy of self and others, there is also

tension between the traditional and progressive role of a teacher in the classroom. The expectation of a teacher in India is of a more experienced and knowledgeable adult whose role it is to explicitly guide the learner rather than to assume a more passive facilitator of independent discovery valued by current Western educational thought (Gupta, 2003).

Early childhood education in India today is well placed at an intersection between traditional and progressive perspectives. In the last few years, educators, parents, and policymakers in India have become more aware of the importance of positive experiences in the early years. While this growing awareness of the importance of early childhood development and increased demand for excellence in preschool is a good thing, it can also contribute to the spread of inaccurate and misapplied information about child and brain-development (Fogarty, 2002). Translating cognitive and brain research into appropriate educational practice, in India and elsewhere, holds much promise, but also many potential pitfalls.

Case Study as a Research Method

In this section**,** the purpose, benefits, and guidelines for using a case study as a research method are considered. Several specific case study designs are also explained.

Case Study Purpose

In general, case study is a form of research that endeavors to produce rich descriptions about singular contemporary events or topics rather than historical ones (Lapan & Armfield, 2009). Yin (2013) states that "case studies are the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (p. 1). Case study is considered the polar opposite of survey research. In survey

research researchers cast a wide net to gather substantial and useful, albeit superficial, information. Case study research, in contrast, aims to understand the complexities of a case by understanding the complicated relationships between people, settings, and programs (Lapan & Armfield, 2009). Although survey and case study research differ, they can be used effectively together to triangulate data and achieve both breadth and depth of understanding (Yin, 2013).

There are several purposes for employing a case study methodology to program research. Stake (2005) contrasts two overall purposes for program case studies. The first is identified as intrinsic where the case study seeks to answer questions about the case alone. This type of research provides stakeholders with "sharpened views and new insights about program operations" (Stake, 2009). The other purpose, defined by Stake (2009), proposes that the researcher considers the case as a device for understanding context beyond the specific case under study. Glaser and Strauss (1967) use the idea of theorizing case study as the basis for grounded theory where a theory is constructed from the ground up by examining several concrete instances of a case, followed by the construction of an explanation for all the concrete events.

Case Study Design

In addition to several purposes for choosing a program case-study methodology, there are several program case study designs. Single-case studies are used when researchers seek to investigate a single case at a single point in time. Yin (2003) argues that a single-case study is warranted and appropriate on the basis of the case being revelatory where there is an assumption that the problems explored in a particular case are common to other cases as well. Complexity, and arguably validity, can be added to

the research design by choosing a longitudinal design considering the same case over time, or by selecting a comparison design where two, or more, cases are compared. Analytic conclusions derived from two, or more, separate cases will be more conclusive and valid than those conclusions coming from a single-case study (Yin, 2013). Because Intellitots is a unique case without another other early childhood setting implementing BTT, this project will use a single case study design.

Benefits of Case Study

In general, case studies offer narrative portraits of the complexities in a case through authentic reproductions of daily activities and events. Stake and Turnbull (1982) suggest that a unique benefit to utilizing a case study methodology is that the researcher collects and records what readers are not able to observe for themselves; however, when reading the study, readers are able to experience vicariously the various complexities of the case and draw their own conclusions and insights.

Case studies allow substantial detail to be collected that would not normally be easily obtained by other research designs. Local and granular data are valued and placed within a greater context. The data collected is normally much richer and of greater depth than can be derived through other experimental designs. However, there are limitations to this research method that must be considered. The most widely held criticism of case study methodology is that case studies are not generalizable (Yin, 2003). Ensuring that the research goals provide explicit aims of understanding complex phenomenon rather than providing statistical generalizability can mitigate this criticism. Another criticism of case study methodology is that because it is based on qualitative and descriptive analysis, it is subject to researcher bias (Yin, 2013). To overcome this criticism, it is essential to

describe the research context and discuss data analysis, interpretation and presentation techniques and also to overlap data collection with theories and similar literature. The case study researcher must look beyond initial impressions and examine all major rival explanation in an unbiased and objective manner.

Because Intellitots is singular and unique within the context of education in India and reflects an educational philosophy designed around current research on brain and cognitive development, it is well suited to investigation via case study methodology.

Conclusions

What factors account for the rapid expansion of the Intellitots early childhood brand and the successful implementation of a translational brain research based curriculum? The initial hypothesis was that the multifaceted curriculum of Intellitots, respectful of Indian traditional beliefs and grounded in brain-research, resonates with parents of pre-school children in New Delhi. This multifaceted curriculum is defined as the formal curriculum (philosophy and pedagogy), intended curriculum (teachers' perceptions and attitudes), enacted curriculum (teachers' methods and materials), and experienced curriculum (children's knowing and learning). Additionally, it was believed that high teacher efficacy heightens awareness of the need to improve teaching practices, remain student-centered, and improve student learning. It was expected that teachers with higher teacher efficacy were willing to make the needed instructional changes inherent with curriculum revisions.

Chapter Three – Methodology

Introduction

This chapter will provide an overview for the study and explain the proposed type of research, research questions, selection of participants, and data collection tools. Data analysis procedures are summarized. An explanatory mixed method case study examined perspectives from administrators, parents, and teachers within the Intellitots organization and considered other internal and external factors that contribute to increasing popularity and student enrollment at Intellitots.

Overview of Problem of Practice

This section provides an overview and introduction to the story of Intellitots. The history of the early childhood centers is described and placed within a specific context.

The Case

Intellitots consists of early education learning centers for students from ages 6 months to 8 years of age located in Gurgaon, India. Over 7500 families have benefitted from the variety of programs offered through Intellitots ranging from preschool, kindergarten, parent and toddler programming, daycare and enrichment activities. Intellitots is an early years education and childcare partner of many multinational companies like Fortis Healthcare, PepsiCo, and American Express. Intellitots was awarded the Education Excellence Award for Best Preschool in 2013.

Short History

Intellitots was founded over six years ago with a belief, grounded by research in neuroscience and cognitive development, that early experiences set the stage for lifelong habits of learning, social behavior, and emotional and physical growth. Since its

inception as a small mommy-and-me program, Intellitots has grown to four learning centers, fifty employees, and plans to expand programming beyond early childhood years.

Community Setting

Intellitots is located in Gurgaon, India. The city's name, Gurgaon, is rooted with the Guru Dronacharya. The village was given as *gurudakshina*, or payment, to this teacher by his students. The area came to be known as Guru-gram, which changed over time to Gurgaon (Municipal Corporation, 2015). It is located 30 km south of the national capital, New Delhi, and 268 km south of Chandigarh, the state capital. Significant construction and development changes have occurred over the past 25 years. According to a New York Times Article, " In this city that barely existed two decades ago, there are 26 shopping malls, seven golf courses, and luxury shops selling Chanel and Louis Vuitton. Apartment buildings are sprouting like concrete weeds" (Yardley, 2011).

Gurgaon is part of the National Capital Region and is one of Delhi's four major satellite cities. According to the 2011 national census, it boasts a population of 1.5 million. It is within commuting distance of New Delhi via an expressway and Delhi Metro. Gurgaon is the second largest city in the Indian State of Haryana and an industrial and financial center. It has the 3rd highest per capita income in India after Chandigarh and Mumbai. Gurgaon is also the only Indian city to have successfully distributed electricity connections to all its households. It is the IT hub and center of various international companies (Kannan, 2013).

School Setting

Currently Intellitots operates four learning centers. The original center is located at Essel Towers. At Fortis Daycare, Intellitots provides on-site childcare services to employees of Fortis Memorial Research Institute as well as to the local neighborhood. The third location is at Sector 57. A new center opened in January 2016. All centers are located in Gurgaon. Each center includes several discovery zones like an outdoor play area, fitness area, reading and mindful zone, music and movement space, and creative expressions and discovery zone.

The Players

The management team at Intellitots consists of three key leaders. Pooja Goyal is the founder and director of Intellitots. Pooja Goyal began her career as an engineer from IIT Delhi, with an MBA from INSEAD, France. She worked for several corporations such as Palm and Adobe Systems before founding Intellitots. Pooja Goyal is described as an entrepreneur, author, singer, mother, mentor and transformational educator (http://intellitots.in/, retrieved June 2015). She was awarded the Woman of Substance award by Biz Divas due to her contribution to the field of education. The second member of the management team is Shivani Kapoor. Shivani Kapoor is co-founder of Intellitots and heads all school and company operations. Like Pooja Goyal, Shivani Kapoor brings experience from outside of the field of education. After graduating with top honors from IIT Delhi and IIM Calcutta's Executive Management Program, Shivani Kapoor worked for several Fortune 500 companies in the US, UK, and Canada. The Programs Director for Intellitots is Seema Varma. Seema Varma is an educator with over 20 years of experience as a teacher and administrator.

Type of Study

Case studies seek rich description about contemporary people, events, programs, and topics by researching them in their natural environment (Yin, 2013). An explanatory single case study model will be used to shed light on the applied and contextual phenomenon of brain-compatible education within a critical case (Yin, 2013). This case study will be an intrinsic study seeking to explain perceptions and temporal events surrounding the implementation of a translational model of brain-targeted teaching in the single case of Intellitots Early Childhood Learning Centers, located in Gurgaon, India.

This mixed methods case study will use a causal-process tracing (CPT) approach, which begins with an interest in a specific outcome (Haverland & Blatter, 2012). Using this CPT approach, the researcher focuses on research questions that ask which preconditions are necessary and sufficient in order to make a specific kind of outcome possible. This approach is interested in the various causes of an effect rather than the various effects of a specific cause. This research is grounded in the assumption that there is a plurality of factors working together to produce the outcome of interest. The aim of the CPT approach to explanatory case study research is to provide a thick description of the scene and a dense description of the temporal unfolding of events during critical times, such as program implementation. Because Intellitots already implemented BTT within the classroom curriculum and systems, and increased enrollment increased significantly, the CPT approach is appropriate to understand what factors and preconditions supported this outcome.

Additionally, this case study will include quantitative methods through survey research. The mixed methods combination is designed to meet the needs of discovery and

verification, as well the need to understand actors' meanings and intentions while measuring objective and quantitative distributions of outcomes (Gable, 1994). The purpose for the mixed methods design is to combine quantitative and qualitative measures to provide both depth and breadth to the analysis.

Research Questions

The main purpose of this case study is to determine how a neuroeducation model was implemented in an independent school in India with a population of local and expatriate families. Intellitots Early Childhood Learning Centers experienced rapid enrollment growth since the implementation of this neuroeducation model. In this very unique context, this study is interested in investigating, and describing in depth, how this neuroeducation model was interpreted, put into practice, and perceived by different stakeholders. The general goals of this case study are to explore procedures, issues, solutions, and outcomes associated with implementing a Brain-Targeted Teaching curricular framework. It relates the efforts and story of one unique case and attempts to uncover commonalities, pass on lessons and observations, and serve as a reference for early childhood schools wanting to embark upon a similar reform journey and to those curious to know about reform efforts both in the US and across the globe. The specific research questions are listed below.

Curriculum Implementation Process

RQ1- What was the impetus for changing the curriculum at Intellitots Early Childhood Centers?

RQ2- What was the process used in changing the curriculum at Intellitots Early Childhood Centers?

RQ3- What specific changes were made to the curriculum?

Current State of Implementation

RQ4- To what extent do teachers at Intellitots Early Childhood Centers practice or integrate indicators of Brain-Targeted Teaching in their daily instruction?

RQ5- What factors do parents identify as most essential in their decision to send their children to Intellitots?

RQ6- What factors do teachers identify as most essential to effective classroom instruction?

Reflection on Curriculum Implementation

RQ7- To what extent did teacher efficacy support the implementation of the Brain-Targeted Teaching Model?

RQ8- To what extent is the original Brain-Targeted Teaching Model adapted for implementation within an early childhood setting in India?

Study Participants

All parents from Intellitots Early Childhood Center received an online survey in the fall of 2015. There are 350 families with children enrolled at Intellitots Pre-kindergarten. The aim was for 100 completed surveys to be completed and returned by parents. Parents who have their child enrolled in part-time enrichment classes (i.e. Kindermusik, mommy-and-me classes) and do not have their children in full time classes are not included in this sample.

All full time teachers were provided with an online survey to complete in the fall of 2015. A teacher is defined as any full-time teacher who has instructional contact with students. Thus, the sample includes classroom early childhood teachers, reading and

mathematics specialists, music teachers, art teachers, P.E. teachers, and special education teachers. Not included in this sample were teaching assistants. There are 40 full time teachers working with Intellitots. The aim was for 30 completed surveys to be returned from this group of teacher participants.

Center administrators were also provided with an online survey to complete. There are two administrators at Intellitots, and both administrators were expected to complete and return the survey. Administrators must be full time employees of the school directly responsible for site and student management. This information was verified from school website information.

Each online survey began with information about informed consent. Information about the purpose of the research, procedures, risks, benefits, confidentiality, and right to withdraw was included in the initial recruitment letter (Appendix A). All surveys were sent electronically and no identifiable features of participants were collected. The email addresses of parents were gathered from current year registration information from Intellitots. Permission to conduct research at Intellitots and send email surveys was provided by the co-founder of Intellitots on June 15, 2015 (Appendix B).

Tools Including Data Sources and Measures

This study was broken down into different components, all of which contribute to making the case study more complete. The research design included two phases. In phase one, survey data was collected and analyzed from teachers, parents, and administrators. In phase two, further elaboration and triangulation of survey response data was gathered through face-to-face interviews with parents, teachers, and administrators as well as

classroom observations. Document analysis was ongoing throughout both research phases.

Surveys

Each participant group was given a unique version of the online survey specific to their role. The survey includes three sections: demographics, teacher knowledge of Brain-Targeted Teaching framework, and BTT efficacy. In addition, teachers were asked to complete the Gibson and Dembo (1984) Teacher Efficacy Survey and the Goddard, Hoy, and Hoy (2000) Collective School Survey.

Existing Data

Existing data came from historic enrollment data, teacher lesson plans, school promotional materials, instructional scope and sequence curriculum documents, and staff development agendas. Additionally, web-based sources, like the school website and Facebook were also examined. Existing data was used to used to corroborate, augment, and contradict other sources of evidence (Yin, 2013).

Classroom Observations

To examine the implementation of a neuroeducation model in an early childhood context in India, a mixed methodology was utilized. Recognizing that all methods have limitations, this method helps to limit biases inherent in any single method. The qualitative portion of research studies the meaning of people's lives under real-world conditions. According to Bogdan and Biklen (2007), qualitative research is naturalistic and descriptive. In other words, the objective is to explore human behaviors within their natural environments. This study would be incomplete without observations of teachers in their natural environment – the classroom. Observational evidence provides an

opportunity to gather additional information about the case and to add new dimensions to the context and the phenomenon being studied (Yin, 2013). The observation sample was randomly chosen from the pool of Intellitots teachers. The observation were of 20 teachers utilizing the Brain-Targeted Teaching Model. Observations were documented through anecdotal notes.

Interviews

Bogdan and Biklen (2007) describe an interview as a "purposeful conversation." For the purposes of this study, interviews were used in conjunction with other data sources to gather descriptive data in the participants' own words to develop insights on how subjects interpret some piece of the world. While surveys can provide evidence of patterns amongst large populations, interview data can gather more in-depth insights on participant attitudes, thoughts, and actions (Creswell, 2003).

A semi-structured format was used with open-ended questions designed to elicit personal opinions and perspectives about the implementation and efficacy of brain-targeted teaching. This interview method allows new ideas to be pursued as a result of responses to prepared questions (Richards, 2014). The specific interview questions were designed after the analysis of the initial survey data.

Data Analysis Procedures

Creswell (2003) recommended three core strategies for data analysis. They are:

1. Review all information including interview transcripts, survey data, observation checklists, field notes, and school documents.
2. Allow informants to review and verify collected information.
3. Reduce the data and develop codes and categories of information.

Additionally, Creswell's (1994) data analysis spiral (Table 3.1) was adapted to organize and analyze the levels of data analysis from multiple sources to begin developing a narrative.

This data analysis requires continuous organization and reorganization of information in an effort to refine emergent categories, eliminate overlapping categories, and develop new categories. Data analysis began with the first survey returned and continued throughout the data collection process. Preliminary codes are listed in the Survey Rationale (Appendix D).

Data analysis involves an active search for patterns within and between all sources of data (surveys, interviews, observations and data review). This process involves "decontextualizing" and "recontextualizing" (Creswell, 1994, p. 154). The researcher first deconstructs the data for the purpose of analysis and then reconstructs it for the purpose of writing a narrative and telling the story of the specific case.

Evidence to answer the research questions was collected from participants using a teacher survey (Appendix C), a parent survey (Appendix E), an administrator survey (Appendix F), semi-structured interview questions, observations and document analysis. Table 3.2 lists each research question and the method of data collection and analysis.

Table 3.1

Data Analysis Procedures

Levels in Data Analysis	Processes
Level 1: Data Management	Organizing data from surveys, interviews, observations and school documents.
Level 2: Reading, Writing Notes, Questioning	Reading through all the data, taking field notes, raising questions, and verifying information with participants.
Level 3: Description	Analyzing multiple sources of data, describing the setting, and the facts.
Level 3: Patterns	Establishing patterns and looking for correspondence between two or more categories to further reduce the data, looking for similarities and differences across cases, creating matrices, triangulating the data.
Level 4: Representing Data, Making Propositions, Writing a Report	Recontextualizing, synthesizing the data, reporting overall learnings

(Adapted from Creswell, 1994, p. 143)

Table 3.2

Data Analysis Methodology

Question	Method	Data	Analysis
RQ1- What was the impetus for changing the curriculum at Intellitots Early Childhood Centers?	Interview	Interview transcripts	Code for themes
RQ2- What was the process used in changing the curriculum at Intellitots Early Childhood Centers?	Surveys, Interviews	Teacher and administrator survey responses, Interview transcripts	Word frequency, Code for themes
RQ3- What specific changes were made to the curriculum?	Surveys, Interviews, Document analysis	Teacher and administrator surveys, Interview transcripts, Documents	Word frequency, Code for themes
RQ4- To what extent do teachers at Intellitots Early Childhood Centers practice or integrate indicators of brain-based learning in their teaching?	Surveys, Interviews, Document analysis, Observations	Teacher survey responses, Interview transcripts, Documents	Word frequency, Code for themes
RQ5- What factors do parents now identify as most essential in their decision to send their children to Intellitots?	Surveys, Interviews	Parent survey responses, Interview transcripts	Word frequency, Code for themes
RQ6- What factors do teachers now identify as most essential to effective classroom instruction?	Surveys, Interviews	Teacher survey responses, Interview transcripts	Word frequency, Code for themes
RQ7- To what extent did teacher efficacy support the implementation of Brain-Targeted Teaching?	Surveys, Interviews	Efficacy survey responses, Interview transcripts	Correlation analysis, Regression analysis
RQ8- To what extent is the original Brain-Targeted Teaching Model adapted for an early childhood setting in India?	Surveys, Interviews, Observations	Survey responses, Interview transcripts, Anecdotal notes	Word frequency, Code for themes

Methods of Verification

There is a general consensus that qualitative researchers, including those using case studies, need to demonstrate that their studies, methodologies, and findings are credible. To this end, several authors identify common procedures for establishing validity in qualitative projects (Creswell & Miller, 2000; Lincoln & Guba, 1985). Qualitative researchers routinely employ member checking, triangulation, thick description, participant review, peer reviews, and external audits. For this specific project with Intellitots Early Childhood Centers, participant review, member checking, triangulation, and an audit trail are employed to mitigate threats to validity.

Participant Review

All interview transcripts were reviewed by participants for accuracy and completeness. The researcher corrected all errors or omissions.

Member Checking

The researcher trained the Executive Sponsor, Dr. Dana Bashara, Assistant Superintendent of Alamo Heights ISD, with the coding system to act as second coder for 20% of the data from each source (surveys, interviews, observations, and data review). An inter-rater agreement of .80 or higher was considered acceptable. If acceptable agreement were not reached or if patterns of disagreement emerged, the definitions of the categories would be refined and result in recoding another 20% of the data to reassess reliability. There was an acceptable level of inter-rater reliability (>.80) between the researcher and the Executive Sponsor

Triangulation

Triangulation is a validity procedure where researchers search for convergence

among multiple and different sources of information to form themes or categories in a study. Data was triangulated across individual participants, participant groups (parents, teachers, and administrators), and methods.

