# The Neuleaph School and Early Childhood Center

**Final Project**

**Cognitive Neuroscience and Social Emotional Learning**

**Professor Hoyte**

**Julia Niego**

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### *School Mission*

The Neuleaph School and Early Childhood Center represents a groundbreaking approach in educating the whole child. Our goal is to create a rich and supportive learning environment for children ages 2 -5, living in an inner-city neighborhood in Detroit, Michigan. We focus on the brain, the body, and the child's unique growth within an interconnected community of learners. Through the intertwining of knowledge and research on *cognitive neuroscience*, *physical well-being*, and *social-emotional learning*, we hope to generate a fresh start for education, and to foster skills for life-long intellectual, physical and mental health in our students, their families and the greater community.

### *Location*

Detroit is recognized as the poorest and most dangerous big city (cities with populations over 250,000). According to the Detroit Free Press (2008), 33.8% of residents live below the poverty line (Satyanarayana & Tanner, 2008, para. 1), with an estimated 95% of inner city students living in poverty (laurenlaughs, 2010), the majority with single parents (Satyanarayana & Tanner, 2008, para. 2). Detroit has clearly been hit hard with the recent economic downturn and the rapid decline of the city's auto industry. Since 1950 it is reported that approximately half of the population has fled and a quarter of the city land stands abandoned and vacant (Owens, 2008). A recent FBI crime statistics study (2007) ranked Detroit as the most dangerous city in the US (Associated Press, 2011a, para. 1).

Education in Detroit is in crisis. Adult literacy is at 50%, and only 12% of adults have a college degree (Glaeser, 2011). Based on 2010 ACT scores, only 16% of high school students are ready for college (Hoffman, 2011, para. 4). As of 2009, the graduation rate is only 24.9% (laurenlaughs, 2010).

Furthermore, Detroit is ranked the fifth most obese city in the US. According to the US Census Bureau (2008) the nearest grocery store for over half of the population is twice as far as the nearest *fringe store*, such as gas stations, delis or convenience stores selling prepackaged processed foods with little nutritional value.

These fringe stores also make of 92% of retailers accepting USDA Food Stamps, making access to proper nutrition most problematic for the city's poorest citizens. Currently, Detroit's schools have done little to meet the nutritional needs of their students. City schools have no mandated nutrition or physical education programs. The schools have not followed in the footsteps of many states in establishing BMI assessment, and limiting vending machines and soda consumption in the cafeteria (Ward, Reade, Baek, Johnson, Kaya, & Shah, 2011). In the face of the severe rise in obesity, and the many health, behavioral and cognitive problems the disease brings, this can be seen as irresponsible.

Though the statistics present a bleak picture, there is reason to hope. The city recognizes a crucial need to reform the current state of education, literally from the ground up. As the Detroit Free Press states, "To meet Michigan's economic potential we must adopt a cradle-to-career education system with emphasis on health, emotional well-being and education before kindergarten." (DeGrow, 2011, para. 1). Detroit's governor Snyder announced on May 1st, 2011 that a new state office was being formed to coordinate Michigan programs related to Early Childhood. The proposed budget calls for increased funding for Early Childhood. As governor Snyder declared, "Early childhood is a time of remarkable brain growth that affects a child's development." (Egan, 2011, para. 1).

The city of Detroit has also had another kind of resurgence. As stated above, nearly a quarter of the city's land now stands vacant. Demolishing abandoned houses and factories is a drain on the city's budget, already stretched thin. The city of Detroit has 20,000 vacant parcels of land, and as many city residents have discovered these are all free for public gardening (Owens, 2008). These residents have seized on an opportunity for a fresh start.