Audit Trail

Creswell & Miller (2000) describe the benefits of an audit trail as providing clear documentation of all research decisions and activities. This was accomplished throughout the case study field notes and in the appendices.

Computer Aided Qualitative Data Analysis (CAQDAS)

Using NVivo for Mac, a computer-generated software package, the researcher reviewed existing school documents, PDFs, and web pages as well as interview and classroom observation audio and video materials to code images and text. After all data was transcribed, the researcher identified themes with word frequency queries. Word frequency queries were used to list the most frequently occurring words in the source material and to visualize the results in a word cloud. Coded material was compared across codes and data sources.

Chapter Four- Results

Introduction

This chapter consists of three main divisions. The first division presents demographic information about the students, families, and teachers at Intellitots Early Learning Centers and an overview of the hiring process. The next section follows the causal process tracing (CPT) method outlined in the previous chapter. The final section uses the temporal outline established through CPT to directly address the results from the study research questions.

Demographic Characteristics of the Intellitots Community

Data from administrator and teacher surveys is used to describe the participants within the Intellitots case study. This section presents student, family, enrollment, and teacher characteristics.

Student and Family Characteristics

Intellitots Early Childhood Learning Centers consists of four separate facilities all located in Gurgaon, India. Gurgaon is in the state of Haryana, about 30 km south of New Delhi, and in 2015 reported a population of 1.8 million residents. Additionally, Gurgaon has the third highest per capita income level in India. Intelitots serves children from ages 6 months through 8 years of age. Intellitots Créche and Activity Centre at Fortis Memorial Research Institute provides daycare services for families of Fortis employees, patients, and the local neighborhood. This daycare facility serves students from 6 months of age through 3 years old. Intellitots Early Learning Centre at Essel Towers serves students from 6 months of age through 8 years old. Intellitots Early Learning Centre at Sector 57 also serves students from ages 6 months through 8 years of age. Intellitots

serves a small number of special needs students (n=5). Students with special needs are described as being on the autism spectrum and are served in the regular classroom with the assistance of an inclusion teacher. Both Essel Towers and Sector 57 also provide an occupational therapy room for pull-out services, as needed. The specific enrollment at each center follows in Tables 4.1. Administrators report the average daily attendance to be at 90%.

Table 4.1

Enrollment at Intellitots

Ages of Children	Program	Number of students Fortis	Number of students Essel Towers	Number of students Sector 57
0-6 years	Day care	45		
0-2 years	Bouncing Babies		50	20
2-2.5 years	Baby Bears		45	40
2.5 – 3.5 years	Happy Hoppers		30	20
3.5- 4.5 years	Busy Bees		30	20
4-6 years	PK and Kinder			20
After school	2-8		35	30
Evening Programs	2-12		70	20

About 80% of the students are of Indian origin with well-educated parents at mid to senior levels in corporate careers. The other 20% are expat families from countries such as Australia, France, Japan, Korea, UK, and the US. They represent organizations such as Pepsico, AMEX, and numerous IT corporations. Most children are bilingual with English and Hindi as home languages; however, some Indian students also speak regional

languages and a few expat children speak other home languages, such as Japanese or Korean. Both expat and Indian families pay the same tuition, which is the second highest preschool tuition rate in Gurgaon. Depending on the program, tuition rates range from $220 a month for day care to $ 180 a month for preschool. There are additional charges for extended day kindergarten and after school care.

Teacher Characteristics and Hiring Procedures

Intellitots employs 40 full time classroom teachers and 15 full time classroom assistants or "Didis," which means big sister in Hindi. Additionally, Essel Towers and Sector 57 have a lead teacher and administrator on site, and Fortis Day Care has one administrator. The three centers share two counselors, three special education teachers, and three fine arts specialists. Teachers at Intellitots have an average of nine years of teaching experience. The turn over rate of teachers is very low with only three teachers leaving in 2014. Two of those teachers left because of relocation, and the other left to stay home with a new child. When compared to other early childcare centers, the salary scale at Intellitots is described as slightly above the median. Teachers are expected to work for 20 hours a week teaching children and another 10 hours a week for preparation time. A description of demographic characteristics of teachers is presented in Table 4.2.

Table 4.2

Demographics of Teachers (n=40)

Description	Number	Percentage
Female	39	98
Male	1	2
Married	28	70
Parents	32	80
Upper Middle Class	32	80
Middle Class	8	20

Table 4.3

Educational Level and Certification of Teachers (n=40)

Description	Number	Percentage
Bachelor's Degree	16	40
Master's Degree	24	60
University Teaching	22	55
Certification		
Early Childhood	8	20
Certification		
No Certification	8	20
Certification in Progress	2	5

Table 4.4

Overall Teaching Experience (n=40)

Description	Frequency	Percent
0-1 year	4	10
2-5 years	12	30
5-10 years	13	32.5
More than 10 years	11	27.5

Table 4.5

Teaching Experience at Intellitots (n=40)

Description	Frequency	Percent
0-1 year	5	12.5
2-5 years	16	40
More than 5 years	19	47.5

All Intellitots teachers are university graduates. Some teachers hold specialized degrees in education while others hold bachelor or master's level degrees in fields such as literature, science, math, economics, and international relations (Table 4.3). Teaching certification is not required in India for teaching in an early childhood setting, but 75% of teachers at Intellitots hold some kind of teaching certification. When recruiting new staff members, greater weight is given to evidence of alignment between the teacher's personal values to Intellitots core values of Positivity, Integrity, and Excellence. The Human Resource Director and administrators recruit new teachers from in-house recommendations from parents and staff and applicants from the website. Based on an initial phone interview, candidates are filtered based on attitude, alignment with core values, experience, and educational qualifications. Potential candidates are asked to fill

out an application that asks them questions about their philosophy towards teaching and learning. Upon completion and review of the application, candidates undergo a formal interview. When asked what characteristics are desired in a teaching candidate, School Director Shivani Kapoor stated:

> We want teachers who posses a rooted belief with our philosophy of engaging teaching and learning. They should be team players open to feedback and growth. They should have a love of learning and be on a journey of learning themselves. They must possess a true love for children and teaching and should be energized by the work they do. Above all they must value personal relationships with students, parents, and staff members.

Before being offered a position at Intellitots, candidates are required to conduct a live demonstration-teaching lesson in the classroom with students, so administrators can assess their classroom presence and ability to connect with children. Based on the application, interview, and classroom demonstration lesson, administrators judge whether a candidate will be a good fit with the team and school.

Once hired there is a structured in-take and orientation process. This begins with an extended meeting with the Human Resource Director, Sumedha, where time is spent explaining the core values and goals for every child. This meeting can take several hours, and values are addressed before hiring logistics because, as Sumedha describes;

> In the frenzy to complete the new hire paperwork and attend to all of the details of onboarding a new employee, it is easy for what is really important to get forgotten. So we start with an honest conversation about the core values of Intellitots and the goals we have for all our children. This is on the first two pages

of our handbook because it is that important.

After the time is spent on core values, Sumedha reviews the rest of the employee handbook with the new teacher and introduces the new teacher to the rest of the faculty.

The orientation process also includes several days of mentorship with a lead teacher. The teachers of the Bouncing Babies classes at both Essel and Sector 57 have been with Intellitots for seven years. They have both written curriculum and been active in the development of the core values of Intellitots. New teachers spend a week working with these lead teachers. Even though they may be assigned to different classroom levels, all new teachers begin their career at Intellitots by being mentored by these two lead teachers. Again, the focus for this initial mentorship is on the core values at Intellitots. When asked to describe the purpose of this mentorship, Ruchi the lead teacher at Essel Towers stated,

> They (new teachers) already know how to teach, but they don't know how we teach and do things *here*. They watch how I interact with children and parents, and then gradually I let them lead the class a little and give them support, encouragement, and advice.

The last phase of the orientation is on the job training. Every classroom has two teachers, so new teachers are placed in their new classroom with an experienced co-teacher. It is during this time that the developmental expectations for students contained in the "Intellitots Ages and Stages*"* document is explained. Additionally, the co-teacher clarifies the specific curriculum documents and outlines the specific roles and responsibilities within the individual classroom. An experienced teacher at Sector 57 described this part of the new employee training as being similar to the curriculum

development for students,

> Our instructional units go from near to far and always start with the child themselves. Our teacher training is the same. We start with who you are and what you value. Then we move into general teaching strategies and communication styles. Finally, we go to classroom responsibilities. Teaching strategies is easy; teaching values is not.

The employee handbook is 99 pages long and includes extensive information about core values, Brain-Targeted Teaching, curriculum, and campus policies and procedures. The employee handbook was crafted over time through a collaborative process between the school directors, campus administrators, and the director of human resources. Through reading and discussing the employee handbook, the mentorship period, and the on the job training, employees are afforded significant time and support to acclimate to a new teaching position and responsibilities. According to Sumedha, the director of human resources,

> We want our new teachers to have the opportunity to become their ideal professional selves. This takes some time as teachers kind of negotiate between the ideas of teaching as they experienced it as a student, the idea of teaching from their previous teaching experience, and what we are asking of them now. We want everyone to bring in their unique talents and ideas and to feel valued, but they have to value the *Intellitots' Way* first.

These expectations and values associated with *The Intellitots' Way* were shaped over time and through the unique experiences of the founders and staff at Intellitots. This study now turns to a temporal unfolding of those events to understand what is meant by *The*

Intellitots' Way.

Causal Process Tracing

CPT process is employed to identify causal mechanisms on a lower level of analysis. It aims to identify causal configurations based on complex interactions and contextual factors. Focused on the temporal unfolding of causality, CPT is based on a holistic ontology where the basic unit of analysis is not an individual variable, but a multi-level model or a configuration of densely linked causal factors (Blatter & Blume, 2008). The findings from process tracing are not used to draw conclusions from a case study, but rather to highlight a set of potential causal configurations or a multi-level causal model that led to a specific outcome (Blatter & Blume, 2008).

In line with CPT, this section opens with an overview of the temporal events that occurred within the implementation of Brain-Targeted Teaching Model in the Intellitots Early Learning Centers. This is logical because an account that runs from a suitably chosen beginning to the end of the story is likely to be more persuasive than one that starts or ends at an odd or unconvincing moment (Bennett & Elman, 2006). A thick description is presented of the critical junctures of the implementation story where contingent events led to decision moments where one of numerous possible alternatives was selected that later constrained the organization and actors to keep to a particular path.

Intellitots Early Beginnings

Shivani and Pooja, co-directors founders of Intellitots, had been friends while undergraduate students at IIT Delhi. Both were studying engineering within a male dominated student cohort. At this time, neither aspired to careers in education. Pooja went on to earn her MBA from INSEAD in France and then had a successful career in

technology, working for Adobe Systems. In describing her transition from business to education Pooja says:

> After having worked in different parts of the world with technology companies, I had my midlife crisis moment when I wanted to pursue a course where I could find more meaning. The field of education offered me that platform. Every small interaction we have with a child offers us an opportunity to make a difference. This desire to have an impact – however small in what we do was definitely the biggest impetus behind Intellitots.

Shivani graduated as a gold medalist from IIT Delhi and went on to earn top honors from IIM Calcutta's executive management program. Her successful business career took her to England, Japan, Canada, and the United States.

Both women, now with young children, moved back to Gurgaon, India. While in the United States and Canada, they both participated in mommy-and-me classes like Little Gym, Kindermusik, and public library story times. Upon their return to India, they looked for similarly engaging preschool or mommy-and-me programs. Unfortunately, there were no local programs available that offered engaging and active programs for early childhood. There were day care facilities that kept children clean and fed, but these facilities did not focus on warm adult-child interactions, literacy, or fine arts.

Wanting to provide something more for their own children, Pooja and Shivani began a mommy-and-me story time in the community room of a local apartment complex. The decision to initiate a mommy-and-me story time came, in part, from a sense of guilt that their younger children would not be able to take advantage of the same opportunities afforded to their older siblings. Pooja and Shivani had taken the older

children to mommy-and-me programs in the United States while they were infants and toddlers, and there was no similar opportunity currently in existence in Gurgaon, India in which to enroll their younger children. Reaching out to friends and neighbors, the first mommy-and-me program began in August 2008 with about 12 mothers. Pooja and Shivani, engineers by trade, found themselves planning literacy, music, and craft activities.

Gradually, through word of mouth, additional parents and children joined the group. Many of these parents also experienced engaging mommy-and-me programs in the United States and elsewhere and were looking for similar options in India. As children left the mommy-and-me program and transitioned up into other preschools, parents came back reporting on difficulties faced by their children in traditional preschool programs in Gurgaon. Parents and children alike were missing the warmth and personal relationships of the mommy-and-me programs. Parents saw the value in fostering caring and positive relationships between caregivers and children and were disappointed in the philosophy of traditional preschool programs that let children *cry it out* and focused on rote memory lessons. Parents felt that the traditional preschools in Gurgaon were just an extension of elementary schools and lacked experiential and play-based learning.

So in October 2008, Pooja and Shivani rented out two large downstairs rooms in a house and expanded their parent and toddler program. At this point of expansion, Pooja quit her business job at Adobe to focus, with Shivani, on building their business, and Intellitots was born. In the early days of Intellitots, Shivani and Pooja recall doing parent counseling, cutting receipts, designing the interiors, teaching classes, and cleaning the facility themselves.

> In our minds, it was a huge learning experience and also a sign of our commitment to make it work; but in the Indian context where the power distance is very high, parents, vendors, and partners used to find it very strange that we were so accessible. In fact, our landlord advised us multiple times that power comes from being a little inaccessible. Of course, gradually, this had to change because as we began to grow, we needed to hire more people in different roles.

Pooja's time was needed to fuel the growth, identify new locations, build partnerships, and Shivani's time was needed to develop organization structures to manage the growth and develop a strong curriculum and teacher training expertise.

The first core decision to begin the mommy-and-me program was grounded in a desire to provide an opportunity for enrichment and growth for their own children beyond what they could provide at home. The motivation to expand the parent and toddler program came from a request from other parents who wanted the same opportunities for enrichment and growth for their children. Pooja, Shivani, and their staff spent a year refining the parent and toddler program, now called Bouncing Babies. When they could not find existing books, they wrote them. When they could not find appropriate music for their programs, they wrote music and recorded it in both English and Hindi.

After a year spent focusing on developing a solid curriculum for the parent and toddler program, Pooja and Shivani decided to expand their programs into the preschool years. Shivani reports that she knew it was time to expand once the Bouncing Babies program was running smoothly with established curriculum and teachers and procedures in place. They then had time to "think and plan" for a model preschool program.

Intellitots Expands into Preschool

During this thinking and planning stage, there were several milestone decisions to make. In India, there are no policies, guidelines, or curricular expectations for the preschool years. There are no official developmental standards or milestones for young children. Decisions had to be made about standards, curriculum, and the core values of the school.

Pooja and Shivani studied research on early developmental stages from both England and the United States. The core document for all professionals working with early childhood in England is the Early Years Foundation Stage (https://www.gov.uk/topic/schools-colleges-childrens-services/early-years) that describes the standards for the learning, development and care of children from birth to 5 years old. In the United States, the core source of information about early childhood is from the National Association of Educators of Young Children (Copple & Bredekamp, 2009). Pooja and Shivani recall sitting with their staff around a white board crafting what would become the "Intellitots Ages and Stages Guide". In describing a motivating factor of the decision making process for setting the developmental and instructional standards for Intellitots Shivani states:

> You can't just take something off the shelf and implement it anywhere. It has to be directly matched to a specific context. We aren't in England or the US, so we took their ideas and spent hours discussing how to be sure the developmental standards are relevant in our Indian context.

One key consideration was how to integrate local culture into a framework developed outside of India. Language was a significant consideration. India has two national

languages: Hindi and English. There was quite a bit of debate about the language of instruction. In the end, they decided to offer an English Immersion preschool. The rationale was that students would learn Hindi from their home environment. This decision had ripple effects into hiring because all teachers needed to be fluent in English.

As services expanded into preschool, a codified curriculum was also a prerequisite. Key decisions were made about how to structure the curriculum. A core consideration was how to break down all the learning that needed to happen into manageable categories. At first the discussions focused on cognitive skills: math and literacy. However, when parents from the parent and toddler program were brought into the discussion, their opinions shifted the focus. What parents valued and wanted emphasized in a preschool program were not the cognitive skills but rather care and warm relationships. So the foundation of the *Intellitots' Way* was established on a foundation that warm, responsive, and trusting relationships are built from positive interactions over time, and that these positive interactions help students develop a healthy sense of self-identity and self-confidence. Six cognitive areas were developed: (1) Language and Literacy, (2) Logic and Maths, (3) Creative Representation, (4) General Awareness, (5) Personal and Social Development and (6) Physical Development. To codify the curriculum, the core team decided to create monthly themes that would be further subdivided by week. All of the six cognitive areas, as well as the foundational beliefs of care and confidence, were directly addressed in every curricular unit. Additionally, the curriculum units begin with the child and not with the subject matter. Shivani and Pooja describe this approach as "near to far". All units begin with what individual children

already know and can experience within their immediate environment and then move to transfer the concepts to environments outside the child.

After a year of planning and designing curriculum, in October 2009 Intellitots moved to into a 2nd house across the street from the first house that offered the Bouncing Babies program and offered preschool programs for two and three year old children. They remained in the two locations until July 2010. As enrollment with the Bouncing Babies and the, now named Baby Bears, 2-3 year old preschool programs continued to increase, parents once again asked Pooja and Shivani to extend services up another grade. Knowing that they had the needed enrollment numbers to justify expansion, Intellitots relocated into one new building called the Galleria Building. Now the Bouncing Babies and preschool programs were all under one roof. This decision had the added benefit of introducing parents in the Bouncing Babies programs to the programs offered through the preschool years. Over the next two years, Intellitots added the Happy Hoppers (2.5 – 3.5 years) and Busy Bees (3.5 – 4.5 year) programs and continued to recruit and train staff and design curriculum. Through only word of mouth, enrollment continued to increase.

Additional Intellitots Sites Added

In 2012, the team at Intellitots was approached with a new business opportunity. Fortis Memorial Research Institute and Healthcare was opening a large building complex and wanted to establish a day care facility on site for employees, patients, and neighborhood children. They asked if Intellitots would like to manage the day care site. This was a different learning center than the one Intellitots was currently operating because it would be a fulltime day care facility for children from ages 18 months – 4 years of age with after school care for children up to age 6. Pooja and Shivani recruited

an early childhood educator with experience in day care facilities to be the Center Head. The "Intellitots Ages And Stages Guide*"* created for the preschool and Bouncing Babies programs began with developmental milestones from birth to age 5, so this document became the foundation for the day care curriculum. Although there are no federal or state requirements for safety and cleanliness in early childhood settings in India, when designing the routines and procedure for a daycare, the Intellitots team made explicit decisions about the physical layout of the space, schedules that supported sleep and potty training, dietician-planned lunches and snacks, and special school hours that support working families. Another decision was made to keep the curriculum child centered. Rather than being driven by teacher-directed activities, children progress through several learning zones: outdoor play, fitness, reading, mindfulness, creative expressions, and discovery. In addition to setting up the day care at the Fortis Memorial Research Institute, Pooja and Shivani also designed an age-appropriate waiting area for children within the hospital and established a small gift shop and store that sells educational toys and books for children.