One of these fresh starts was the Catherine Ferguson Academy, which drew attention from the nation, including Oprah, to Detroit's struggle to improve education. This typical cash-starved school accomplished the goal of setting up an urban farm on school grounds and creating a fresh school lunch program. In the process the school discovered agriculture as a powerful teaching tool; test scores have improved since the gardening program was established, and college

acceptance became a condition for graduation. The school's principal, Asenath Andrews, also discovered the collaborative project of growing food provided social and emotional support for teen mothers. As Ashley Atkinson, of Detroit's Garden Resource Program Collaboration stated, "No, it's not just a patch of rural America, it's Detroit, and it just might be showing other towns across America how to regenerate, blossom and thrive." By creating The Neuleaph School we hope to join and further this vision (Owens, 2008).

The Neuleaph School and Early Childhood Center will be set up in a large abandoned property that is purchased from the city, and surrounded by vacant land that is free for gardening. Preliminary studies will be conducted to find a neighborhood where urban gardening is already underway. In this way we can support a community in an endeavor for which there is already shared momentum.

Families from surrounding neighborhoods with children who will be between ages of 2.6 and 4 the following September will be informed about the school and invited to apply. Neuleaph will have open enrollment for the first years until capacity is reached, and will then use a lottery. Tuition will operate on a sliding scale, and will be minimal or free for most families.

Special needs will be addressed as they arise, and accommodated. Parents, professionals and teachers will work together to make sure each child is receiving needed developmental support including full evaluations, progress plans and therapies. SEITs (Special Education Itinerant Teachers) will be assigned to individuals as needed in order to implement specialized instruction.

In return, we hope that our school can inspire new momentum to increase the involvement of the community in response to the needs of the greater city. It is our goal to educate and enrich this community on the importance of change at the earliest new growth, so that together we can create a better future for the city, and serve as a model for the US in approaching the problems in education armed with new knowledge about how to improve it.

***Theoretical Foundation***

The Neuleaph School and Early Childhood Center is an answer to Detroit's needs for high quality Early Childhood education for the city's poor, undernourished and emotionally at-risk students. In direct response to the recognition for support for children's brain development during these vital early years, the program incorporates cognitive and educational neuroscience into policy, curriculum and teaching. The reality of life for young students in inner city Detroit bring up many challenges for healthy cognitive development, and put them at risk for delays, disabilities and disorders that impede their learning and social and emotional health. It is clear from neuroscience research that the years from 2 to 5 are vital for the initial development of the frontal lobes of the brain, which are responsible for many higher level processes including planning, sense of identity, empathy, attention and concentration (Kusche & Greenberg, 2006). A student's ability to orient to important elements in his or her environment, ignore distractions, sustain and shift attention are responsibilities of the frontal lobes (Sylwester, 1995). During these years the brain circuits that connect sensory motor and emotional areas to prefrontal regions are also being established and shaped through experiences (Kusche & Greenberg, 2006).

It is also known from neuroscience research that the effects of a stressful, emotionally turbulent environment have negative effects on brain development and function. For example, neuroscience research on the brain demonstrates that areas of the brain responsible for regulating emotions, such as the ventral area of the anterior cingulate are separate from areas responsible for the regulation of cognitive processes (like maintenance of concentration and attention) located in the dorsal anterior cingulate (Berger & Posner, 2000). When one of these areas is activated, function of the other is compromised (Drevets & Raichle, 1998). Therefore children who are emotionally upset, anxious, depressed, worried, anxious or sad will find it difficult to concentrate and attend to cognitive schoolwork, and to regulate their negative emotions in order to have successful interactions with teachers and peers. (Kusche & Greenberg, 2006).

Based on the recommendations from neuroscience, as well as the recognition by city governance for education that builds the emotional health of students, social emotional learning will be embedded in instruction at all levels. The statistical likelihood is that our students will be coming from broken and single-parent homes where they are often forced to deal with fear, stress and anxiety. While cognitive neuroscience research in both the typical and atypical brain has given us a window into how these things negatively impact the way students learn and interact with others, the research also reveals the ways that emotionally supportive environments create successful can strengthen links between brain areas that are needed for emotional regulation, successful social interaction and subsequent learning (Dawson, 1994; Goleman, 1995; Shore, 1994).

Research has shown that cognitive and emotional health are tightly linked to physical health (Tokuhama-Espinosa, 2010). A nutritious and balanced diet is integral to creating healthier neural tissues and balanced neurotransmitter function that effect executive function and attention (Marcason, 2005). Molteni (2002) demonstrated that a refined sugar, high-fat diet reduces hippocampal brain-derived neurotrophic factor, neuronal plasticity and, subsequently, learning. It follows that this is even more important during early years when the highly plastic brain is in a state of rapid development. The school will build on models like the Catherine Ferguson Academy, utilizing urban gardening to make fresh, organic and seasonal produce available to the school and the greater community. The Neuleaph urban garden will increase the physical health of our students, parents and the community, through an edible schoolyard, fresh school lunch program, and a community Farmer's Market. In addition, a comprehensive, neuroscience-based Social Emotional Curriculum for students at different developmental levels will center around the school's central urban garden, making it a rich resource for SEL embedded in a natural, meaningful, real life context.

Neuleaph administrative staff will be recruited from neuroscience research centers, MBE Science programs and strong teacher education programs across the country. Teacher recruitment will focus on a strong staff of multi-disciplinary neuroeducators, produced by undergraduate and graduate programs such as the

Mind, Brain and Education program at Harvard, the Neuroscience and Education program within the Education Department at Dartmouth College, and the Neuroscience and Education Program within the Biobehavioral Sciences Department at Teacher's College. Administration and board members will include neuroscience researchers from the Henry Ford Neuroscience Center in Detroit.

Professional staff such as psychologists, SEITs, speech therapists and occupational therapist will work closely within classrooms alongside teachers in order to assesss and support development. Student data will be analyzed by research staff and connected to ongoing studies in the neuroscience laboratories. In this respect the school will serve as a laboratory for data collection of the efficacy of the program, and will connect this research back to educational and cognitive neuroscience through partnership with the Henry Ford Neuroscience Center, located in Detroit.

Thus, the Neuleaph model represents an intertwining of cognitive neuroscience, social emotional learning, and physical well-being. In the development of the design, care was put into identifying areas of strong connection between cognitive neuroscience, education and social emotional learning. This is in line with the current understanding shared by these fields that these individual elements cannot simply be pasted over traditional classroom methods. Instead, approaches that work must be built collaboratively from the ground up, and must incorporate models and language that make sense and are relevant to all. Important areas of connection informing the school design will be briefly discussed below.

*Cognitive Neuroscience and Education*

Social Emotional Learning can be seen as an area of intersection between neuroscience and education, two theoretically related fields that have struggled to find common ground throughout the last two decades. Since the 90's, declared by the US Congress to be the "Decade of the Brain," much of the initial zeal for direct application of neuroscience data has faded. Early attempts to use neuroscience theories in the classroom resulted in misunderstandings and questionable

educational policies based on hyped ideas such as synaptogenesis, critical periods and enrichment (Bruer, 1997; Mayer, 1998).

This led the research community to react with appropriate caution and skepticism about further attempts to merge neuroscience and education. Bruer has been at the forefront of this position since his 1997 paper "Neuroscience and Education: A Bridge Too Far" (Bruer, 1997). He makes the claim that the theoretical distance between neuroscience and education may simply be too great. The core concepts used by neuroscientists are different from those used by psychologists and classroom teachers, leading to inevitable misunderstandings. He poses that researchers should instead devote efforts to shorter bridges between education and cognitive psychology, cognitive psychology and neuroscience (Bruer, 1997).

Mayer (1998) points out that there is an inherent problem in the goal of tailoring neuroscience findings for educators in order to base educational practices on neuroscience. Instead, he poses that the bridge between cognitive neuroscience and educational psychology needs to be a "two-way street," where educational theory guides and informs neuroscience research.

Since 2000, there has been a refinement of knowledge about the developmental processes of learning (Levine, 2000; Sousa, 2000, Weiss, 2000a, Wolfe, 2000a,b). The larger field of neuroscience has branched and merged with other disciplines, leading to subfields of cognitive, social and developmental neuroscience. In 1999 NRC declared "Neuroscience has advanced to the point where it is time to think critically about the form in which research information is made available to educators so that is it interpreted appropriately for practice."