Intellitots was built on a foundation of care and confidence, and the day care facility, hospital waiting room, and small store all support the same core beliefs. The day care includes creative free play, songs, story time, and age appropriate crafts. Teachers with a background in infants and toddlers were recruited and trained for the day care facility. Shivani, Co-Director for Intellitots, spends one day a week at Fortis day care to ensure quality in the care and site operations and warmth in the relationships. The hospital waiting room includes a small playscape, child-sized tables and chairs, a kitchen center, and children's books. For a family spending hours in a waiting room, this small

area is a respite from tedium. The store offers a healthy and educational alternative for visitors wanting to purchase gifts for hospital patients. Another benefit of establishing a presence at Fortis Memorial Research Institute and Healthcare is that parents who send their children to Intellitots day care at Fortis have a ready transition to Intellitots preschool and parents who have a child in Intellitots preschool and need a day care for a younger sibling have a ready transition to Fortis Day Care. Also, the hospital store offered a continuous source of publicity for Intellitots Learning Centers.

As enrollment continued to rise, Intellitots was outgrowing their current building site in the Galleria Building. In April 2013, Intellitots was awarded the Excellence in Education Award for fastest growing preschool in Gurgaon. The additional publicity from the award helped to boost enrollment. During this time, the administrative team at Intellitots began to design the curriculum for a kindergarten classroom. In October 2013, Intellitots opened a third location at Sector 57.

The facility at Sector 57 was unique because it was significantly larger than the Galleria Building and the Fortis Day Care. This new site offered Bouncing Babies classes, preschool and kindergarten. Although the building was different, the decision was made to keep the core values, curriculum, and level of instructional quality equitable in all the sites. This meant creating structures for common staff development and team planning. The entire staff of Intellitots gets together twice a year; teachers from similar levels (i.e.- all Busy Bee teachers) get together once a quarter to plan instructional units; and the core administrative team meets monthly. Additionally, Pooja and Shivani did not set up permanent offices. Instead they spent time in each site every week observing classrooms and meeting with parents and teachers.

Curriculum Changes

As the teaching staff grew beyond the original core team, the decision was made to further codify the curriculum to help teachers who were not directly involved in the creation of the curriculum by providing a level of explicit detail needed to successfully implement the curriculum with a high level of fidelity across the three sites. The core administrative team met back together to refine the curriculum. One change to the curriculum was a shift from a complete English Immersion model to a more dual language model that included Hindi and English. The rationale behind this change was to ensure that the culture of the school was respectful and reflective of the home cultures of students. English remained the dominant language of instruction, but stories and songs in Hindi were integrated into the curriculum along with specific Hindi vocabulary words and sentences. To complement this language integration, additional Hindi craft and cooking activities were added into the curriculum.

Adding more Hindi culture to the curriculum was not the only change made during this time. When reflecting on the foundational core values of care and confidence and the six cognitive areas, concerns came up about what was missing. As the group talked about what made them individually successful and persevere through life's challenges, they realized they all identified strengths of character as the reason for personal success in life. The group decided to add a character education strand to the curriculum. They brainstormed all the possible character traits to include in the curriculum and initially drafted a list of 21 character strengths. After prioritizing, combining, and deleting traits, the core administrative team decided to add six character strengths into the curriculum: Cultural Values, Tenacity, Gratitude, Active Self Learner,

Self Control and Awareness, and Social Intelligence. The foundational beliefs, character strengths, and cognitive skills were combined into a graphic representation of the goals for every child at Intellitots (Figure 4.1).

Rewriting the curriculum to increase the level of detail in unit plans and include strategies and activities to support the newly drafted character strengths was a daunting task. Pooja and Shivani began looking for curriculum models that would help with the curriculum-writing task. Pooja and Shivani, being former engineers with strong science backgrounds, had always been keen on integrating research from the learning sciences into the curriculum. During this time, Shivani was taking education courses on Coursera. She came across a course description for the Brain-Targeted Teaching Framework for 21st Century Schools (BTT)(Hardiman, 2012). The basic description of a curriculum framework based on brain-research was intriguing, so she ordered the book and did some research on the Brain-Targeted Teaching website.

Figure 4.1 Goals for every child at Intellitots

Partnership with Brain-Targeted Teaching and Intellitots

After reading the *Brain-Targeted Teaching for the 21st Century* book, Pooja reached out to the author, Dr. Mariale Hardiman from Johns Hopkins University. While in the United States on a vacation, Pooja met with Dr. Hardiman to talk about the steps for implementing the Brain-Targeted Teaching framework in the Intellitots Learning Centers. According to Pooja, Dr. Hardiman was very helpful and supportive but could not offer specific advice for implementing BTT in an early childhood center because it had not been done before in any formalized fashion. Pooja shared the plans to rewrite the

early childhood curriculum using the BTT framework, and Dr. Hardiman supported a partnership between Johns Hopkins University and Intellitots.

Energized by the visit with Dr. Hardiman and the initial study of the BTT framework, Pooja and Shivani shared their learning with their core administrative team and designed an initial staff development session to introduce the faculty to BTT. During this professional development session, the decision was made to make the learning authentic and meaningful for teachers. As each brain target was introduced, teachers worked with grade-alike groups and brainstormed what they were already doing in the classroom that supported the brain target and what refinements or changes could be made to instructional units, strategies, communication, and learning environments to better support each brain target. All instructional staff took ownership for the changes to the curriculum and school and committed to further learning about research supporting the brain targets.

Further Intellitots Locations Added

In January 2014, Intellitots moved out of the Galleria Building and into a larger space at Essel Towers. This facility offered Bouncing Babies and preschool programs as well as after school care and special summer camps. A new day care facility opened in late January 2016.

Conclusions

Over the course of seven short years, Intellitots grew from a small mommy-and-me story time program to four full time early childhood learning centers. Such robust growth does not just happen by chance. The timeline of the growth of the Intellitots brand illuminates some key decision factors that contributed to the overall success of Intellitots.

Both Pooja and Shivani enjoy what they do. Building a business from the ground up and writing and rewriting curriculum takes considerable hours of labor. Both Shivani and Pooja attribute the inner happiness they have found from working with children and building positive learning environments. Pooja summarizes this idea by saying, "It's not the success that makes us happy; it's the happiness we feel that makes us successful."

In both surveys and interviews, Pooja and Shivani attribute the success of key decisions and the courage to expand to being surrounded by a top-notch team and support group. In describing the team at Intellitots Shivani said:

> No one can build anything worthwhile alone. It requires a team as committed to core values and aspirational goals as you are. You are going to drop the ball at some point, and you need a team that will not only pick up the ball but also lift you up too.

The core administrative and instructional team has remained quite stable over time.

Intellitots exemplifies a learning organization. Peter Senge (2014) introduced the idea of an organization made up of employees capable of creating, mastering, and transferring knowledge. Such learning organizations are able to adapt to the unpredictable with greater facility than more bureaucratic organizations. Pooja and Shivani modeled learning and leadership by embracing the challenge of learning about early childhood education, curriculum design, character education, and integrating brain research into instruction. Intellitots purposefully hires employees who also share a love of learning. New ideas from staff members are valued and there are structured planning and learning times where new learnings and ideas are shared, debated, and molded into practical instructional ideas. At the conclusion of each instructional unit, grade-alike teachers

reflect on students' achievement and make recommendations to improve and refine the unit for the next year.

The core value of care extends to the entire school community. Intellitots began because there were no preschool programs in the local area that made positive and personal relationships a priority. From the very first mommy-and-me story time, building a sense of community, connectedness, and care was established as the number one core value of Intellitots. Key decisions throughout the timeline of Intellitots were grounded in this sense of community, connectedness, and care. The preschool programs were established because of concern over Intellitots' children struggling to transition into traditional pre-kinder programs. Parents asked for help and offered to assist with the expansion of programming through their loyalty and word of mouth publicity. The staff and parent community are stable, illustrating the idea that bonding occurs with people and institutions that help satisfy core needs.

These four overall themes of building a collaborative and supportive team, valuing personal and organizational learning, trusting translational research, and fostering positive and caring relationships will also be explored in the next section as this study turns to a detailed description of findings from the study research questions.

Findings from Research Questions

Introduction

Mixed methods using data from surveys, interviews, observations, and statistical analysis are used to present findings for each of the research questions. The research questions are clustered around three topics: (1) the curriculum implementation process,

(2) the current state of implementation, and (3) reflections of the curriculum implementation process.

Descriptive statistics were generated for the demographics for the respondent sample group as well as for each study variable Intellitots employs 40 full-time teachers and 6 administrators. For this sample, 35 out of 40 (88%) teachers and all 5 (100%) administrators responded to surveys. Educators were asked to complete the Gibson and Dembo (1984) Teacher Efficacy Survey and the Goddard, Hoy, and Hoy (2000) Collective School Survey. In addition, educators were asked to complete a researcher-developed survey to investigate beliefs about the efficacy of translating current research from the learning sciences into classroom practices through the Brain Targeted-Teaching Model (Hardiman, 2012). Because of the high response rate, the demographics from the sample are representative of the general population at Intellitots. Cronbach's alpha coefficient scores for all survey scales were above .50, establishing a threshold of reliability within this study sample.

Table 4.6

Means, Standard Deviations, and Reliability for Study Variables (n=40)

Description	Range	*M*	*SD*	Reliability (Cronbach's Alpha)
Teacher Efficacy Total	57-77	67.05	5.038	0.702
Personal Efficacy Subsection	32-41	36.08	2.474	0.691
General Efficacy Subsection	24-38	30.97	3.758	0.662
Collective Efficacy	53-69	61.30	3.695	0.620
BTT Implementation Efficacy	45-60	53.50	4.241	0.868

Curriculum Implementation Process RQ1

What was the impetus for changing the curriculum at Intellitots Early Childhood Centers?

Based on survey results and interviews with the co-directors of Intellitots, the decision to change the curriculum at Intellitots was not based on poor student outcomes or negative feedback from parents or staff. The school enrollment was increasing and the school staff was stable. However, because Intellitots was expanding, there was a need for a common vocabulary and understanding of the learning process across all staff members at the three sites. Trained as engineers with a science background, Pooja and Shivani already had a preexisting curiosity and appreciation for the learning sciences.

> When we founded Intellitots six years ago with a mission to provide high quality education and care for toddlers and preschoolers, we had a strong belief that experiences in the early years of childhood, set the stage for lifelong habits of learning. However, it was just a belief. Since both founders, Shivani and I, were from engineering and business management background, our exposure to the field of child development was limited and largely driven by our experience as parents. As we began to learn more about the findings from neuroscience research we became convinced about the need the develop pedagogies that are informed by neuroscience because it has profound implications for the growth and development of the child. We began to question some deep-rooted historical methods of teaching children and wanted to devise our own Intellitots curriculum with an approach to learning that drew on the developments in the field of neuroscience.

Brain-Targeted Teaching was the translational model that most resonated with the already established core values of Intellitots. There were several reasons why this one particular translational model was chosen for implementation. The first was the alignment between the foundational value of Intellitots regarding care and warm relationships and Brain Target One: Establishing an Emotional Climate for Learning. In describing the alignment between the foundational relationship of care and Brain Target One, Pooja said:

> We have always believed that a young child who feels a strong personal connection to her teacher, openly communicates with her teacher, and receives more constructive feedback and praise from her teacher is more likely to trust. A child who has trust will be more engaged in school. We always knew that caring teacher-student relationships pull students into learning and promote a desire to learn. Brain Target One not only mirrored what we always believed, but now it gave us some scientific reasons for why this is true.

The second reason was that the Brain-Targeted Teaching Framework was flexible enough to be adapted to a specific Indian early childhood context. Intellitots already had structures in place to create and refine their own curriculum and were not looking for a franchised framework with pre-designed units that would trump their previous work. Shivani expressed this idea during an interview: "We weren't looking for a commercial curriculum. We wanted a guidepost or measurement stick to help us see the strengths of our curriculum and to point out where we can improve."

The third expressed reason for selecting Brain-Targeted Teaching as the translational model to use when changing the curriculum was reliability and reputation.

Both Shivani and Pooja expressed a sense of wariness when reading about implementing brain research into instruction. They were both aware of "neuromyths" and wanted to be sure that they were on solid ground when making changes to an established and effective curriculum- and making changes to their business. The fact that Brain-Targeted Teaching came out of Johns Hopkins University provided a strong level of confidence in the BTT research model. Also, the fact that BTT was created by a professor who had actual classroom and administrative experience bolstered confidence that the implementation framework was feasible in an authentic school context.

Curriculum Implementation Process RQ2

What was the process used in changing the curriculum at Intellitots Early Childhood Centers?

The process for changing the existing curriculum and implementing the Brain-Targeted Teaching Model was completed in three stages. In the first stage, the school directors, Pooja and Shivani, immersed themselves in the framework for Brain-Targeted Teaching and the supporting research. In this beginning stage, Pooja and Shivani also reached out to Dr. Mariale Hardiman for advice and feedback. From this initial study, they made some generalizations about areas of strengths and potential gaps in their curriculum.

The second stage included the core administrative and teaching team. Pooja and Shivani used resources from the *Brain-Targeted Teaching* website (http://braintargetedteaching.org/) and excerpts from "The Brain-Targeted Teaching Model for 21st-Century Schools Reading Companion and Study Guide" (2013) to train the leadership team. As the leadership team began to work with the BTT model, there

was a “contagious sense of pride that we were already on the right track with our original units”.

The last phase of the implementation included training all teaching staff on the Brain-Targeted Teaching Model and the actual work of revising the existing instructional units. In the first professional development session, teachers were presented with an overview of BTT. As each Brain Target was presented, the teachers collaborated in grade-alike groups about where and how their existing teaching practices aligned with the BTT Model and where and how potential modifications and refinements could be made. There have been additional professional staff development sessions on BBT, but it is this first professional development session that teachers cite as being the most memorable and important. Of the 40 teacher surveys returned, 36 teachers mentioned this first professional development session as being especially meaningful.

> Each of the school workshops brought in some life transformative moments, built new perspectives, and widened my horizon. But the one I found especially meaningful was the first one on Brain-Targeted Teaching. Even though I was practicing the methodology in an informal way in my classroom, the workshop lent a structure to my entire lesson plan. It made me conscious of the process of linking each activity to all the six BTT areas. It also made me aware that so much research was being carried out in this field, and led me to explore more research dimensions I had not considered, like helping kids develop a big picture of learning. I appreciated that we all had a voice in improving our curriculum and had a common vocabulary to describe the changes we wanted to make. We are doing something important, and we are doing it together.

After the initial staff development with teachers, the leadership team began to systematically rework the curriculum units. The responsibility for writing the curriculum rests with a specific curriculum team made up of teachers and administrators. The changes to the curriculum, however, were made after extensive discussion and receiving feedback from the teachers enacting the curriculum units. There are planning meetings are scheduled at the beginning of each unit to suggest potential unit modifications, and then another meeting is held at the conclusion of the instructional unit to reflect on the modifications and make final changes.

Curriculum Implementation Process RQ3

What specific changes were made to the curriculum?

After reflecting on the degree to which each of the six Brain Targets was integrated into the instructional units, specific changes were made to the existing curriculum. Documents were outlined, by age group, explaining the specific strategies to implement for each Brain Target.

Teachers and administrators saw a strong alignment between what they were already doing to proactively build supportive and positive relationships and Brain Target One. Specific strategies to support Brain Target One were integrated into the curriculum plans (Figure 4.2).

For Brain Target Two, the classroom and school displays were already changed every month. However, after learning about the potential of environmental features to direct attention and enhance learning, the theme boards were designed as "deliberate instructional tools more than decorative additions to the classroom."

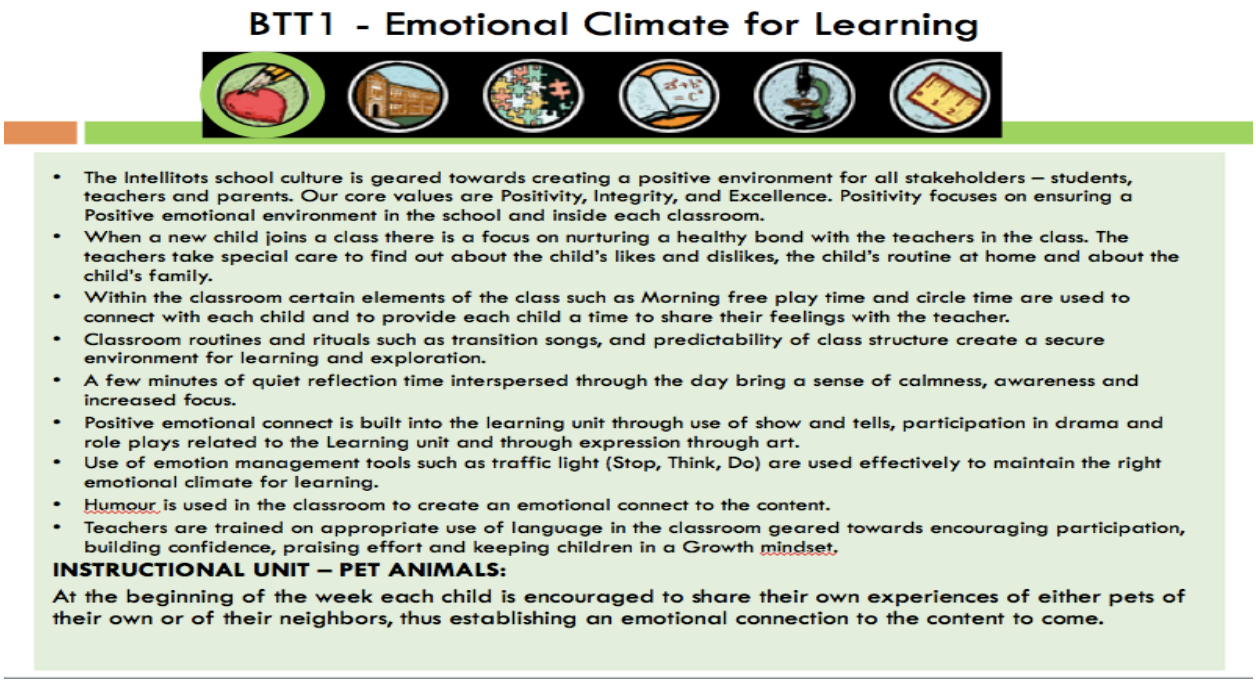


Figure 4.2 Curriculum Plans for Brain Target One

The changes to the theme boards also connect to Brain Target Three - Designing The Learning Experience. Helping young children develop a sense of a conceptual idea is more difficult than just defining a unit through a topic, for example “animals” or “seasons”. Below are some views expressed by teachers about the challenge of helping young learners grasp the “big picture” of instructional units.

> While we had a theme earlier and we prepared the room décor to align with the theme, but we did not place as much emphasis on communication of the high level picture to the children. Now we are beginning to lay a lot more emphasis on conceptual teaching. This is still a work in progress.

> A preschooler will not learn all of the intricacies of a big idea at this age, but they will learn something. Their knowledge now may be incomplete, but the ideas we build can be used as hooks for later learning. It is hard when making a complex

> idea understandable for preschoolers who do not yet read to not oversimplify and leave students with wrong ideas. We have to carefully plan the words we use and the images we share when building "big ideas".

As Intellitots continually strives to improve as an organization, they are revisiting their unit themes to emphasize conceptual learning. They plan to specify the conceptual understandings they want students to remember by focusing on conceptual understandings that will have "shelf life" and extend into later years. From the topic *Cozy Winter* the conceptual theme might be that physical and behavioral changes occur as the weather changes. For young children, it can be worded that as the weather changes people and nature change too.

Brain Target Four - Teaching for Mastery was considered by teachers and administrators to be an established strength of the existing curriculum. An additional level of detail was added into the plans for this Brain Target. A theme provided by teachers regarding changes to the curriculum pertaining to Brain Target Four indicates that while the activities may not change, there is a heightened awareness of the importance of repeating learning songs, activities, and directions to promote long term retention of content. Another theme was the importance of sensory experiences. Shivani stated:

> Brain Target Four was more or less in place with repetition and recall activities happening throughout, as well as teaching in multiple ways with art, music, and drama integration. We are continuing to look at the lesson plans to see how they can be improved further so we design activities that engage the senses of sight, hearing, and touch. For some reason we never thought about the smell. A few

examples from the book enabled us to become more aware of the power of smell.

It is now being used creatively during instruction and in the learning spaces. One teacher summed up the theme of sensory learning by saying, " You can't teach a child about something. You have to teach them through something."