Researchers have begun to collaborate across the disciplines of neuroscience and education and a new interdisciplinary field has emerged. This is evidenced by the growth of new research centers and educational programs such as the Centre of Educational Neuroscience at Cambridge, the MBE Society (http://www.imbes.org) and graduate program in Mind, Brain and Education at Harvard University, and the graduate program in Neuroscience and Education within the Biobehavioral Science Department at Teacher's College, Columbia University, where the Neuleaph School was initially conceived and developed.

*Educational Neuroscience/ MBE Science*

The field of educational neuroscience has become an exciting new area of educational research. A central position within this field is the acknowledgment that attempts at direct application of neuroscience data to the classroom is indeed a "bridge too far" (Bruer, 1997; Goswami, 2006). Instead the aim of new investigation is finding possible ways to "build strong bridges" (DeSmedt, Ansari, Grabner, Hannula, Scheider and Verschaffel, 2010) through multiple bi-directional and reciprocal interactions between researchers in education and cognitive neuroscience.

Ansari and Coch (2006) describe a need for "practical mechanisms" to support and foster meaningful integration between the brain-lab and the classroom so that teachers will be more informed consumers of neuroscience research. This must be accomplished through awareness and understanding of similarities and differences between research in neuroscience and education, and by establishing points of contact between scientists and educators including bidirectional dialogue and collaborative experiment design. Goswami (2006) urges that a new generation of multi-disciplinary researchers must dedicate their combined expertise in both neuroscience and education to presenting high quality knowledge on the brain in digestible form and interpreting neuroscience *from the perspective of* and *in the language of* educators.

There has also been a call for teachers that have knowledge and understanding of neuroscience. These neuroeducators (Fischer & Fusaro, 2006) represent a new class of professionals that spend time working with students and teachers in the classroom in order to establish meaningful communication, models of students' thinking need to be established between researchers and teachers in order to support and sustain true and equal collaboration, and to foster successful exchange of relevant data between disciplines. An active project must also be underway to develop a common language between neuroscientists and educators so that each understands one another clearly, and so that neither side is put off by

misinterpreted theories or jargon. As Mayer (1998) recognized, drawing on teachers' experience and intuitions about students' learning presents new hope for collaborative design of cognitive neuroscience research that will be truly meaningful to educators. According to Howard-Jones (2005), including teachers in new discoveries provides "invaluable foundations for better bridges."

*MBE Science and Social Emotional Learning*

As Goswami (2008a) points out, "The identification and analysis of successful pedagogy is central to research in education but it is currently a foreign field to cognitive neuroscience." One area where cognitive neuroscience and education have established exciting common ground is the area of Social Emotional Learning. Social Emotional Learning includes character education, service learning, citizenship and emotional intelligence. SEL represents a part of education that links academic knowledge with the life skills necessary for success in school, family and the community. A combination of strong academic learning and SEL is the new standard for effective education for the world (Elias, 2006).

***Curriculum and Instructional Approach***

Mind Brain and Education Science offers a set of recommendations for the classroom that, rather than being connections between piecemeal neuroscience studies and pedagogy, are built on a foundation of collective theories that have been well established in neuroscience. Bramwell (2009) lays out a set of these theories, namely: each child's brain is unique; all brains are not equal in their ability to solve problems; the brain is changed by experience; the brain connects new information to old; and the brain is highly plastic.

From this base, the Neuleaph School has drawn of specific well-established findings in the design and implementation of curricula. First, context and ability influence learning (Tokuhama-Espinosa, 2010). Research has shown that effective learning is based on a student's past experiences, and that there can be no academic growth without personal growth (Fink, 2003). It is known that self-confidence and success, built through positive experiences support motivation and learning.

Second, experiences shape the brain. Though these changes may not reflect in behavior at first, with rehearsal they become permanent or hard wired (Hebb, 1949). Though the idea of "critical periods" has been largely discounted, there are "critical moments" (Giordano, 2004) in learning when student's brains are particularly sensitive to the impact of personal experiences, and therefore a student's experiences in the classroom need to be considered as much, if not more, than what is being directly taught.

Third, though the brain is more plastic than neuroscience researchers initially believed, there are major limits on plasticity. Research has shown that plasticity is higher at younger ages (Immordino-Yang, 2007a), advocating the need for high quality education in the early years. Children are not always stuck with the mental abilities they were born with (Doidge, 2007). This establishes the particular importance of early education for children with special needs.

Finally, of specific relevance to the Neuleaph School, MBE Science holds that social and emotional factors are of vital importance in learning. Sousa (2000) showed that when a concept fights with an emotion, the emotion wins out. Thus, effective learning environments must be emotionally supportive. For instance, brain research has shown the ways that good stress, or "eustress," heightens attention, while bad stress detracts. Furthermore, a student does not learn effectively in isolation. In order to be emotionally supportive, classrooms must involve support from others through collaborative interaction (Tokuhama-Espinosa, 2008b).

Taken together, these recommendations when applied to the classroom advocate curricula and activities that are personally relevant, boost self-esteem, and present challenge without threat. Activities should be multi-modal and experiential, active rather than passive, and involve various sensory stimuli (Tokuhama-Espinosa, 2010).

It is clear that taking these social and emotional factors into account necessitates that such activities are embedded in a natural context. These are not top-down curricula that can be pre-set and outlined in a manual. Social Emotional Learning and Mind Brain and Education Science agree that teaching activities should

involve open discussion, rather than the traditional model of teacher at the front of the room speaking to the group. Small group work allows students to interact collaboratively to solve problems and produce new findings. The environment needs to be safe for different ability levels in order to insure that all students are supported by positive and successful social and emotional experiences. All of these methods encourage healthy social interaction, and support balanced functioning and development of the frontal lobes and connections with the emotion centers of the brain including the amygdala and limbic circuits. This in turn fosters executive control, emotion recognition, response and regulation, and social cognition (Kuche & Greenberg, 2006).

The Neuleaph School has an ethic of trust and respect for teachers intuitions. According to Tokuhama Espinosa (2010, p. 15), *"Great teachers have always sensed what methods worked; thanks to brain-imaging technology and better research techniques, it is now possible to substantiate many of these beliefs with empirical scientific research."* Thus, the focus is on the environment, and teachers are given the freedom to develop their own curricula and classroom community. They are informed by MBE Science guidelines for "Best Practice" (Zemelman, Daniels & Hyde, 1998): curricula will be student centered, experiential, holistic, authentic, expressive, reflective, social, collaborative, democratic, cognitive, developmental, constructivist and challenging.

In the setup and design of the classroom community, teachers are asked to respect individual differences in ability, personality, skills and developmental levels of all students. Using "orchestral immersion" (Nummela-Caine & Caine, 1994), administrators, professionals and teachers put thought into combining personalities and skills in the right way, from the students that make up the larger classroom to smaller groups chosen for activities and partner work. Different abilities are purposely grouped together to balance areas of strength and weakness. By calling on individuals in the right place and time, teachers can weave their voices into a single experience (Tokuhama-Espinosa, 2010).

Neuleaph takes a dynamic, value-added approach to measuring student learning and understanding. In place of testing, teachers utilize careful observation

of the child, discussion of video recorded teaching moments, and clinical interview-based assessment of students skills, knowledge and strategies. Levine (2000) describes eight neurodevelopmental constructs to consider in building a full picture of a student's progress. These include memory, attention, temporal sequential ordering, spatial ordering, language, neuro-motor function, social cognition and higher order cognition.

*Neuleaph Classrooms*

Neuleaph Classroom will be hands-on. According to educational research, by manipulating concrete objects in meaningful ways, children lay the groundwork for more abstract concepts (Martin & Lukong, 2007). Evidence from neuroscience adds that even just attending to goal directed activity with hands children may be representing that action with their own hands (Gallese & Rochat, 2010).