Changes to the curriculum for Brain Target Five, Extending and Applying Knowledge, resulted in training for the teachers on crafting age-appropriate open ended questions and including sample questions in the lesson plans. Show and tell opportunities are also now included in the lesson plans so students can bring items from home and share with the class how the items connect to their current unit.

For Brain Target Six, existing units already included assessment of children's progress through games and art activities each week. A reflection on this Brain Target resulted in a school goal to explore the development of online student portfolios to "capture the joy, learning journey, and progress of each child during their time with us."

Current State of Implementation RQ4

To what extent do teachers at Intellitots Early Childhood Centers practice or integrate indicators of brain-based learning in their teaching?

Combinations of classroom and school observations were conducted during an on-site visit December 7-11, 2015. The results of these observations are used to answer Research Question Four.

BT 1 Emotional Climate for Learning. Classroom and school observations supported the responses from teachers on surveys and during interviews. As students walk into the school, upbeat children's music plays and children are greeted by name, beginning with the security guard at the entrance gate. A whiteboard is used at the

entrance, and positive quotes and pictures are placed on the board each day. There is a large colorful board that announces the names of any children with birthdays on that day.

There are two teachers assigned in each classroom. During morning arrival, one teacher from each classroom stands outside the school to greet and hug parents and children while the other teacher greets students inside the classroom. Didis, the assistants, guide students from the front door to individual classrooms. The Didis greet children by name and warmly welcome them. Figure 4.3 is a photo of this morning greeting routine.

Figure 4.3 Morning Greeting

Once inside the classroom, the instructional day begins with familiar songs using the students' names. The same morning songs are used in all classrooms. During circle time, eye-contact is established with each child and time is allotted to listen to individual stories and questions. Teachers participated in all classroom activities: for example, they played puppets and counted out beans with students. In one classroom, children went outside to further their exploration of circles by playing with hula-hoops. The teacher

took the hula-hoop and twirled it around her waist while smiling and laughing. Humor was used to lower the level of potential stress incumbent with risk-taking opportunities.

Personal, individual, and generous encouragement and praise was observed in each classroom. In one kindergarten classroom, children were dressing up as community helpers of their choice. They were encouraged to come forward and individually tell information about that community helper and recount why they chose that helper. One student was encouraged through lighthearted humor, "A carpenter needs to speak loudly to be heard over the loud hammer" while another was encouraged through a hug and a private word whispered in the ear. A thumbs up gesture was given to several other children when they volunteered to stand up and share. Thus, all children were given encouragement, but through individualized strategies.

Mindfulness strategies were integrated into the daily schedule at Intellitots. Students practiced quiet yoga meditation both within the classroom and through participation in outside physical education classes. Within the classroom, children were directed to sit still and think about how the ground felt below them, how the air felt around them, and the faces of the people that love them. This took less than 2-minutes and children readily participated in the mindfulness activity. In the outdoor yoga class, children were in rows and each had an individual yoga mat. A yoga instructor led them through stretches and poses while relaxing music played in the background. Children voluntarily participated in the outside yoga class. Teachers modeled the mindfulness strategies and gently redirected students as needed. It is interesting to note that at the end of the outside yoga class, all children bowed and thanked the instructor, and then the

music changed to the Gummy Bear song and the children all began to joyfully dance with the teachers and Didis too.

Figure 4.4 Mindfulness strategies inside the classroom

Figure 4.5 Mindfulness strategies outside

A warm and supportive communication style was consistently observed across all Intellitots locations. Routines were easily observable and understood in classrooms of all levels. Mindfulness strategies were explicitly taught through physical education yoga classes and integrated into classroom activities. Students at Intellitos were observed to

enjoy close, warm relationships with the adults and other children in their classroom. There was frequent positive interaction and communication with peers and adults; students do not spend long lengths of time waiting, ignored, or isolated.

BT 2 Physical Environment for Learning. There are several learning zones established within the Intellitots school campuses. These include the following areas: (1) open green spaces (Figure 4.6),(2) outdoor play equipment (Figure 4.7), 2) indoor play equipment (Figure 4.8 and Figure 4.9), (3) library areas with low shelves (Figure 4.10), (4) Montessori labs (Figure 4.11), (5) assembly and performance areas (Figure 4.12), 6) art discovery areas (Figure 4.13), and (6) organized classrooms (Figure 4.14). Throughout the daily schedule, students rotate through several learning zones. The physical space of Intellitots allows for active and quiet time, indoor and outdoor time, short activities and longer ones to address different aspects of child development. The local culture is also integrated into the physical space. Space outside of classrooms is provided for students to store their shoes. It is a custom to remove shoes before going into classrooms of young children (Figure 4.15). Curiously, on the day when the photos were taken of the outdoor spaces, a cow wandered into the outdoor play area. In India, cows are regarded as sacred animals. All the physical spaces are well-maintained and clean. The children are responsible for putting away their materials and classrooms are organized to facilitate this process. Large windows allow for ample natural light and school gardens are planted with herbs and local fruit trees and flowers (Figure 4.16). The trees on the school grounds are labeled by name and picture (Figure 4.17).

Figure 4.6 Physical space outdoor play area

Figure 4.7 Physical space playground equipment with visiting cow

Figure 4.8 Physical space indoor play area with natural light overlooking courtyard

Figure 4.9 Physical space indoor play area

Figure 4.10 Physical space library area

Figure 4.11 Physical space Montessori classroom area

Figure 4.12 Physical space outdoor assembly and group activity area

Figure 4.13 Physical space indoor art activity area

Figure 4.14 Physical space organized classrooms

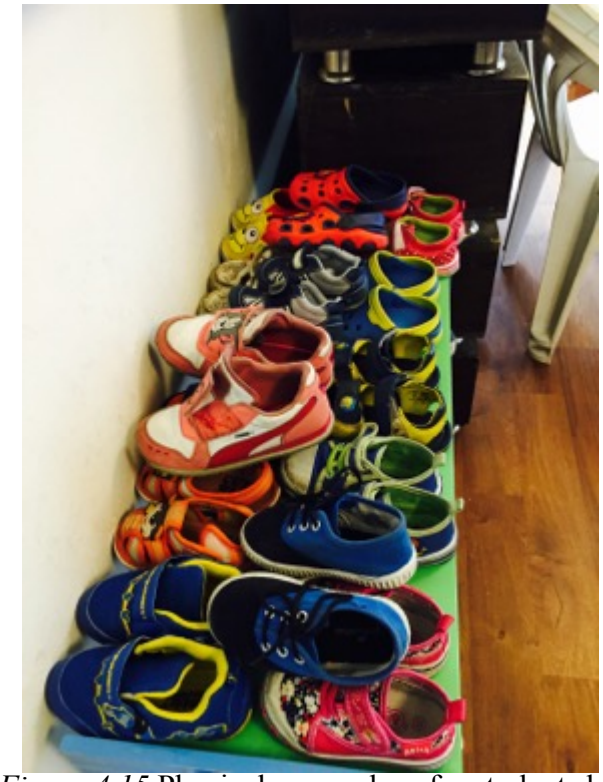


Figure 4.15 Physical space place for student shoes outside classroom

Figure 4.16 Physical Space-Co-Founder and Director of Intellitots in School Garden

Figure 4.17 Labeled trees on Intellitots school grounds

The more permanent elements of the physical environment of the school are used to enhance the aesthetics of the school and elicit positive responses from students. Additionally, temporary elements in the environment are used to influence and promote student attention. In one classroom, a puppet theater area was set up for teachers and students to act out read-aloud stories previously read (Figure 4.18). In another classroom learning about the theme of Cozy Winter, a novel center was set up with a make-believe fire for children to use for imaginary play time (Figure 4.19). The novelty of these two additions to the physical environment captured the attention of the students and supported instructional goals.

Figure 4.18 Physical space puppet theater

Figure 4.19 Physical space for theme-related (Cozy Winter) pretend play

Safety and facilities maintenance evaluations are conducted on a regular basis. The head custodian at each center maintains a log of these evaluations. Specific forms are used and include school, classroom, and grounds maintenance such as the following items:

- All surfaces, counters, sinks, tables, and equipment to be washed and rinsed before and after preparing the meal.
- Classrooms – All classrooms to be cleaned every morning. All high touch areas such as classroom furniture, doorknobs, doors, windows, light switches to be wiped with a disinfectant (mixture of dettol and water diluted in the ratio of 1:20). Classroom mats should be clean. Classrooms should be restocked with tissue paper and All Out or equivalent if needed. Classrooms and other areas should be insect and bug free. All plug points must have a child safety plug.

- The outdoor areas should be checked for any dangerous or sharp objects lying around every morning. Outdoor play areas should be made as green as possible with plants and seasonal flowers. Grass should be well maintained.

Extensive time and care is given to the design, use, and maintenance of the physical environment of Intellitots. A strong connection exists between the physical environment, emotional climate, curriculum, and instruction. One teacher described the physical environment of Intellitots as "the third teacher in the classroom. Children learn from each other, their peers and the environment."

BT3 Designing the Learning Experience. This Brain Target focuses on helping both teachers and students develop an in-depth understanding of conceptual ideas that underscore the big picture of an instructional unit. Within this Brain Target, teachers proactively plan to help students form meaningful connections from content to self and to seek out relationships between academic ideas.

At Intellitots, a theme board is designed for each instructional unit. These theme boards use images and icons to map out the weekly content standards and illustrate the connections between standards. Teachers direct student attention to these theme boards throughout the day. The theme boards are changed each month. There are similar theme boards in every grade-alike classroom. All Busy Bees have a theme similar theme board across the two Intellitots campuses. Figure 4.20 shows a theme board for the unit on Seasons. It highlights the role of the sun, and how animals and people change physically and behaviorally throughout the seasons. Each section on the theme board represents the focus of the weekly subthemes within an instructional unit.

Figure 4.20 Designing the learning experience classroom theme board

BT4 Teaching for Mastery. The focus of Brain Target Four is the integration of specific strategies into instruction that will promote long-term memory, such as repetition and arts integration. Observations at Intellitots provided evidence of music, art, and drama integration in almost every class visited (19 out of 20). In one classroom, students were painting the letter J and turning it into a jellyfish to learn about the shape and sound of the letter J. In another classroom, students were making their own cozy sweaters out of paper and cotton after a magic box activity where they discovered, and tried on, winter clothing. The curriculum units include a list of potential songs and rhymes that align with the content for the unit. Children sang songs in circle time, as they walked to and from different areas of the school, and as they transitioned from one activity into another activity. After reading several stories about zoo animals, children and teachers used puppets to act out conversations zoo animals might have together. Figures 4.21- 4.23 are a few examples of the integration of the arts into instruction observed at Intellitots.

Figure 4.21 Teaching for mastery through visual arts integration

Figure 4.22 Teaching for mastery through music integration

Figure 4.23 Teaching for mastery through drama integration

BT5 Teaching for Extension and Application of Knowledge. This Brain Target addresses what happens after content mastery occurs. This target promotes lasting learning through application of knowledge to real-world tasks that require creative thinking and authentic problem-solving. Direct observation of this target was not as extensive as other brain targets. The one example of application of knowledge observed was through a show and tell activity. Students were asked to bring in objects from home that relate to previously learned content.

BT6 Evaluation of Learning. Both formative and summative assessments were observed during the on-site visit in December 2015. Examples of formative assessments include observations of students during free play and structured activities. Teachers keep a communication journal for each child, and these observations are written in the

communication journal and shared with parents. Figure 4.24 shows an example of a student communication journal. Additionally, summative assessments include one-on-one student interviews. In the Montessori lab, children were called up to the teacher one at a time and asked to complete several two-digit addition problems, such as 24 + 45, using manipulatives. Once the students completed the task, the teacher asked the students to explain the strategies used to solve the problem and to justify how they knew that they had computed the correct sum.

Throughout all the classrooms, evaluation was braided into direct activities and self-directed play. It did not interrupt instruction or cause anxiety in students. The anecdotal notes from observations are used to inform the final student checklist and evaluation. A final report is prepared for each child at the midpoint and conclusion of the year. The reports are written in narrative form (Appendix G) and provide information about student progress and abilities across six domains: (1) language skills, (2) math and logic, (3) general awareness, (4) creative expression, (5) personal and social skills, (6) and physical development. The reports are each about three pages in length. Each report is proofread and checked for content by an administrator before being sent home.

Overall, on-site observations at Intellitots provide substantial evidence of the integration of Brain Targets One, Two, Three, Four and Six. Teaching practices and student activities aligned with these specific targets were observed in multiple classrooms in both sites and on multiple days. There was some evidence of integration of Brain Target Five, but not to the same degree as the other Brain Targets.

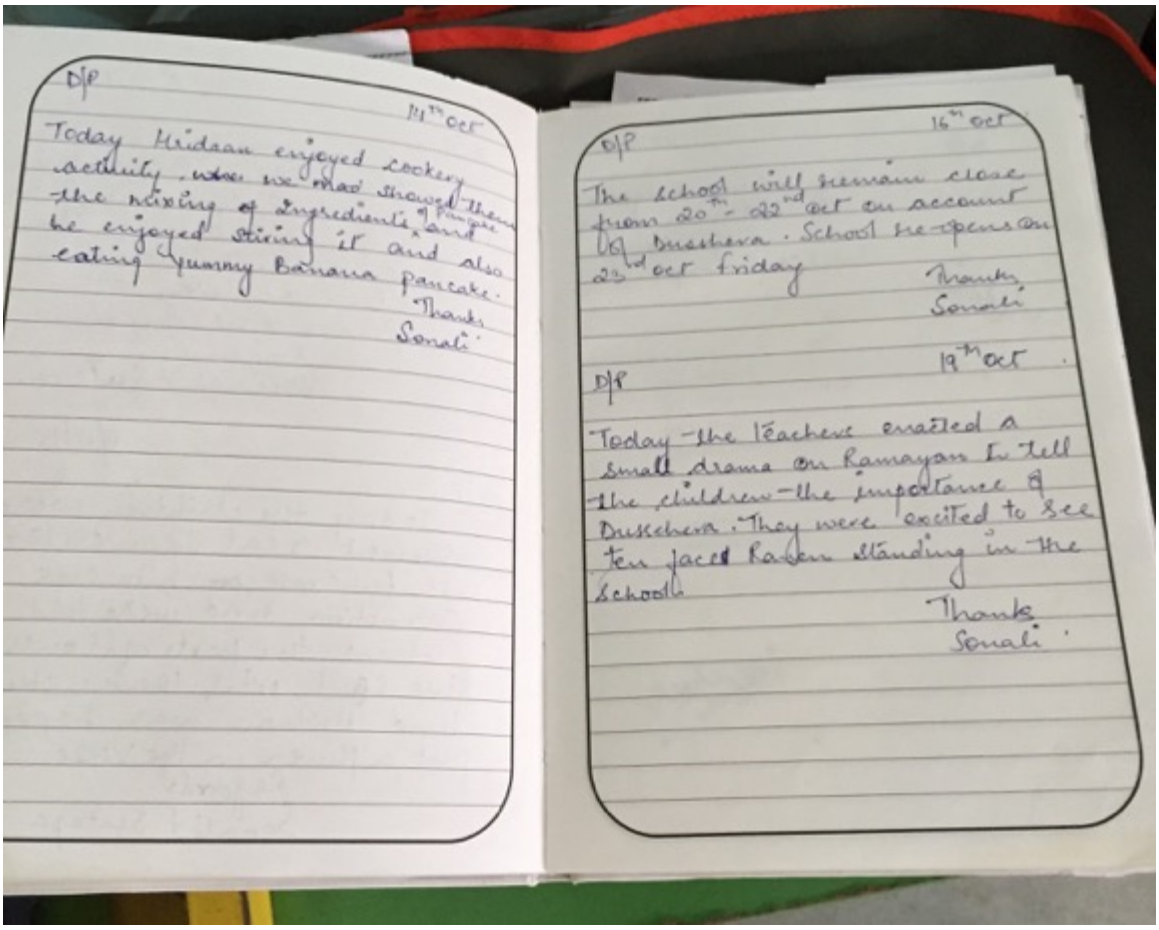


Figure 4.24 Evaluating learning home school communication journal

Current State of Implementation RQ5

What factors do parents identify as most essential in their decision to send their children to Intellitots?

A survey was sent out to parents at Essel Towers and Sector 57 via Survey Monkey. This was a total of 153 parents. There was one response per household even if there were several Intellitots' students in the household. 49 responses were returned online and another 38 were printed and completed by hand. Answers from the hand written surveys were transcribed into Survey Monkey. Six of the hand-written surveys were illegible and not included in the sample. The illegibility seemed to be due to the

style of the handwriting rather than educational background. There were 81 parent surveys in the sample. The return rate for parent surveys was 53%, an average response rate for return rates in the education sector (Bauch, 1999).

The parent survey included three questions designed to elicit reasons why parents chose Intellitots. The first question asked what factors were important when choosing a preschool or kindergarten. The second question was more specific, asking why parents chose Intellitots for their child's education. The third question asked what makes Intellitots unique. All responses were coded using NVivo and the frequency of each code analyzed. A single response could contain several codes. For instance, one response to Question 3 asking what makes Intellitots unique stated, "Good faculty and personal attention. Also it has an organic and warm feel - with hand-cut craft work and paintings and drawings on the walls." Three codes were identified: (1) faculty, (2) individual attention, and (3) facilities. The number and percentage of responses with each code was calculated for each individual question. Under the question "What makes Intellitots Unique?*",* 17 respondents referred to communication and this equates to 17 out of a total of 143 coded responses, or 11.88%. A matrix of the frequency of the codes identified within question is presented in Table 4.4.

Table 4.7

Frequency of codes from parent surveys (n=81)

Description	What factors were important to you when choosing a preschool or kindergarten?		Why did you choose Intellitots for your child?		What makes Intellitots unique?	
	n	%	n	%	n	%
Budget and Costs	3	1.23	2	1.10	-	-
Cleanliness and Hygiene	10	4.13	2	1.10	-	-
Communication	12	4.95	1	0.55	17	11.88
Curriculum	43	17.76	40	22.09	46	32.16
Distance from Home	21	8.68	13	7.18	3	2.09
Facilities	51	21.07	33	18.23	7	4.89
Faculty	33	13.63	36	19.88	43	30.06
High Level of Care	12	4.95	2	1.10	15	10.48
Individual Attention and Student Teacher Ratio	20	9.91	20	11.04	12	8.39
Language of Instruction	1	0.41	-	-	-	-
Moved up from Bouncing Babies	-	-	8	4.41	-	-
Reputation	18	7.43	8	4.41	-	-
Safety	15	6.19	3	1.65	-	-
Word of Mouth from Other Parents	3	1.23	13	7.18	-	-
TOTAL CODES	242		181		143	

The main themes that emerged from the three questions pertaining to why parents chose Intellitots are faculty, curriculum, and facilities. Parents identified that the curriculum at Intellitots was more active and different from a traditional approach. The curriculum was perceived to be not only more enjoyable for children but also resulted in more profound learning. Below are a few quotations from parents commenting on the curriculum at Intellitots.

- The methods are different from the traditional ways and the approach toward learning within the school is more experiential and fun loving.
- With its different style of teaching, or rather I would say different style of making kids learn new things and doing activities on their own, my child is able to do things I wasn't able to do at his age. And he is happy doing it!
- From early days on, Intellitots' management has been focused on ways to help with early brain development in children through creative activities. Intellitots staff has demonstrated the intention of providing a nurturing atmosphere with love making children feel secure and settled.
- Intellitots is a school with a hands-on method for learning; specific attention to individual needs of the child; identifies the strengths of potential in my daughter; and provides a secure and bullying free environment.

The second main theme was the importance of faculty. The comments focused on relationship-oriented words and staff relationships with both parents and children. Parents also identified how the warm relationship between students and staff at Intellitots supported academic growth. Examples of comments about the faculty at Intellitots are below.

- Team Intellitots is genuinely happy and content and thus giving those positive vibes to children as well which is extremely important for children's learning. Since it is the first step out of house, Intellitots makes sure that children are happy, beloved, and comfortable in school. When I give my son from my hands

into another's hands, I want to know he is loved and cared for at school like he is at home.