Classrooms will be greatly influenced by the Montessori Method, specifically for Math and Literacy. This choice reflects a recognition in the field on the close connections between neuroscience and the Montessori Approach, which was designed by Maria Montessori based on close observation of the developing child. Lillard (2005) points out how the Montessori model sees each students as active participants in constructing knowledge, via hands on exploration of a carefully prepared environment. Duffy (2008) outlines how the Montessori approach acknowledges and supports child development, including the development of self-esteem and self-confidence, social development and moral development.

Rather than specific subject areas being taught in pre-set time slots throughout the day, Neuleaph classrooms will be set up with sets of developmentally appropriate concrete materials, or works, laid out on shelves at children's height. These shelves will be divided by subject areas: Math, Language, Science, Sensorial, Practical Life, Science, Music and Art. The majority of instruction takes place as open work times. Often, these follow a teacher presenting new work to children , using clear goal-directed actions and simple language, during circle time. During open work periods, children may work with these materials alone or with peers, at small tables placed throughout the classroom or on mats on the floor.

In Neuleaph classrooms students learn independently, with partners or in small groups through doing and making. Collaborative projects emerge from students' own interests, and adequate time is given for students to fully engage with the concepts and themes, and to reflect on that they learned. For example, in the 3's classroom students may show particular interest in a work from the Science Shelf that involves using a light table to see the structure of the bones inside of various animals. Through conversations with the children the teacher may identify a shared interest in the group regarding the pattern of fish bones. The class then participates in the dissection of a real fish and reassembles the bones to place at the Science Station for further observation. This connects to a building interest in how scientists use bones to learn out about animal's bodies. Each student could independently build a fish, beginning with the skeleton, and together create an exhibit for a classroom museum.

Neuleaph classrooms hold that rather than knowledge simply being based on experience, learning involves the whole person, including recognition and active use of a learner's relevant life experiences and reflection on these experiences (Anderson, Boud, and Cohen, 1995). Reflection on learning, or metacognition, has been shown to strengthen executive control including planning, goal-setting and choice of strategy (Tokuhama-Espinosa, 2010). In this way students become motivated and independent learners. Each unit will involve review, reflection and open discussion of finished projects to assess what students have learned guide the incorporation of new knowledge into students prior knowledge. Thus Neuleaph classrooms will have walls covered with thought webs and charts. Each student will have a gallery space in which to display art work. The book shelves will include books made by the students, on topics such as feelings, classroom work, and student's homes.

As previously mentioned, a specific Social Emotional Curriculum will be implemented for all age levels that is connected to the urban garden. Consideration of developmental stages of cognitive, physical and social and emotional learning were taken into account. This curriculum is outlined below:

**Social Emotional Curriculum**

2's/3's (Year 1): Senses and Self

- Who am I?
- How do I know?
- Observing through five senses
- Self project

3's/4's (Year 2): Self and Circle

- Self in relation to peers
- How do I tell messages to others?
- Communicating with language
- Circle project (in school garden)

4's/5's (Year 3): Circle and Sphere

- Community membership (classroom and greater community)
- How can I help?
- Collaboration to create within community
- Sphere project (within community)

During a child's first experience at school (2's and 3's classroom), activities and projects center around supporting the development of the sensory and motor systems. Children use their five senses to explore the essential question *How do I know?* During this year the aim is to create an emotional environment that is positive. Studies have shown that positive emotional experiences are very important for building motivation and fostering a love of learning from the start. Frequent trips to the garden to explore the seasons through observation might lead each child to assemble a life-size self portrait on the classroom wall, the Self Project, full of drawings, paintings and stories about these visits. Children will learn to notice color and shape, to use words to describe what they see, hear, taste and smell. Reflection on these projects together will give student a concrete example of how

our experiences, feelings and perceptions are unique for each member of the classroom. Each child might notice something different about the trees and plants in the garden. Some children might like the taste of basil, while others do not.

During the second year (3's classroom), the classroom themes center on strengthening the connections between the sensory and motor systems and prefrontal areas, including executive control, emotional regulation, social interaction and language. Children use their budding cognitive, critical thinking and language abilities to answer the essential question *How do I tell messages to others?* A rich classroom language is developed to establish how to keep the environment safe and peaceful, to identify and talk about emotions both positive and negative, to work through conflicts by giving clear, firm and respectful messages (ie "I don't like it when you push my body." "Don't step on my work mat – walk around it." "Please find another place to work, I want to do this by myself right now.") Children might write a book as a class, their circle project, about a puppet character Snail, and how he emerges from his shell little by little to explore the classroom. What challenges does Snail face in this exploration? Does he feel scared, anxious, or excited? Children's own emotional experiences exploring the classroom will be incorporated into this tale. Children may undertake a greater study of exploration, traveling to local urban gardens in the city of Detroit. Perhaps students become very interested in the layout of different gardens and the study may extend to mapmaking. Children may draw maps of Snail's exploration of the classroom, and then create their own Circle Project, including maps of how they each have explored their own classroom, and what they have learned along the way.

During their third year in the 4's/5's classroom, the curriculum builds on children's growing social emotional and cognitive abilities, and extends to collaborative problem solving, community membership and moral development. Children answer the essential question, *How can I help?* The study of emotions extends to ideas around social justice, conflict resolution and making peace. As a classroom community, children identify a need and work together to create a solution. Building on their prior knowledge, children may decide their classroom needs a Peace Corner, a quiet space to which children can retreat to sit quietly, take

deep breaths, or read when they are feeling mad, scared, or anxious. Perhaps the class decides that the urban garden should have its own Peace Corner. After investigation into peace spaces in gardens, Children become fascinated with a picture of a meditative labyrinth in a book, and set out to involve the parent community in building their own meditative labyrinth in the Neuleaph garden, the Sphere Project. The children may request recycled bricks from the city, and work together to draw up plans for their own labyrinth. Parents will become involved with laying these bricks to build the labyrinth. At their graduation ceremony, students will present their thoughts and ideas about walking through the labyrinth in order to achieve a calm and tranquil state of mind.

**School Governance and Administrative Structure**

The Neuleaph School will be governed by a Board made up of research neuroscientists, neuroeducators, and elected teachers and parents who serve temporary terms. The Board has the primary responsibilities of creating school policies, overseeing curriculum, analyzing student achievement and school efficacy data, and connecting research to the lab. The Board interacts and is supported by teaching teams of neuroeducators and certified teachers who are in turn supported by a strong group of professionals, including psychologists, therapists and curriculum specialists. The administrative structure of the Neuleaph School is outlined below:

**Board**

*Research Staff*

(connected to neuroscience labs at Henry Ford Neuroscience Center)

2-3 Cognitive Neuroscientists

2-3 Educational Neuroscientists

*Neuroeducators* (2 rotating through 6 month terms on Board)

*Certified Teachers* (2 rotating through 6 month terms on Board)

*Class Parents* (One elected for each classroom; serve a full year, but attendance is only required at 2 bi-monthly meetings per year)

**Teaching Teams**

•Certified teachers and Neuroeducators working together in classrooms

**Professionals**

•Curriculum specialists

•Speech Language pathologists

•Occupational Therapists

•Child Psychologists

•Play Therapists

•SEITs

**Research**

Research is a core component of the Neuleaph Philosophy. It is though careful observation, assessment and analysis that we come to understand the developing child, including the child's brain, body, thoughts, feelings and beliefs. It is also through research that we can hope to honestly and accurately identify areas of strength and weakness in our model, and make consistent positive improvements. This is the essence of the model; we are turning over a new leaf for the children we serve. In light of this, it is of utmost importance that all school members and staff are working toward this purpose, rather than obscuring this vision with desire to produce data that is neat and orderly, or twist data to obtain funding or recognition.