- The teachers and the principal always surprised us with their level of involvement and approach to making our son's first years so special. They know every scar, scratch or freckle on my child and know that he hates spiders. The best compliment always came from our son, as he was happy going to school everyday without fail.
- Intellitots is unique for several reasons: (1) Its belief and support of me as a parent, (2) How teachers receive the kids at the main gate. Direct emotional touch with children and the parents - essential too, (3) Participation between parents and teachers at various levels, (4) Teachers making learning in fun way and not a typical ABCD mechanism.
- The staff is exceptional. The care provided to my baby was exceptional. She came out of her shell and became a little person.
- The amount of interest taken by the facility is the most important thing, which makes this place the most unique. The child enjoys thoroughly being at the school and we have seen the learning curve of the child progressing at a very fast pace.
- The whole concept of Intellitots is full of love and warmth, which boosts a lot of confidence in the child. The teachers are very loving and care for the children as their own. I am very satisfied with the school.
- Interaction with the teachers and support staff gives us a conviction that they also have a stake in the growth of our child.

The last main theme expressed by parent revolved around facilities. The comments about facilities were not as lengthy as other comments but the frequency of comments about the facilities underscore the importance of the physical space of the school. Cleanliness and safety were coded separately but often occurred in conjunction with comments about facilities.

- We wanted a facility where the child will enjoy and feel safe. Intellitots has open areas as well as great indoors facility.
- We liked the small school with smaller classes and the indoor and outdoor play areas. Children have good space for free play time.
- The facilities the school has support my child's development. The school is designed for young children with everything they need at a low level and with bright colors and their own artwork on the wall.
- Intellitots has spacious classrooms and a well structured day where children work in different activity zones throughout the day- some places are quiet, some noisy but all hygienic and well maintained.
- There is a nice and cozy learning atmosphere. My child really likes the outdoor garden and growing plants.

Current State of Implementation RQ6

What factors do teachers now identify as most essential to effective classroom instruction?

Several data sources were used to answer this research question: teacher survey interviews, focus groups, and classroom visits. Thirty-five out of forty teachers

completed the survey as well as all five center administrators, providing a survey response rate of 89%. During an on-site visit December 7-11, 2015, 11 out of 40 teachers participated in face-to-face focus groups or interviews and 20 classroom observations were conducted. Triangulation of responses from three separate sources was used as a method of validity control.

The teacher survey included questions of belief, personal efficacy, general teaching practices, and implementation of Brain-Targeted Teaching. To answer this research question, responses from specific questions from the teacher survey are considered. Taken as a whole, the data from the three separate research questions provide insights into what teachers regard as most essential to classroom instruction. Table 4.5 summarizes the codes from the teacher surveys.

Table 4.8

Frequency of Codes in Teacher Survey (n=40)

Description	Describe your personal theory of how students learn best?		In your opinion, what factors do you believe contribute to the success of Intellitots?		In your opinion, what information from brain research can be effectively translated into classroom practices?	
	n	%	n	%	n	%
Appropriate Assessment	1	1.78	-	-	9	13.63
Big Picture of Learning	2	3.57	-	-	7	10.60
Curriculum– General	19	33.92	10	14.70	4	6.06
Emotional Climate	15	26.78	19	27.94	17	25.75
Extensions of Creativity	7	12.50	1	1.47	8	12.12
Faculty	-	-	9	13.23	-	-
Leadership	-	-	4	5.88	-	-
Learning Organization	-	-	9	13.23	-	-
Mastery Learning	9	16.07	-	-	9	13.63
Parents	-	-	6	8.82	-	-
Physical Space for Learning	3	5.35	3	4.41	12	18.18
School Vision and Values	-	-	7	12.50	-	-
TOTAL CODES	56		68		66	

Curriculum. In coding responses, curriculum was defined as the "what' of teaching- what is being taught and what is being learned. When asked about their personal beliefs about how students learned best, a significant number of teachers

included beliefs that what children learn is important. This belief can be clarified through the comments of teachers on the survey.

- Students learn best when their own curiosity can be the guide. This means there needs to be room for teacher decisions about the curriculum. One class may be very curious about one thing and the next-door class may be curious about something else. If everyone has to do the same thing at the same time in the same way, the curriculum is the guide and not the child.
- An integrated approach to learning is important to help students learn. Learning activities need to be planned to encourage learning across several domains of learning like academic, social/emotional, and physical. Children learn with their brains, bodies, and hands at the same time. Also, to help students make connections, themes should bring together maths, literacy, art and science.
- Children learn best when what they learn helps them makes sense of their own world.

During face-to-face interviews and focus groups, teachers elaborated on this theme by citing the personal freedom allotted to teachers to use the formalized curriculum as "the starting place" on which to build the specific activities for the classroom. Teachers expressed their belief that this freedom to make curriculum decisions was rooted in a general school belief that each child is an individual with unique needs and that teachers are capable and empowered to make needed curriculum decisions. Overall, teachers at Intellitots place a high value on curriculum and what students learn but more as a function of desirable characteristics of the curriculum (child-focused, integrated and flexible) rather than specific curriculum standards and content.

Emotional Climate for Learning. Across all three questions on the survey and face-to face communication, teachers expressed the high value they place on creating an emotional climate for learning. Teacher-expressed perceptions align across the three questions: personal beliefs of teachers, factors contributing to the success of Intellitots and research from brain science. Comments from teachers explicate the major subthemes within this overall code: (1) safety, (2) individual attention, (3) joy, (4) positive relationships between teachers and children.

Within the subtheme of safety, teachers commented on both physical and emotional safety. One teacher commented, "Students need to be where they are safe to be themselves where they don't worry about others laughing at them." Other teachers commented on the need for students to feel safe when exploring their environment because "exploring is learning."

Individual attention was valued as a personal belief, a reason for success of Intellitots, and supported by brain research. Teachers often connected individual attention with small class sizes.

- Intellitots has small batch sizes, so that teachers can give individual, personalized attention to each child.
- Good student/ teacher ratio, theme based curriculum keeps the interest of the children and results in constructive engagement. Teachers here pay attention to every need of the child.

Joy was expressed as both a result of learning and also as a tool for learning. Teachers also expressed their belief that joy was related to motivation to learn.

- We celebrate special days and learning with joy, cheers, and hugs.

- There is a visible joy when children make a new discovery by themselves.
- Children need meaningful and joyful learning.
- Children want to be happy. So when learning is joyful, children want to learn.
- Children should love the activities they are doing so much that they never want to stop.

Personal relationships with students were frequently mentioned as a source of satisfaction for teachers and as essential for learning.

- Emotional bonding must happen before learning can occur in a classroom.
- I work hard to form emotional connections in my class. I welcome my kids with a smile and a warm hug. I try to make eye-contact with my kids during circle time. Giving attention to the needs and wants of the children helps children learn better.
- A child who loves their teacher will also love learning.

Overall, teacher responses highlight the belief that a positive climate for learning links with both student and teacher learning.

- Brain research emphasizes that learning is enhanced by providing challenging activities and inhibited by threat. Hence creating a positive and safe environment promotes learning in kids and staff. This can also be achieved by providing a stimulating environment, interactive experiences, centering learning on individual interests and making learning contextual.
- We all love to learn at Intellitots! We also all love to teach! We all fit into the process together. If you love what you learn, you want to teach it to others. This is true for directors, teachers, students, and parents. Our common bond of joy in learning makes Intellitots so happy and unique.

Reflection on Curriculum Implementation RQ7

To what extent did efficacy support the implementation of the BTT Model?

This question looks at the relationship between teaching efficacy, collective efficacy, teaching experience and the successful implementation of the Brain-Targeted Teaching Framework (Hardiman, 2012). Teacher and collective efficacy are based in Albert Bandura's (1986) social cognitive theory, which suggests that people have control over their lives through agentive actions (Bandura, 1977, 1997). Bandura posits that people act within "an interdependent causal structure involving triadic reciprocal causation" (1997, p.6). In his reciprocal model of causation, environmental events, personal factors, and behavior affect each other (Figure 4.25). In the present study, a research question explores the relationship between teacher efficacy and experience as teachers' personal factors, collective efficacy as an environmental factor, and the implementation of the Brain-Targeted Teaching Framework (Hardiman, 2012) as a behavioral factor (Figure 4.26).

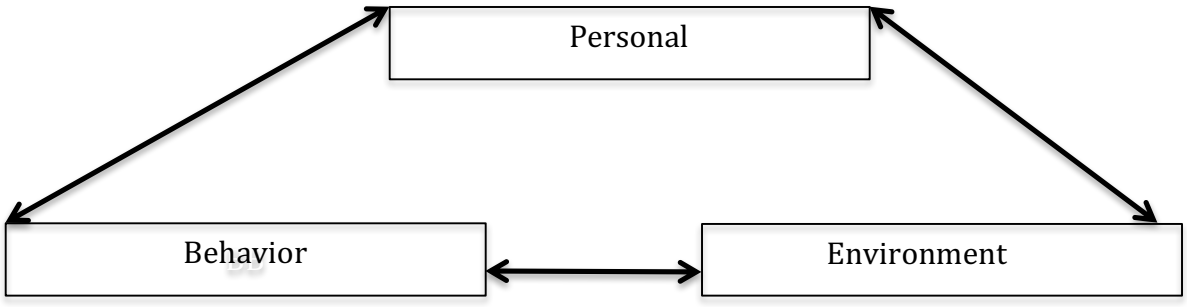


Figure 4.25 Bandura's Model of Triadic Reciprocal Causation

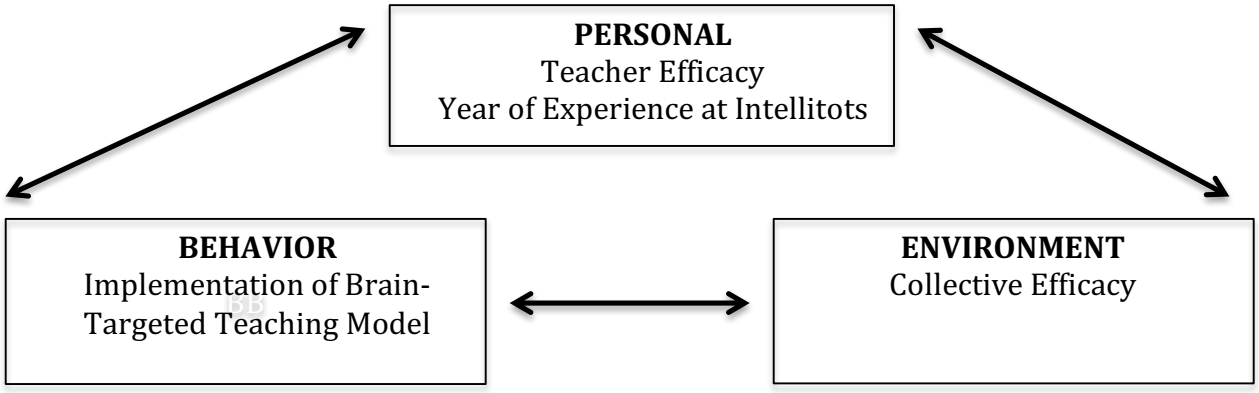


Figure 4.26 Application of the study in Bandura's Model of Triadic Reciprocal Causation

Three survey instruments were used to gather data for this research question. The results were further explored through open-ended questionnaires, focus group responses, and on-site observations.

Collective efficacy scale. Teachers' perceived efficacy was measured by using the 12-item short form of collective efficacy developed by Goddard (2002). Teachers responded to each item on a 6-point Likert-type scale grounded from 1 "strongly disagree" to 6 "strongly agree". One item was changed from the original survey to be more applicable to an early childhood context. Original question 11 "Drug and alcohol abuse in the community make learning difficult for students here." was changed to "Teachers at this school have the skills to help students master complex concepts"

Teacher efficacy scale. The general variables of personal teaching efficacy and general teaching efficacy were measured using the Gibson and Dembo (1984) short form for the Teacher Efficacy Scale. This survey consists of 14 items. All survey items are answered on a 6 point Likert-type scale from 1 "strongly disagree" to 6 "strongly agree" This survey is grounded in two separate factors: personal efficacy and general efficacy.

Personal efficacy considers a teacher's perception of her instructional abilities to influence students learning. An example survey item is: "When a student does better than usual, many times it is because I exerted a little extra effort." (Gibson & Dembo, 1984). The second factor, general efficacy, considers a teacher's perception of the power of teaching when compared to other factors in a student's environment or background. An example survey question is: "The influences of a student's home experiences can be overcome by good teaching" (Gibson & Dembo, 1984). Seven of the questions are aligned with personal efficacy and the other seven questions are aligned to general efficacy. This survey was administered to Intellitots staff as written without any revisions.

Brain-Targeted Teaching efficacy scale. The researcher designed this instrument (Appendix G). It aims to measure the degree to which teachers perceive the efficacy and value of the Brain-Targeted Teaching. This survey consists of 10 questions anchored to a 6-point Likert-type scale. This survey was designed with the guidelines from Bandura's "Guide for Constructing Self-Efficacy Scales" (2006). The recommendations include wording questions to illicit perceived capabilities through using *can* statements rather than *will* statements. Sample questions include "To what degree can the Brain-Targeted Teaching framework help to produce meaningful student learning?" Other guidelines recommend that efficacy scales should be tailored to activity domains rather than to factors that have little or no impact on the domain of functioning. For example, if relaxation does not affect drug use, then perceived self-efficacy to relax will be unrelated to drug use because the causal relationship is faulty. All questions from the BTT efficacy survey directly map onto specific brain-targets from the Brain-Targeted

Teaching Model (Hardiman, 2012). The degree to which the belief in the efficacy of BTT translated into enacted classroom practice was observed through on-site observations and responses to open-ended questionnaires.

The following explanation concerning terminology is provided to add clarity to the presentation of results. In most cases the variable names are abbreviated: PE is used for personal teaching efficacy, GE is used for general teaching efficacy, TE is used for the combined overall construct of teaching efficacy, CE is used for collective efficacy, and BTT is used for teacher efficacy beliefs of Brain-Targeted Teaching.

This section is presented in two sections. The first presents the preliminary analyses, and the second section describes the results of hypothesis testing. The discussion and implications of these results are presented in Chapter 5 of this study.

Preliminary Analyses. The analysis was performed using Statistical Package for Social Science (SPSS) 16.0. Before conducting any analysis, several steps were conducted to be sure the data were both accurate and useable. In the first step, the data were examined for errors or missing values from the survey. The data from one respondent was deleted because only the first two questions on the survey were answered. In the second step, frequencies were run to check for outliers to see if data was entered incorrectly. Since responses on the surveys ranged from 1-6, data were checked for responses outside of this range. No responses were outside of this range, so no deletions were necessary. Finally, both the Teacher Efficacy Scale and the Collective Efficacy Scale include items that need to be reverse scored. The scoring of these items was reversed and double checked for accuracy. Completing these three basic steps ensured that statistical results were not influenced by incorrectly entered data.

Normalcy of the data was verified through histograms, tests for skewness and kurtosis and the Shapiro-Wilk test. The Shapiro-Wilk test compares the scores in the sample to a normally distributed set of scores with the same mean and standard deviation. If the test is non-significant ($p > .05$) it provides evidence that the distribution of the sample is not significantly different from a normal distribution. The Shapiro-Wilk test is recommended for small and medium sized sample up to n=2000. The score for all three variables were normally distributed. Table 4.9 provides information on the tests for normalcy and Figures 4.27- 4.29 provide histograms with imposed normal curve lines. Once the data was judged to be sound and valid, statistical tests were conducted.

Table 4.9

Test for Normalcy

Variable	Skewness	Kurtosis	Shapiro-Wilk Sig.
TE	-0.183 (*SE*=0.374)	-0.920 (*SE*= 0.733)	0.055
PE	0.378 (*SE*=0.369)	-0.639 (*SE*= 0.724)	0.080
GE	0.124 (*SE*=0.369)	-0.646 (*SE*= 0.724)	0.137
CE	-0.334 (*SE* = 0.374)	-0.334 (*SE* = 0.374)	0.077
BTT	-0.307 (*SE*=0.374)	-0.937 (*SE* = 0.733)	1.090

Note: TE= Teacher Efficacy Survey; PE= Personal Efficacy Subsection of TE; GE= General Efficacy Subsection of TE; SCE = Collective Efficacy Survey; BTT= Brain-Targeted Teaching Efficacy Survey