As a part of the Neuleaph community, all staff will move toward becoming better consumers of educational, psychological, developmental and neuroscientific research. In order to support this aspect of the school identity, relevant research is made accessible and available to staff at all levels, and to the parent community. Each level of the staff structure utilizes and contributes to research in its own way.

*Board Members*

Board Members attend bi-monthly board meetings to discuss and debate research related to school policy, classroom related issues and the school curricula,

specifically the SEL curriculum. The board also reviews data collected through dynamic assessment (Wiggins & McTighe, 2005), which is analyzed carefully to identify observation categories and establish coding schemes leading to the emergence of hypotheses regarding student achievement, obstacles to success, social emotional factors and efficacy of teaching methods. Larger hypotheses guide the design of new research studies which are exported to the fMRI and ERP laboratories at Henry Ford Neuroscience Center.

Teachers and parents serving temporary terms on the board benefit from access to participation in research discussion, and add valuable perspectives regarding how to make such research accessible for school members with different knowledge, thought models and language.

Specific research discussed and extended by the Board may include:

- *Neural correlates of Anxiety* (Kilts, Kelsey Knight & Ely, 2006)
- *The effects of stress on the learning brain* (Society for Neuroscience, 2007c)
- *Effects of Depression on the hippocampus* (Sapolsky, 2001)
- *Role of Dopamine facilitation in motivation and social extraversion* (Depue & Collins, 1999)

*Teaching Teams*

Teaching teams in all classrooms meet weekly, or as needed with professional developmental support staff and curriculum specialists. At these meetings staff discusses curriculum and teaching related issues as well as topics related to SEL and MBE Best Practice.

Teaching teams also discuss data collection via clinical interview and watch and discuss video cases of teaching and assessment. These video cases serve as a way for neuroeducators , teachers and professionals to meet within a shared problem space to create longitudinal neurodevelopmental profiles and measures of social emotional learning for students, to build shared models of learning as it takes place in the student brain, and to further refine assessment methods. These collaborative practices lead to a common language and models of thought among neuroscientists, teachers and professionals (Ansari & Coch, 2006; Goswami, 2006).

Members of teaching teams work together to design and conduct quarterly

staff research presentations at board meetings. The brain-based research presented at such meetings may include:

- *Constructivist practices and subsequent memory and learning in students* (Schacter & Addis, 2007)
- *The role of teacher tone of voice in eliciting positive/negative emotions in students* (Sander, Grandjean, Pourtois, Schwartz, Seghier, Scherer, & Vuilleumier, P., 2005)
- *Students' emotional response to teacher facial expression* (Ambady & Rosenthal, 1993)
- *Individual learner potential* (Tomlinson, 1999)

*Parents and Community*

Extending school culture and vision to Neuleaph parents and the greater Detroit community is a vital element of our model. Two class parents will be elected annually from each classroom, and will lead monthly parent meetings. In addition, Neuleaph staff will lead ongoing parent education classes at the Neuleaph Community Center. Meetings and classes will aim to inform school and community parents about current research regarding healthy child development and the foundational aspects of our school mission. Research topics may include:

- The *importance of social interaction with others for learning* (Bramwell, 2009)
- *The importance of diet for brain development* (Marcason, 2005)
- *The importance of emotions in learning* (Immordino-Yang & Damasio, 2008)

As a final piece, the Neuleaph Farmer's Market and Art Space will be open year round, six days a week. The Farmer's Market will sell produce from Neuleaph Gardens as well as fruit, vegetables, juice, cheese, bread and other homemade goods from local community growers. The Art Space will serve as a gallery and store for community artists and craftspeople. Hiring priority for Farmer's Market and Art Place staff will be given to working single mothers from the school and community. Salary will be subsidized by grant money, and workers will receive full health benefits once they reach ten hours per week. Additional funding will be available

for management training and agricultural education as well as classes on sewing, knitting, carpentry, painting, and fabric printing. By creating a local and safe place for mothers to work near their children, we hope to improve family life and build a stronger and healthier community from the inside.

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