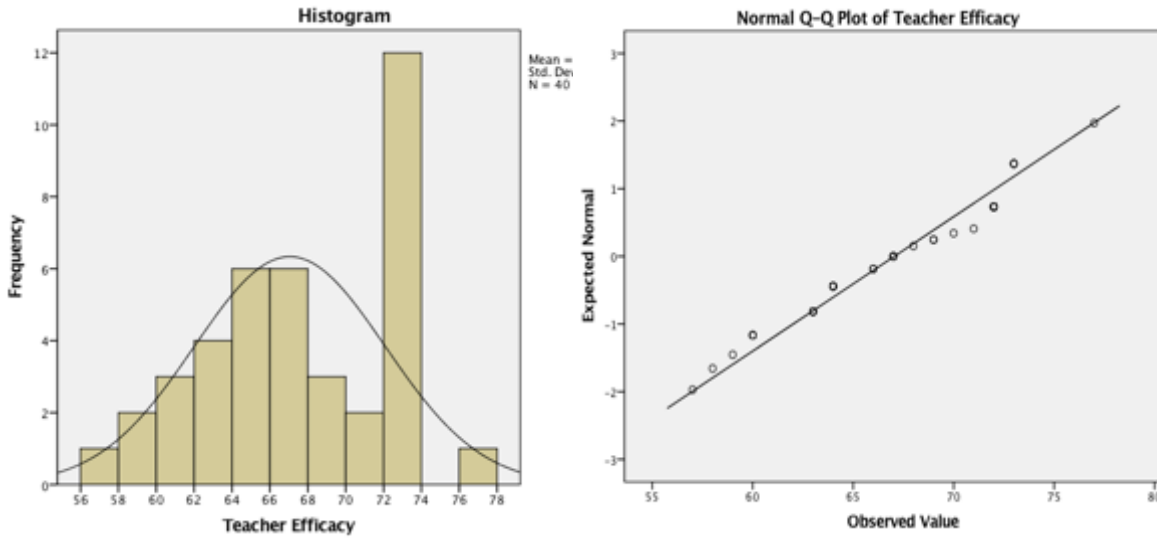


Figure 4.27 Histogram and Normal Q-Q Plots for Teacher Efficacy

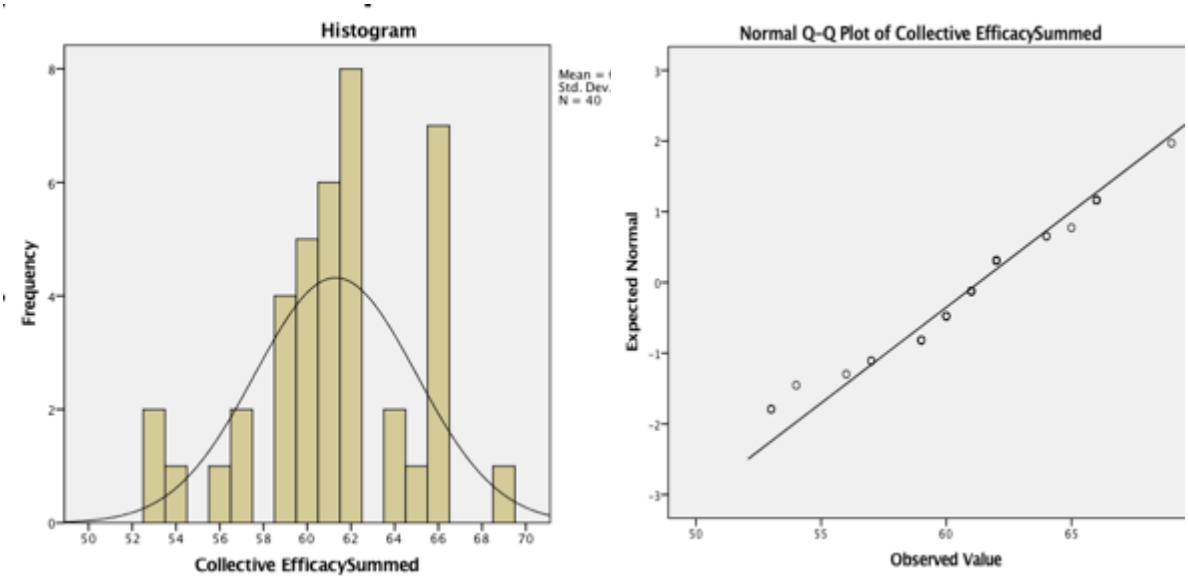


Figure 4.28 Histogram and Normal Q-Q Plots for Collective Efficacy

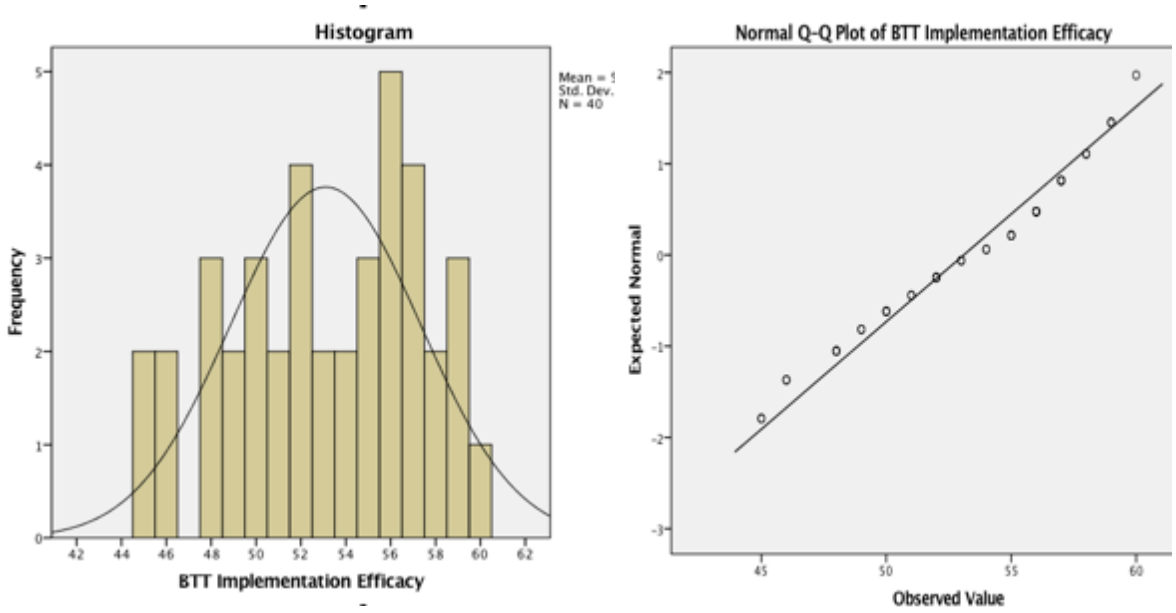


Figure 4.29 Histogram and Normal Q-Q Plots for BTT Implementation Efficacy

Hypothesis testing overview. Based on qualitative responses to the open-ended questionnaires and focus group responses, the hypothesized models for this specific question were as follows:

Hypothesis 1: A significant correlational relationship would emerge among teacher experience, general efficacy, personal efficacy, collective efficacy and efficacy of the Brain-Targeted Teaching Model (Hardiman, 2012).

Hypothesis 2: The efficacy of Brain-Targeted Teaching Model could be predicted by the independent variables of general teaching efficacy and collective efficacy.

Hypothesis 3: Efficacy of of BTT would mediate the relationship between length of years at Intellitots and collective efficacy.

Mediator variables specify how or why a particular effect or relationship occurs. Mediators describe the psychological process that occurs to create the relationship, and as such are always dynamic properties of individuals (e.g., emotions, beliefs, behaviors).

Baron and Kenny (1986) suggest that mediators explain how external events take on internal psychological significance. The overall aim of this study was to analyze the preconditions necessary for a successful implementation of a brain-targeted translational curriculum model. Understanding the relationship between the variables that shaped behaviors was essential to realize this aim.

In order for the first hypothesis to be analyzed, bivariate correlations were used with all of the study variables. For the second and third hypothesis, regression analysis techniques were used to examine the direct and indirect effects among the variables. Baron and Kenny's (1986) approach to mediation regression analysis was utilized. This technique is described as especially appropriate when there is information about the problem derived from theory, research and observable practice. Regression path analysis was appropriate in this research question where the tenets of social cognitive theory are established. In addition, as explored in previous literature review, previous research offers strong empirical and theoretical support for the hypothesized relationships between variables.

Analysis of Hypothesis 1. Hypothesis 1 stated that significant relationships would emerge among teacher experience, general efficacy, personal efficacy, collective efficacy and efficacy of the Brain-Targeted Teaching Model. Pearson correlations were calculated between the study variables. Significant positive correlations were found between CE and BTT, $r = .540$, $p < .001$; CE and Time at Intellitots, $r = .514$, $p = .001$; and BTT and Time at Intellitots, $r = .454$, $p = .003$. Personal efficacy and general efficacy were highly correlated with teaching efficacy because PE and GE are subsections of the overall TE survey.

Hypothesis 1 was partially supported. Within this data, no significant relationships were found with the teaching efficacy variable or with teaching experience. It was expected that teacher efficacy and collective efficacy would be functions of each other to some extent. The current results that demonstrate a lack of correlation could provide evidence that there are separate forces at work that contour teacher' individual and collective efficacy beliefs. A teacher might feel that colleagues do a better job of influencing student achievement than she does. Another possible hypothesis could be grounded in Indian cultural factors that value collective achievements. Table 4.10 reports correlations among all study variables.

Figure 4.10

Bivariate Correlations Among the Study Variables

Variables	1	*2*	*3*	4	5	6	7
1. Teacher Experience	1						
2. Time at Intellitots	-.070	1					
3. Teacher Efficacy-Total	.253	.199	1				
4. Personal Efficacy-Subsection	.280	.146	.680**	1			
5. General Efficacy-Subsection	.151	.167	.876**	.242	1		
6. Collective Efficacy	-.016	.514**	-.021	.100	-0.94	1	
7. BTT Efficacy	.186	.454**	.221	.267	.116	.540**	1

** Correlation is significant at the 0.01 level (2-tailed) * Correlation is significant at the 0.05 level (2-tailed)

Analysis of Hypothesis 2. Hypothesis 2 predicted that Brain-Targeted Teaching efficacy could be predicted by the independent variables of teaching efficacy (including both personal and general $f^2 = \frac{R^2}{1 - R^2}$ efficacy) and collective efficacy. A multiple regression was conducted to predict BTT efficacy from teacher efficacy and collective efficacy. The assumptions of linearity, homoscedasticity, unusual points, and normality of residuals were met. There were no outliers. The assumption of independence of errors was violated with a resulting Durbin-Watson statistic of 0.643; however, there is no cause to believe adjacent observations (specifically, their errors) are correlated (i.e., not independent). A significant regression was found ($F(2,37) = 9.749$, $p < .000$, with an R^2 of .345. Using the R^2, a further examination of effect size can be considered by calculating Cohen's f^2. Cohen's f^2 method measures the effect size when methods like multiple regression are used (Cohen, 1988). The Cohen's f^2 measure effect size for multiple regressions is defined as the following:

The effect size for this analysis ($f^2 = .0527$) is considered a large effect size. Cohen suggests f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes(Cohen, 1988). Predicted Brain-Targeted Teaching efficacy is equal to 1.666 + .196 (Teacher Efficacy) + .625 (Collective Efficacy). Collective efficacy was the only significant predictor of Brain Targeted- Teaching efficacy. Regression coefficients and standard errors can be found in Table 4.11.

Table 4.11

Summary of Multiple Regression Analysis Predicting BTT Implementation Efficacy

Variables	B	SE_B	β
Intercept	1.666	12.143	
Teacher Efficacy	.196	.112	.232
Collective Efficacy	.625	153	.545**

**Note. **** p<.001: B= unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient

Analysis of Hypothesis 3. Baron and Kenny (1986) require a three-step approach to analyze hypothesized mediation models. The method to test for mediating variables has been cited in over 58,000 journal articles, including several articles on teaching efficacy. The Baron and Kenny model of mediation was used to examine the relationship between emotional intelligence, teacher efficacy and length of experience (Penrose, Perry, & Ball, 2007), the mediating role of teacher efficacy on organizational and personal predictors of teacher commitment (Chan, Lau, Nie, & Hogan, 2007), and the relationship among school types, teacher efficacy beliefs, and academic climate (Chong, Klassen, Huan, Wong, & Kates, 2010). To complete all three steps expected in the Baron and Kenny model of mediation, several regression analyses were conducted, and the significance of the coefficients were examined across each of the three steps. It is essential to note that the data will only support the hypothesis when the requirements for each set are met (Kenny, 2008). Figure 4.29 illustrates this model for Hypothesis 3.

Step 1. Show that the predictor variable is correlated with the outcome.

Step 2. Show that the predictor variable is correlated with the mediator.

Step 3. Show that the mediator affects the outcome variable.

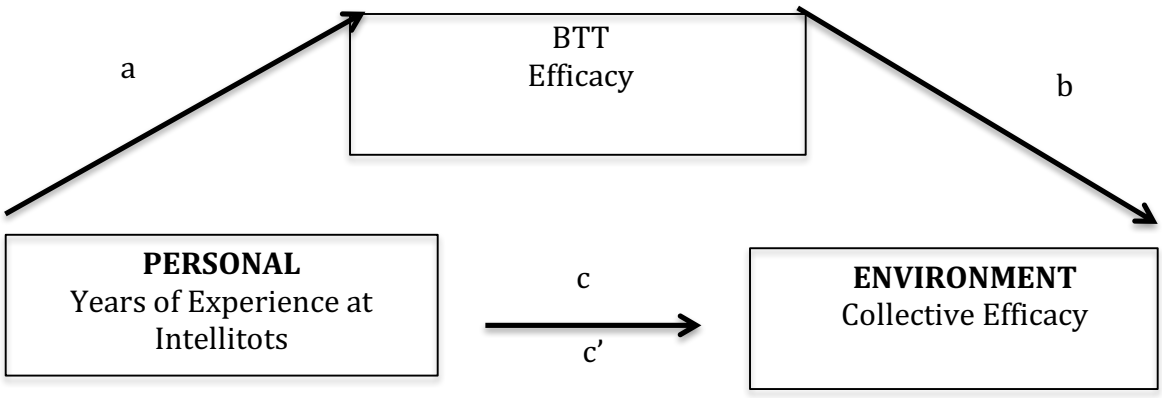


Figure 4.30 Application of the study to variable mediation

Results from three regression analyses revealed that the data supported Hypothesis 3. BTT efficacy partially mediated the relationship between years of experience at Intellitots and collective efficacy. Years of experience at Intellitots alone was a significant predictor of collective efficacy (path c), $F(1,38) = 13.621$, $p = .001$, and accounted for 26% of the variance in collective efficacy. These data indicate that levels of collective efficacy increase as teachers remain working at Intellitots. But this regression analysis alone does not explain what is it about tenure at Intellitots that increases collective efficacy.

The second regression analysis revealed that years of experience at Intellitots was also a statistically significant predictor of BTT efficacy (path a), $F(1,38) = 9.887$, $p = .003$, and accounted for 20% of the variance in the efficacy of BTT. This model indicates that teachers with more experience working at Intellitots have stronger beliefs in the efficacy of BTT.

The third regression analysis revealed that BTT efficacy was also a significant predictor of collective efficacy (path b), $F(1,38) = 15.611$, $p < .001$, and accounted for

29% of the variance in collective efficacy. This analysis indicates that teachers with the experiences from the implementation of BTT held a higher sense of collective efficacy.

Regression results indicate that when years of experience at Intellitots and BTT efficacy were jointly entered to predict collective efficacy (path c'), both variables were statistically significant predictors of collective efficacy, $F(2,37) = 11.437$, $p < .0001$. Further, $R^2 = .382$ indicates that 38% of the variance in collective efficacy is explained by years of experience at Intellitots and BTT efficacy. Examinations of standardized beta weights indicated that both years of experience at Intellitots and BTT implementation efficacy uniquely contributed to the prediction of teachers' collective efficacy; however, in path c' when the model controlled for the effect from BTT efficacy, the β for year of experience at Intellitots dropped in significance from .514 to .338, suggesting partial mediation.

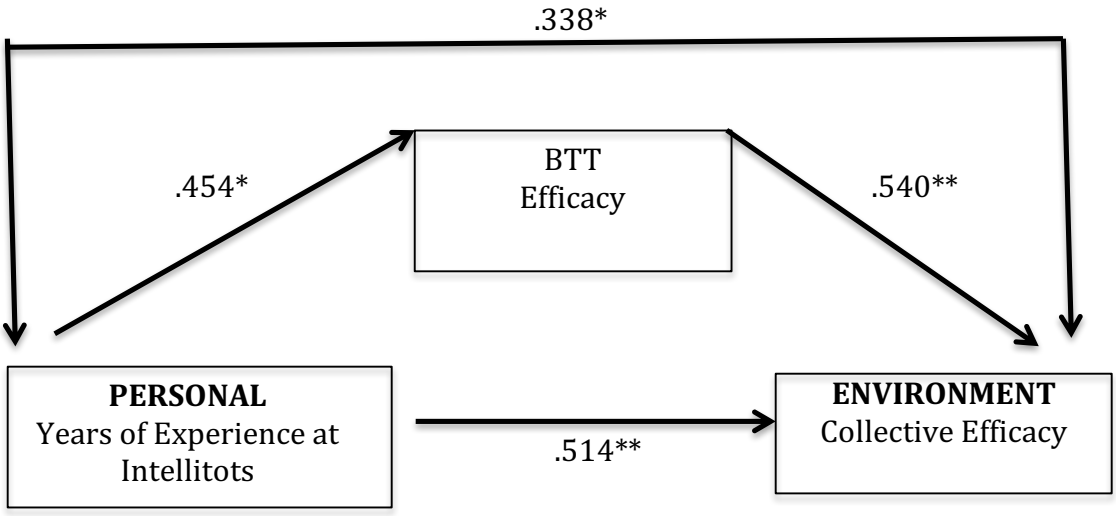
The final step in this analysis was to determine if the amount of mediation was statistically significant (path c'). A Sobel test was conducted. Results of the Sobel test suggest that the association between years of experience at Intellitots and collective efficacy was partially mediated by BTT efficacy ($z' = 1.973$, $p=.04$). Additionally, there was a significant indirect relationship using the bootstrapping method with bias corrected confidence estimates (based upon 1000 iterations) to test the mediation hypothesis (Preacher & Hayes, 2004), $K^2 = .18$, 95% BCa CI [.07, .34]. Because zero is not in the bias corrected confidence interval, results indicate a significant indirect relationship within the model. Additionally, a K^2 score can be equated to the values used for $R^{2:}$: a small effect is around.01, a medium effect is around .09, and a large effect is around .25 (Cohen, 1968; Field, 2013). Therefore the K^2 value of .18 is a moderate effect size.

Table 4.12

Summary of 3 Regression Analyses for Hypothesis 3

Regression	Path Tested	*F*	*df*	β	SE_{Est}	R^2
1	Path c	13.62 **	(1, 38)	.514 **	3.21	.264
2	Path a	9.88*	(1, 38)	.454*	3.82	.206
3	Path b	15.61**	(1, 38)	.540**	3.15	.291
	Path c'	11.43**	(2, 37)	.338*	2.92	.349

p < .05 ** p< .01



*p< .05 **p<.01

Figure 4.31 Diagram of mediation

In summary, the relationship between the years of experience at Intellitots and perceptions of collective efficacy can be explained by their relationship to a third variable, perceptions of the efficacy of Brain-Targeted Teaching. The collaborative efforts required in BTT implementation combined with the amount of time working at Intellitots results in a high sense of collective efficacy and a consolidated understanding of what is meant by the *Intellitots' Way*. These results suggest that teachers who have lengthier terms of experience at Intellitots and higher levels of BTT efficacy express

more efficacious beliefs about the collective talents of the staff at Intellitots. It is worthy to note that the mean collective efficacy score for Intellitots was 5.1083. The score for the normative sample in the often-cited "Collective teacher efficacy: Its meaning, measure and effect on student achievement" (Goddard, Hoy, & Woolfolk, 2000) was 4.1201. When the mean score of Intellitots was standardized and compared to the normative sample score, Intellitots scored at one full standard deviation above the normative sample and thus approximately higher than 84% of schools.

Reflection on Curriculum Implementation RQ8

To what extent is the original Brain-Targeted Teaching Model adapted for implementation within an early childhood setting in India?

Interviews with school administrators did not suggest that any major adaptations were needed when implementing the Brain-Targeted Teaching Model in Intellitots. There were areas where local culture was integrated into the curriculum. Regional and national Hindi festivals, such as Dwali are celebrated through songs, stories, and activities. Additionally, local culture is merged with non-traditional holidays such as Christmas. The life of Gandi is blended with stories of Christmas giving to promote the value of giving to others during the season of Christmas in December. Additionally, many stories and songs are taught to children in both English and Hindi reflecting a national value of bilingualism.

As an early childhood provider, Intellitots chose to initiate the implementation of the Brain-Targeted Teaching Model with a focus on the first three targets: (1) Emotional Climate for Learning, (2) Physical Environment for Learning, and (3) Designing the Learning Experience. Interviews with teachers and administrators alike show a common

belief that integrating Brain Target One and Brain Target Two was fairly straightforward since those targets already aligned with their current beliefs and use of space. As a school for early learning, their stated foundational belief is based on emotional care of children and this directly aligns with Brain Target One. Changes and enhancements were made to the curriculum and the physical space, but no complete overhauls were needed. The previous curriculum did not include any activities or provisions to support the big picture of learning described in Brain Target Three. For this reason, substantial time and energy was needed to translate this brain target into an early childhood setting. Most children at Intellitots are not yet fluent readers, so using Venn Diagrams or other text-based graphic organizers was not an effective option. Curriculum designers embedded the use of theme boards with every unit to promote conceptual understanding. These theme boards are colorful and use images and icons to represent ideas instead of text. Each classroom of the same level has the same theme board in the classroom. The theme boards map out the major academic standards of the unit as well as previewing unit activities. For instance, a theme board on animals has two main sections: zoo and farm animals. On each section are pictures of animals and some of the pictures are craft activities the students will complete later in the unit. Images are also used for key vocabulary words.

Conclusion

This results section summarized both qualitative and quantitative data to elaborate the story of how one early childhood center in Gurgaon, India implemented a brain research translational curriculum model into their school. The temporal events and core decisions that shaped the BTT implementation progression were explored. The degree to which BTT is implemented into daily classroom practice and school structures was

discussed through the use of open-ended questionnaires, focus group responses, and on-site observations. The perceptions of parents and school staff about the implementation of BTT were compared and unifying themes were identified. A statistical analysis was used to understand the mediating role of perceptions of the efficacy of BTT on collective school efficacy. Several core themes were identified and triangulated across multiple sources. The mixed methods results presented here in Chapter Four support additional discussion of these findings and form the foundation for the conclusions, implications for practice and recommendations for future research in Chapter Five.

Chapter Five – Discussion

Introduction

This case study reports on what took place, what was learned, and what other potential curriculum reformers can expect if they, too, embark upon implementing a Brain-Targeted Teaching framework. In this manner, the study aims to be a resource for other early childhood educational institutions interested in either improving or completely revamping their curriculum. This chapter presents answers to the research questions of importance in this study, describes the conclusions from this research, and presents implications for future research and practice to help education "move beyond isolated acts of intuition to a comprehensive set of brain-compatible strategies and thus to new and more powerful outcomes" (Kovalik & Olsen, 1998, p. 33

This dissertation looked at how one early childhood learning center faced the challenge of a lack of research on neuroeducational curricula for young children. Intellitots was the first school in India to implement the Brain-Targeted Teaching Model (Hardiman, 2012). Intellitots has seen its enrollment grow from 12 to over 400 in five years and now operates four learning centers in Gurgaon, India. In addition, overall staff job satisfaction is high. There is a very low turn over rate of teachers with only three teachers leaving in 2014. Parent satisfaction is also quite high, as evidenced by 100% of parent survey respondents saying they would recommend Intellitots to another parent (n=81). A mixed methods causal process-tracing model was used to identify the factors that supported the successful implementation of a brain research translational curriculum model. These factors can be grouped as sociocultural, normative, school structure, and political.

Sociocultural Factors

Intellitots began as a small mommy-and–me program based on the foundational values of play and positive relationships as the core components of learning. The research behind BTT provides evidence to support both play and positive relationships to support learning (Hardiman, 2012; LeDoux, 1996; Radin, 2005; Sylvester, 1994). This alignment resulted in a foundational trust in the components of the new curriculum structure. To ensure that findings from the learning sciences are not misapplied, it is important that there be clearly understood research guides. These guides can be in the form of written guides or people.

According to Intellitots school directors, the clear and substantial research support for BTT found in books (Hardiman, 2012; Hardiman, 2003) and personal attention from Johns Hopkins' faculty members provided direction and support for reforming their curriculum based on findings from the learning sciences. School and university partnerships require more than a one-way flow of information (Fischer, Bernstein, & Immordino-Yang, 2007). This bi-directional partnership offered direct benefits for all parties involved. Being the first school in India to implement a curriculum based on BTT, the importance of the partnership with Johns Hopkins was magnified. This partnership between Intellitots and Johns Hopkins exemplified one of the primary goals in the field of neuroeducation to join research from the biological and social sciences with education so that education will be more solidly grounded in research, and so that the research can be refined to have practical applicability (Coch, Michlovitz, Ansari, & Baird, 2009; Fischer, Goswami, Geake, & the Task Force on the Future of Educational Neuroscience, 2010).

Additionally, the implementation of a curriculum designed using the BTT model was accomplished over the course of three years. The directors at the study site had the capacity to engage teacher leaders in an innovative and incremental change process. The change process purposefully built on the existing practices and strengths of the organization. In alignment with the existing practices and values of Intellitots, the implementation began with a focus on the first three brain targets: (1) Creating an emotional climate for learning, (2) Creating a physical climate for learning, and (3) Designing the learning experience. The responsible roll-out of a new innovation allowed time to garner staff buy-in. The careful alignment between the first three brain targets with early childhood values and Indian cultural values also helped to support the implementation of BTT.

The BTT curriculum model derives its principles from research on learning generated by a diverse array of scientific disciplines. These principles fit within a system of childhood development and reflect universal properties of the brain as is currently understood. This approach provides the opportunity to work within different cultural backgrounds while respecting the differences those contexts pose. Culture, which is comprised of behaviors, values, symbols, meaning systems, communication systems, rules, and conventions, is shaped by and in turn shapes the mind and brains of individuals in the culture (Keesing,1974). As cognitive neuroscientists have pointed out, localized brain areas may be activated in a particular task; however, the extent and onset of this activation may be fine-tuned by cultural values and preferences (Adams et al., 2010; Chiao et al., 2008; Freeman, Rule, Adams, & Ambady, 2009, Hedden et al., 2008).

Because BTT is based on research that integrates the role of culture on development and learning, the BTT model was readily transferable to an Indian context.

Culture shades all learning. This belief is underscored in Developmentally Appropriate Principle 8: Development and learning occur in and are influenced by multiple social and cultural contexts. (Copple & Bredekamp, 2009) This principle aligns with a core value from Intellitots that children are active learners drawing on physical and social experience as well as culturally transmitted knowledge to construct their own understanding of the world around them. Thus, alignment between the tenets of child development valued by Intellitots and the understanding of the role of culture on development and learning embedded in the Brain-Targeted Teaching Model, especially through Brain Target One: Create an emotional climate for learning, and Brain Target Two: Create a physical climate for learning, was a key factor in the successful implementation of a translational brain targeted curriculum.

Normative Factors

In addition to aligned values and other sociocultural factors, normative factors supported the successful implementation of the BTT framework. Collective efficacy was the primary normative factor that contributed to the successful implementation of the BTT framework. Social cognitive theory defines efficacy beliefs as "perceptions of capability to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997). Analogous to self-efficacy, collective efficacy is associated with the following factors: tasks, level of effort, persistence, shared thoughts, stress levels, and achievement of groups (Goddard, 2000). As reported in Chapter 4, the mean collective efficacy score from teachers at Intellitots was one full standard deviation

above the normative sample. This normative sample was based on schools in Ohio, and there are no comparative samples from India, but the higher than average collective efficacy scores from Intellitots are still worthy of note.

Intellitots provided time for staff to collaborate on instructional issues, and this designated learning, planning, and reflecting time contributed to the development of collective efficacy. During this collaborative time, teachers work with their peers to develop skills and strategies by discussing current research from the brain sciences, ways to reach students, and problem solving challenges that exist in the classroom. Additionally, by having two teachers within each classroom, teachers modeled different approaches with each other and discussed varied approaches to enhance the learning of their students. Teachers generate efficacy when they witness previously unseen levels of student achievement in their classrooms, and they attribute changes in student skill levels as resulting from their deliberate change of instructional practice. Additionally, the opportunity to watch co-teachers interact with students provided teachers with vicarious experiences to build self-efficacy by watching others do a task that either they have never done before, or have done with mixed success.

Developing a supportive work group allowed teachers to feel comfortable sharing their challenges and created an environment that encouraged a reliance on the expertise of each member of the staff. Consistent constructive and positive support from peers enhanced each teacher's professional opinion of her peers, thus resulting in an increased level of confidence and collective efficacy. Results of this study suggest that this supportive environment, provided on a consistent basis, is a key component of collective teacher efficacy. Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) note that "teaching

is typically performed in a group context. In fact, many problems teachers face require that they work together to change the lives of their students" (p.241). This interdependence of teachers within Intellitots, and schools in general, highlights the importance of collective efficacy as an important research construct. Neuroeducation itself is about collaborative work and represents a cohesive organization focused on a shared goal. The BTT implementation process mirrored this collaborative work focused on a shared goal. The interacting components of BTT curriculum reform, combined with professional development on cognitive science, psychology, biology, linguistics and educational research, validated good teachers' practices and motivated innovative ideas to produce meaningful student learning.

School-Level Factors

Several school structures support the implementation of the BTT model. Responses from the teacher survey suggests that the daily work day that affords teachers two hours a day to plan with peers allows time for teachers to feel confident with the lessons they present to students. Additionally, results from both parents and staff suggest that a low teacher-to-student ratio promotes the development of close relationships. Built into the school calendar are set times before each new instructional unit for teachers to contribute new ideas and understand the alignment between the codified BTT curriculum and research from the brain sciences.

Responses from parent surveys revealed that overwhelmingly parents value the staff at Intellitots. They identify the quality of the staff as a primary driver in the selection of Intellitots as their choice for an early childhood provider in spite of higher-than-average tuition. In India, early childhood providers are not required to hire certified

educators as teachers. Instead of hiring practices that value certifications, Intellitots seeks out teaching candidates who demonstrate a love of continuous learning and value professional development.

Further, the complex, context-specific nature of the work of teaching makes improving education a moving target. This in turn renders teachers' continuous learning a central task of education. Research concerned with improving teacher knowledge and skill has established that professional development that is long-term, school-based, collaborative, and focused on the interactions of teachers and students around specific content yields the best results (Darling-Hammond & Richardson, 2009; Darling-Hammond & Sykes, 1999; Garet, Porter, Desimone, Birman, & Yoon, 2001 Edmondson, 2002). The knowledge base associated with organizational learning (Edmondson, 2002) and the sociocultural theory of education (Vygotsky, 1978) suggests the conception of learning as a collective, rather than an individual, exercise. This applies to all levels of education, from early childhood to adult learning. The school-level structure of ongoing context-embedded adult learning promoted a value of the same social and active learning expected in the classroom. This alignment between adult and student-level learning theory strongly supported the successful implementation of a brain research translational curriculum model.

Political Factors

To add to sociocultural, normative and school level factors, political factors also led to the successful implementation of the BTT curriculum. Although there is a core leadership team responsible for the writing and formatting of the daily curriculum units, all staff opinions and ideas are valued and considered for inclusion into the codified

curriculum. All staff members participate in the planning and implementation of the curriculum. Additionally, after completion of the instructional unit, all staff members collectively judge the effectiveness of the instructional activities and resources. All teachers are actively involved in the collection of documentation of practice. The heavy emphasis on teacher development and curriculum made implementing a translational curriculum model more closely linked to school leadership. This requires that not only teachers develop an understanding of current brain research as it relates to educational goals, but that administrators are also trained and well-versed in the science of development and the learning sciences. School leadership helps to create the goals of a school, impacts the overall environment, and provides the necessary support for developing teachers. At Intellitots, the school directors are active consumers of current research from the brain sciences, lead ongoing professional development sessions, promote the value of integrating current research into educational practices through school communication, both in print and in online formats, and enthusiastically seek out research partnerships. The strong instructional leadership found within Intellitots was a core factor supporting the successful implementation of a brain research translational curriculum model.

Summary

Little in-context assessment of the synergistic application of neuroeducation to curriculum development and implementation is available to inform educational practice. The data collected and presented in this study provide educators and researchers with information gathered within a particular early childhood context. It is hoped that the findings from this study can help educational leaders further their understanding of the

dynamics of change in education to foster better decision-making about innovative change and needed supports.

The findings, when summarized, indicate that innovative shared leadership, a shared vision, school structures that develop collective efficacy amongst a group of competent and caring teachers, research partnerships, and ongoing professional development in the learning sciences are the circumstances and situations required to support a successful implementation of a brain research translational curriculum model.

Implications for Research

More bidirectional research is needed between researchers and early childhood schools and learning centers in the area of brain research and its applications to educational practice. Similar to the relationship established between Intellitots and Johns Hopkins, other partnership models between universities and schools could provide an excellent opportunities to pursue bidirectional research.

Studies should be undertaken to determine how teaching and learning are improved when a teacher has an understanding of the biological basis of teaching. This study investigated applications of neuroscientific research in context within the specific case of a curriculum based on the Brain-Targeted Teaching Model (Hardiman, 2012). Additional in-context studies of brain-research translational curricula are needed to provide multiple case analyses.

An additional area for future research is the correlation between positive emotional climates within schools with a variety of student outcomes. Correlations between positive emotional climates and student achievement, attendance, student engagement, teacher self-efficacy, and staff job satisfaction should be explored.

Implications for Practice

This case study research provided evidence that educators are willing to question their existing understanding of early childhood and neuroeducation to learn what neuroscience has to offer when planning instructional environments and experiences for young children. Teachers are willing to implement scientifically supported research that is sound and has educational benefits for their students and are eager to grow in their knowledge of the brain processes.

At a school level, a school's improvement requires concerted efforts beyond changing the practice of individual teachers. This case study research provided evidence that school-wide structure such as common learning, planning, and reflective times correlates to improved collective efficacy, which in turn, support school improvement. Thus changes in school structures and policies are needed to support innovative classroom practice.

Conclusions

An analysis of this case study suggests that reforming the curriculum can be an effective way to improve early childhood education. Other early childhood centers might benefit from the experiences of Intellitots as they travel the journey of reform. The road of curriculum improvement is laborious, complicated, and often solitary. School curriculum reform based on translational models from the learning science requires a great deal of trust. The school leadership needs to trust that the research is current, well founded, and effectively applied within specific contexts. The school staff needs to trust the reform pathway created by the school leadership. The parents need to trust the school because they are entrusting their children to the care of the faculty everyday. This mutual

trust also fosters two-way communication where suggestions and feedback from all stakeholders is valued. Clearly, hours of work and reflection are involved. The end result, though, can be a much better learning environment— a curriculum that allows educators to be better teachers and researchers, a curriculum that better meets the needs of the students, the institution, parents, and even society.

The research provides insight into what motivates teachers and administrators to reform the curriculum, the approach taken in reforming the curriculum, the nature of the changes made to the curriculum, and the outcomes they achieved and continue to realize. The environment is dynamic, not static. The study demonstrates anew that professionals in early education who are committed and dedicated to their students and the importance of early childhood exist and are moving curriculum development forward.

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Appendix A Letter of Introduction

June 11, 2015

Dear Staff and Parents of Intellitots:

My name is Jimmie Walker, and I am doctoral student at Johns Hopkins University. I am working with Dr. Christine Eccles, faculty member and doctoral advisor at the Johns Hopkins School of Education. You are invited to participate in a research study of the impact of brain-based instruction on teaching and learning. The directors of Intellitots Preschool and Early Childhood Center approved this research.

Research Purpose: The main purpose of this case study is research. We aim to explore how a neuroeducation model is implemented in an independent school in India with a population of expatriate families. This specific research will take place at Intellitots Preschool and Early Childhood Center in Gurgaon, India. In this very unique context, we are interested in investigating and deeply describing how this neuroeducation model is interpreted, put into practice, and perceived by different stakeholders. Intellitots was selected to participate in this research study based on its outstanding reputation and significant recent growth.

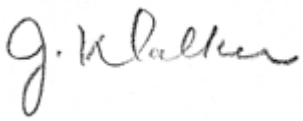
Research Procedures: All parents of currently enrolled students, full time staff and administrators are eligible to participate in the research study. If you decide to participate in this study, you will complete a survey to find out about the general structure of school and your opinions about the overall strengths of the school. The survey should take about 20 minutes to complete. Survey responses will be analyzed for recurrent themes and patterns in the data. Additionally, curriculum documents, and examples of student work

will be collected (without name attached to the items) to support school information gather from the surveys.

Risks, Benefits and Confidentiality: The risks associated with this survey research are minimal. No identifying characteristics will be collected through the online survey. No one outside of the research team will have access to the survey information. Potential benefits are an increased understanding of how teachers can explicitly apply relevant research from educational and cognitive neuroscience to classroom settings. There is no financial compensation for participation.

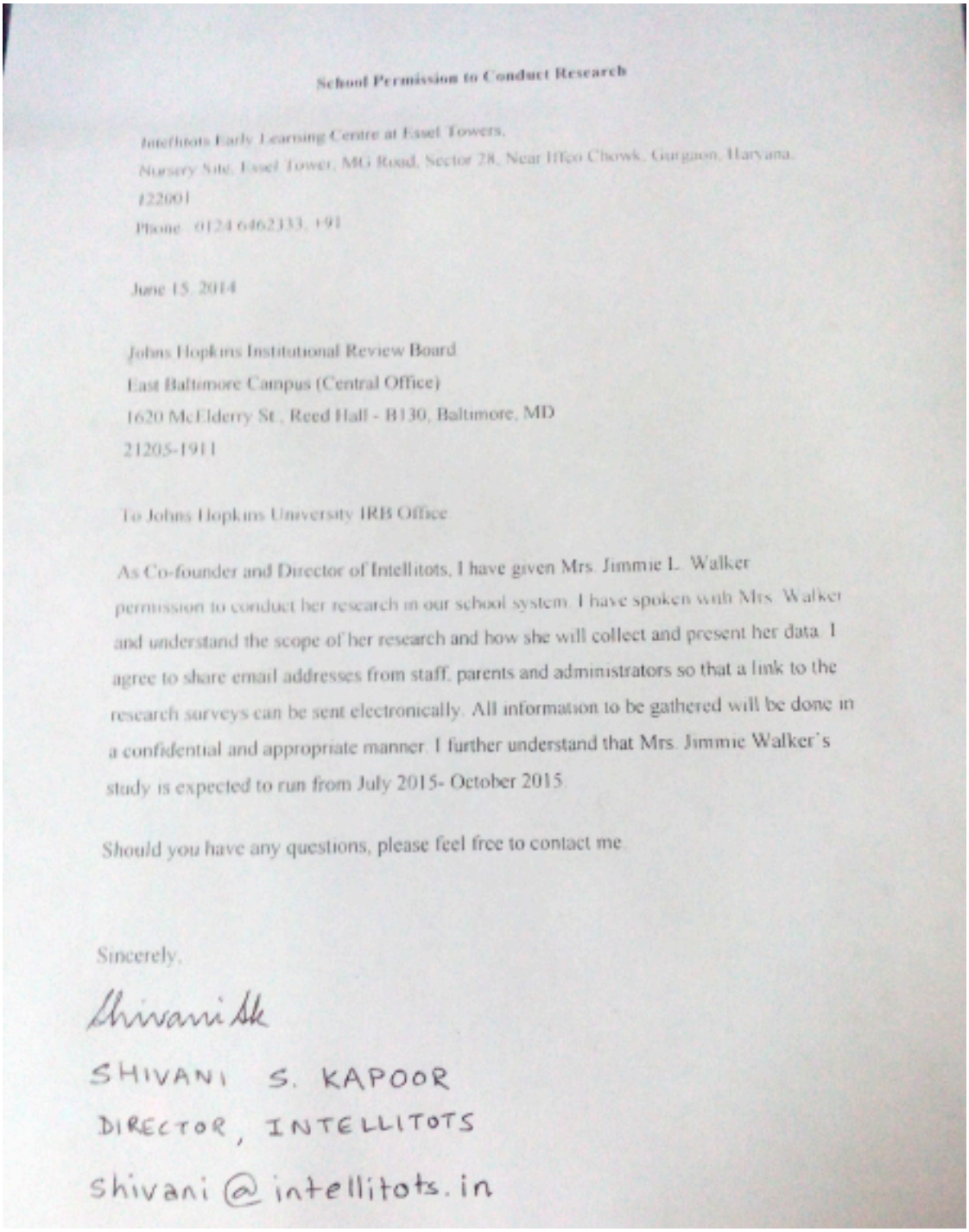
Contact Information: Please do not hesitate to contact me with any questions. jwalke79@jhu.edu . Additionally, for further information you may contact Dr. Christine Eccles at ceccles2@jhu.edu.

Thank you,



Mrs. Jimmie Lynn Walker, M. E

Appendix B Permission to Conduct Site Research



School Permission to Conduct Research

Intellitots Early Learning Centre at Essel Towers,
Nursery Site, Essel Tower, MG Road, Sector 28, Near Iffco Chowk, Gurgaon, Haryana.
122001
Phone: 0124 6462333, +91

June 15, 2014

Johns Hopkins Institutional Review Board
East Baltimore Campus (Central Office)
1620 McElderry St., Reed Hall - B130, Baltimore, MD
21205-1911

To Johns Hopkins University IRB Office

As Co-founder and Director of Intellitots, I have given Mrs. Jimmie L. Walker permission to conduct her research in our school system. I have spoken with Mrs. Walker and understand the scope of her research and how she will collect and present her data. I agree to share email addresses from staff, parents and administrators so that a link to the research surveys can be sent electronically. All information to be gathered will be done in a confidential and appropriate manner. I further understand that Mrs. Jimmie Walker's study is expected to run from July 2015- October 2015.

Should you have any questions, please feel free to contact me.

Sincerely,

Shivani Sk

SHIVANI S. KAPOOR
DIRECTOR, INTELLITOTS
Shivani@intellitots.in

Appendix C Teacher Survey

By completing this survey or survey, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time.

School Survey- Teacher Information

1. What is your highest educational degree earned?

2. Have you taken courses in teaching methods or teaching strategies? If so, please describe.

3. Have you taken courses in principles of early childhood education? If so, please describe.

4. Do you hold a teaching certificate? If so, please describe.

5. How many year of teaching experience do you have?

6. How long have you worked at Intellitots?

7. Describe your current role at Intellitots.

8. What are your most important activities or duties in your role?

9. Have you participated in professional development activities this year? If so, please describe.

10. Please describe a professional development activity from this past year that was especially meaningful.

11. Describe the physical environment of your classroom.

12. How does the physical environment of your classroom promote student learning?

13. Please describe how you support the emotional climate for learning within your classroom.

14. What three adjectives best describe the emotional climate of your classroom?

15. Describe some of the routines, rituals and celebrations in your classroom.

16. Describe how you provide very young learners with feedback on their work and effort?

17. Are students provided opportunities to make choices about their learning? Please describe.

18. Is humor used in the classroom? If so, please describe.

19. How are instructional units designed?

20. How are student learning goals established?

20. How are specific instructional activities designed?

21. What do you do when a specific instructional activity does not go as well as planned?

22. How do you assess individual student mastery of learning goals?

23. How do you measure student skill growth?

23. How do you communicate content mastery and skill growth with students?

24. How do you communicate content mastery and skill growth with parents?

25. What strategies or activities do you use in your classroom to help students retain and remember new learning?

26. What strategies or activities do you use in your classroom to foster student creativity?

27. How do you integrate technology into your classroom?

28.In your opinion, what are the benefits for students from integrating technology into the classroom?

29. How do you integrate the fine arts (music, art, drama) into your classroom?

28.In your opinion, what are the benefits for students from integrating fine arts into the classroom?

29. Describe your personal theory of how students learn best?

30. In your opinion, what factors do you believe contribute to the success of Intellitots?

31. Why did you make the choice to work at Intellitots?

32. What do you enjoy the most about working at Intellitots?

Appendix D Rationale for Teacher Survey Questions

Question	Rationale	Code
1. What is your highest educational degree earned?	Responses can be used to create comparison groups within respondents. Can be compared to average educational degree of teachers in India.	University training
2. Have you taken courses in teaching methods or teaching strategies? If so, please describe.	Responses can be used to create comparison groups within respondents. Can be compared to average preservice courses of teachers in India.	University training Teaching methods
3. Have you taken courses in principles of early childhood education? If so, please describe.	Responses can provide insight into backgrounds and personal theories of early childhood education.	Early childhood education
4. Do you hold a teaching certificate? If so, please describe.	Responses can be used to create comparison groups within respondents. Can be compared to average certification of teachers in India.	Certification
5. How many year of teaching experience do you have?	Responses can be used to create comparison groups within respondents. Can be compared to average experience of teachers in India.	Teaching experience
6. How long have you worked at Intellitots?	Responses can be used to create comparison groups within respondents. Results can provide information about stability of staff.	Intellitots experience
7. Describe your current role at Intellitots.	Responses can be used to create comparison groups within respondents. Results can provide information about staffing patterns in school.	Role
8. What are your most important activities or duties in your role?	Teachers make judgments about what they determine most important daily activities. Responses can provide insights into if teachers consider child centered or administrative duties as more important.	Duties- child centered Duties- administrative
9. Have you participated in professional development activities this year? If so, please describe.	Responses can provide some insight into the range of staff development offered. Answers between administrators and staff will be compared.	PD with child codes depending on responses
10. Please describe a professional	Teachers make judgments about quality of	PD with child

development activity from this past year that was especially meaningful.	professional development and descriptions may provide insights into what teachers value from PD.	codes depending on responses.
11. Describe the physical environment of your classroom.	Responses provide evidence of Brain Teaching Target #2	BTT2 with child codes depending on responses
12. How does the physical environment of your classroom promote student learning?	Respones provide evidence of purposeful decision making to link classroom environment to learning.	BTT2 with child codes depending on responses
13. Please describe how you support the emotional climate for learning within your classroom.	Responses provide evidence of purposeful decision making to link emotional climate to learning.	BTT1 with child codes depending on responses
14. What three adjectives best describe the emotional climate of your classroom?	Provide insight into what elements of emotional climate are most valued.	BTT1 with child codes depending on responses
15. Describe some of the routines, rituals and celebrations in your classroom.	Responses provide specific evidence of Brain Teaching Target #1	BTT1 with child codes depending on responses
16. Describe how you provide very young learners with feedback on their work and effort?	Responses provide specific evidence of Brain Teaching Target #1	BTT1 with child codes depending on responses
17. Are students provided opportunities to make choices about their learning? Please describe.	Responses provide specific evidence of Brain Teaching Target #1	BTT1 with child codes depending on responses
18. Is humor used in the classroom? If so, please describe.	Responses provide specific evidence of Brain Teaching Target #1	BTT1 with child codes depending on responses
19. How are instructional units designed?	Responses provide insight into the process of designing the learning experience and the	BTT3 with child codes

	classroom level and shared curriculum leadership. Results will be compared with results from administrator survey	depending on responses
20. How are specific instructional activities designed?	Responses provide insight into the process of designing the learning experience at the student level and shared curriculum leadership. Results will be compared with results from administrator survey	BTT3 with child codes depending on responses
21. What do you do when a specific instructional activity does not go as well as planned?	Responses provide insight into teacher efficacy, child centered instruction and classroom autonomy. Compare results to efficacy survey results.	BTT3 with child codes depending on responses
22. How do you assess individual student mastery of learning goals?	Responses provide insights into the frequency and type of assessment. Information will also he coded to see if learning goals are individual or age-related. "Hannah will learn to write her name" or "All 4 year olds are expected to write their names."	BTT6 with child codes depending on responses
23. How do you measure student skill growth?	Responses provide information about balance between skill achievement and skill growth. Also provides insight into teacher autonomy.	BTT6 with child codes depending on responses
24. How do you communicate content mastery and skill growth with parents?	Responses provide information about home/school connection. Responses will be compared to parent survey responses and archival documents.	BTT6 with child codes depending on responses
25. What strategies or activities do you use in your classroom to help students retain and remember new learning?	Responses provide specific evidence of Brain Teaching Target #4. Looking for links between responses and PD and preservice courses. Compare results to efficacy survey results.	BTT4 with child codes depending on responses
26. What strategies or activities do you use in your classroom to foster student creativity?	Responses provide specific evidence of Brain Teaching Target #5. Compare results to efficacy survey results.	BTT5 with child codes depending on responses
27. How do you integrate technology into your classroom?	Results are dependent on what technology is available to teachers. Looking to see if technology is used to promote retention, as a teacher tool, to foster creativity, or for administrative tasks.	BTT4 or BTT5 with child codes depending on responses

28.In your opinion, what are the benefits for students from integrating technology into the classroom?	Provides judgments about technology as a classroom tool. Compare results to PD, university courses and teaching experiences.	BTT4 or BTT5 with child codes depending on responses
29. How do you integrate the fine arts (music, art, drama) into your classroom?	Responses provide specific evidence of Brain Teaching Target #5.	BTT5 with child codes depending on responses
30. In your opinion, what factors do you believe contribute to the success of Intellitots?	Success in not clearly defined or operationalized. Responses provide insight into how teachers define success and the factors that promote that success.	Success with child codes depending on responses.
31. Why did you make the choice to work at Intellitots?	Responses provide insights into staffing recruitment processes. Responses will be compared to administrator and parent surveys.	Reasons for working at Intellitots with child codes depending on responses
32. What do you enjoy the most about working at Intellitots?	Responses will provide insights if BTT, PD opportunities, supportive administration, creativity with curriculum, salary or other working conditions contribute to staff retention. Results will be compared with parent and administrator surveys.	Reasons for working at Intellitots with child codes depending on responses

Appendix E Parent Survey

By completing this survey or survey, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time.

School Survey- Parent Survey

1. What was important to you when selecting a school for your child?

2. Why did you chose Intellitots for your child's education?

3. What makes Intellitots unique?

4. Describe what your child enjoys about Intellitots?

5. Do you feel Intellitots provides your child with an appropriate level of academic challenge?

6. Do you feel Intellitots provides your child with opportunities to develop their creativity?

7. Do you feel Intellitots supports the social and emotional development of your child?

8. Would you recommend Intellitots to a friend looking for a school? Why or why not?

Appendix F Administrator Survey

By completing this survey or survey, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time.

School Survey- General Information

1. As of January 2015, how many students were enrolled at each school and in each grade level or age group?

2. Describe the demographics of the students. (i.e.-Ethnicity, socio-economic levels, home language)

3. How many teacher are employed at each school?

Teachers

Assistants

Academic Specialists

Counselors or behavior specialists

Fine Arts (music, drama or art)

Technology

Other (please describe)

4. Describe the demographics of the school staff.

5. What is the average daily attendance rate at each school?

6. How are classroom organized? (i.e.-By age grouping, multi-age, self-contained, co-teaching)

7. What is the current tuition rate?

8. How does this tuition rate compare to other comparable programs?

School Survey- Principal/ School Head Information

1. How are teachers recruited and hired?

2. What characteristics are desired in a teaching candidate?

3. Describe the educational background of teachers.

    - What percentage of teachers have a graduate degree?
    - What percentage of teachers have a bachelor degree?
    - What percentage of teachers are certified teachers?

4. What is the average number of years of teaching experience of teachers?

5. What is the turnover rate of teacher?

6. Do teachers have a teaching contract? If so, describe length of contract.

7. What are the expected teaching hours?

8. Is there a salary scale? How does the salary compare to other comparable school salaries?

9. How is teacher effectiveness measured?

10. In your opinion, what percentage of teachers in this school system are presently teaching to high academic standards?

11. What resources are available to support instruction (i.e.- professional library, school supplies, art supplies)

12. What technology is available to support instruction?

13. What are the expectations for technology integration into instruction?

14. Does the school receive performance reports from student assessments? If so describe.

15. Are there clearly defined standards and student expectations at each level? Please describe.

15. What criteria are used to evaluate the academic progress of students?

16. What criteria are used to evaluate the social and emotional development of students?

17. What criteria are used to determine the instructional focus for the curriculum?

18. What criteria are used to inform parents about student progress?

19. Does the school have a formal school improvement plan? If so, describe the process for development.

20. What percentage of students had at least one parent actively involved in the school community? (i.e.- attendance at open house, parent conferences, school events, volunteer at school)

21. Describe the communication between parents and the school. (i.e.- monthly newsletters, web sites, conferences, general meetings)

22. Does the school serve students with disabilities? Please describe.

23. Does the school serve students limited English proficiency? Please describe.

24. What supports are in place for students with identified disabilities or limitations?

25. What professional development opportunities exist for teachers? (i.e.-staff development sessions, conference attendance, book studies)

26. How is the curriculum developed?

27. How is the curriculum vertically aligned?

28. How is student progress through the identified curriculum measured?

29. How is the curriculum disseminated to teachers?

30. How much control do teachers have to develop and implement the curriculum within their classrooms?

31. How is current brain research integrated into the curriculum?

32. How is current brain research integrated into staff development?

33. Please describe the fundamental belief of the school about how young students learn best?

Appendix G Brain Targeted- Teaching Efficacy Survey

Please indicate the degree to which you agree or disagree with each statement by circling the appropriate numeral to the right of each statement.

	Inhibits or hurts	Nothing	Very Little	Some Degree	Quite a Bit	A great Deal
To what degree can the Brain-Targeted Teaching Framework help to produce meaningful student learning?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help to get students to believe they can do well in schoolwork?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help to make behavior expectations clear to students?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help to establish rules and procedures that facilitate student learning?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help young learners master complex content?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help promote deep understanding of academic concepts?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help teachers to respond effectively to students with academic challenges?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help promote critical thinking?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help promote creativity?	1	2	3	4	5	6
To what degree can the Brain-Targeted Teaching framework help students feel safe while at school?	1	2	3	4	5	6

Appendix H Student Evaluation Report

Child's Name: Aarav Sharma

Class: Busy Bees

Report Date: October 2015

Aarav is a bright and confident child. He is very affable and enjoys taking part in all group activities. He has settled beautifully in his new class and is comfortable with his peers and teachers.

Language Skills

Aarav is able to use English language to express his feelings and thoughts. He is able to frame complete and meaningful sentences. He speaks confidently during circle time and likes to share his routine at home or weekend routine during circle time. He is able to understand and respond well to all instructions. Aarav is making an effort to recognize all the letters and the related phonic sounds done so far. He is able to talk confidently in front of the class during the 'show and tell' sessions. He enjoys sand paper tracing and likes to colour his worksheets and make his letter crafts. His pincer grip is developing quite well and he is able to join dots, make vertical and horizontal lines. He is beginning to recognize and name objects of letter sensory bin. He listens to stories with increasing attention and recall.

Math and Logic

Aarav confidently recites numbers in sequence from 1 to 30. He is able to quantify numbers 1 to 10 on his fingers and is making an effort to quantify numbers from 1 to 23. He can differentiate between letters and numbers and has also started to relate to concepts

of size such as big, small, long, short; concepts of shape such as circle, square, rectangle, triangle, oval, diamond, semi-circle and star. Aarav is able to follow associative activities like clapping for specified times along with the facilitators. He enjoys working with simple Pre-Math activities like sorting of beads, sequencing and stringing in a pattern, number rods, spindle box, knobbed and knob less cylinders, brown stairs etc. He looks forward to going to the Montessori lab. Aarav recognizes all colours and some mixed shades as well. He is also able to relate the colours to the environment such as green leaf, yellow banana etc.

General Awareness

Aarav is a keen observer and is making an effort to understand the why and how of the activities that he undertakes. He can name all the days of the week serially and answer to questions like 'what comes after Tuesday' etc. He is able to understand words like 'today', 'tomorrow' in the conversations and can identify the day's weather like 'sunny day' or 'rainy day' by looking outside the window.

Aarav is being encouraged to identify the sequence of events through various games and picture sequencing activities such as Timeline of a chapatti, Lifecycle of a plant, The Red Hen story etc.

Aarav loves to look at the pictures of the books and tries to frame stories from them. He has understood the theme of 'Health and Hygiene' very well and is fully aware of the difference between junk and healthy food. Aarav likes to participate in various activities related to the theme - 'Science and Discoveries'.

Creative Expression

Aarav loves music time. He likes to listen to music and thoroughly enjoys the associated actions and dance sessions. He is also a keen participant in rhyme sessions.

Aarav likes to explore and experiment with a range of art materials. He likes to do pasting and painting activities. He was very happy when he saw the colour change from red to pink on mixing of red with white paint. He has also started to experiment with different shades to get a new shade of colour. He enjoys moulding clay into various shapes such as chapatti, ball, snake, car etc. Aarav enjoys participating in all kitchen activities done – preparation of paneer, butter and cake. Aarav enjoys playing with mechanical toys and objects like nuts, bolts, tools etc. He is good at making various patterns with block materials and makes innovative designs.

Personal and Social Skills

Aarav expresses himself beautifully. He likes talking about his personal experiences and events such as his Goa trip. He is comfortable with his teachers and likes talking to them during free play. Aarav is steadily beginning to make friends with his peers. He is an observant child; he expresses his own preferences and interests well. Aarav waits for his turn during circle time, hand washing, using art material and playing with common toys. He is able to inform adults when hungry or tired or when he wants to play or use the restroom.

Physical Development

Aarav has developed good body control. He walks upstairs or downstairs holding onto the banister. He attempts to kick a big ball in a particular direction. His favourite indoor game is running with his friends in a set pattern such as going around in a big circle.

Aarav is able to balance and walk on a straight as well as a zigzag line.While playing outdoors, he enjoys the slides and swings. He also loves playing in the rope tunnel.

Aarav's fine motor skills are developing well. He has good eye-hand coordination and uses his thumb and two fingers to pick up small objects like spoon, beads, crayons etc. He works well with the spooning, pouring and transferring activities. He also enjoys lacing and stringing activities. Aarav is beginning to imitate drawing of simple shapes such as circle, triangle etc.

It's a pleasure to have Aarav in the class and we are looking forward to our time with him in the coming months.

Teachers:

_____ _____

(Rakhee Prasad) (Sowmya Pramod)

Preschool Coordinator

_____

(Madhuchhanda Rao)

Intellitots Early Learning Center

Appendix I Collective Efficacy Survey

Collective Efficacy Scale (Goddard, Hoy, & Hoy, 2000)

Please indicate the degree to which you agree or disagree with each statement by circling the appropriate numeral to the right of each statement.

1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = slightly agree, 5 = agree, 6 = strongly agree

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	Teachers in the school are able to get through to the most difficult students.	1	2	3	4	5	6
2.	If a child doesn't want to learn, teachers here give up.	1	2	3	4	5	6
3.	Teachers here are confident they can motivate students.	1	2	3	4	5	6
4.	Teachers here have the necessary skills needed to produce meaningful learning.	1	2	3	4	5	6
5.	Teachers in this school believe every child can learn.	1	2	3	4	5	6
6.	These students come to school ready to learn.	1	2	3	4	5	6
7.	Home life provides so many advantages that students are bound to learn.	1	2	3	4	5	6
8.	Students here just aren't motivated to learn.	1	2	3	4	5	6
9.	Teachers in this school do not have the skills to deal with student disciplinary problems.	1	2	3	4	5	6
10.	The opportunities in this community help ensure that these students learn.	1	2	3	4	5	6
11.	Learning is more difficult at this school because students are worried about safety.	1	2	3	4	5	6
12.	Teachers at this school have the skills to help students master complex concepts.	1	2	3	4	5	6

Appendix J Teacher Efficacy Survey

By completing this survey or questionnaire, you are consenting to be in this research study.

Your participation is voluntary and you can stop at any time.

Teacher Efficacy Scale (Gibson & Dembo, 1984)

Please indicate the degree to which you agree or disagree with each statement by circling the appropriate numeral to the right of each statement.

1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = slightly agree, 5 = agree, 6 = strongly agree

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	When a student does better than usual, many times it is because I exerted a little extra effort.	1	2	3	4	5	6
2.	The hours in my class have little influence on students compared to the influence of their home environment.	1	2	3	4	5	6
3.	The amount that a student can learn is primarily related to family background.	1	2	3	4	5	6
4.	When a student is having difficulty with an assignment, I am usually able to adjust to his her level.	1	2	3	4	5	6
5.	If students aren't disciplined at home, they aren't likely to accept any discipline.	1	2	3	4	5	6
6.	When I really try, I can get through to most difficult students.	1	2	3	4	5	6
7.	A teacher is very limited in what he/she can achieve because a student's home environment is a large influence on her/his achievement.	1	2	3	4	5	6
8.	When the grades of my students improve it is usually because I found more effective teaching approaches.	1	2	3	4	5	6
9.	If a student masters a new concept quickly, this might be because I knew the necessary steps in teaching that concept.	1	2	3	4	5	6
10.	If parents would do more with their children, I could do more.	1	2	3	4	5	6
11.	If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.	1	2	3	4	5	6
12.	If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him quickly.	1	2	3	4	5	6
13.	The influences of a student's home experiences can be overcome by good teaching.	1	2	3	4	5	6
14.	Even a teacher with good teaching abilities may not reach many students.	1	2	3	4	5	6

Jimmie Lynn Walker

1020 Canterbury Hill ~ San Antonio, Texas 78209
jwalker@ahisd.net

Education

Ed.D. Mind, Brain and Teaching, 2016	Johns Hopkins University
Mind, Brain and Teaching Certificate, 2013	Johns Hopkins University
12 graduate hours, 2011	Harvard University Extension School
M.Ed. Administration, 2009	Lamar University
Teaching Certification, 1994	University of Texas at San Antonio
B.A. History/Art History, 1991	Baylor University

Employment

August 2005 – current **Alamo Heights Independent School District**

San Antonio, Texas

June 2013- current	Academic Dean for Elementary Schools
2012 – May 2013	Elementary Curriculum Coordinator
2005- 2012	Elementary classroom teacher

August 1999- May 2005 **Escuela Campo Alegre International School**

Caracas, Venezuela

2003-2005	Eighth grade language arts classroom teacher
2002- 2003	Sixth grade social studies world cultures teacher
1999- 2002	Fourth grade classroom teacher

Honors and Awards

2014/2015	School of Education Merit Scholarship	Johns Hopkins Univ.
2014/2015	A&G Schiffman Fellowship	Johns Hopkins Univ.
2011	Mensa Foundation Scholarship	Mensa International
2011	HEB Excellence in Education State Winner	HEB Company
2010	NEA Learning and Leadership Grant	Washington, DC
2010/2009/2007	HEB Fund for Teacher Excellence Grant	HEB Company
2007	Faye Cowden Langley Endowed Chair	AH School Foundation
2007	ATPE Scholarship Recipient	Alamo Heights ATPE
2006	Excellence in Education Award	Rotary Club