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The Promise and Pitfalls of Neuroeducation as a Grounding for Instructional Practices

Stephanie C. Murphy, Ed.D.

### Abstract

This narrative inquiry study explored how five educators from a language-based neuroeducation program apply and assess neuroeducation-grounded approaches in the classroom, and investigated their perceptions of the challenges and merits of neuroeducation implementation. It synthesized research from the domains of neuroscience, cognitive psychology, and language theory, and applied Neuro-Semantic Language Learning Theory (NsLLT) as its underpinning. The study found that teachers' self-efficacy, feelings of isolation coupled with a lack of greater buy-in, and *mindset mismatch* are barriers to neuroeducation implementation, whereas the ability to meet students' needs, the established results witnessed by participants, and the opportunity for a paradigm shift are merits. This study adds to the existing body of research on a neuroeducation model predicated on language function.

## **Introduction**

### *The Need for Neuroeducation*

In order to meet the needs of learners, educators must have a foundational understanding of the brain and its workings. After all, “Can a profession whose charge is defined by the development of an effective and efficient human brain continue to remain uninformed about the brain” (Sylwester, 1995, p. 6)? Neuroscience sheds light on the mechanisms and neural underpinnings of learning, which in turn informs educational policies and practices (Goswami, 2008; Petitto, 2008). There are inherent barriers to seamlessly merging disparate domains, however. Tommerdahl (2010) noted it is unlikely that a single study in neuroscience will have a direct application to the school setting, but perhaps aggregations of various studies will inform teaching methodologies. Ferrari (2011) underscored the need for sensitive integration of neuroscientific insights into education, to avoid reductionism. Arnold (2016) suggested that a bridge between suggestion and prescription is lacking, and Tommerdahl (2010) posited that although neuroscience may have a role to play in education, complex relationships exist between the brain sciences and classroom-ready teaching methods.

Since it is virtually impossible to directly transfer findings from the laboratory to the classroom (Tommerdahl, 2010), a third field of study is needed to mediate the relationship between neuroscience and education. Bruer’s (1997) seminal research suggested that psychology should be the third discipline included in the triad, as the learning theories borne of psychology serve as a filter through which to interpret neuroscientific and educational research. A model premised on interrelatedness and connectivity has the potential to propel educational practices, and neuroeducation is one such model by which to re-envision teaching and learning. Furthermore, neuroeducators (Fuller & Glendening, 1985; Gardner, 2008) play an important role

in the transdisciplinary approach, serving as brokers who triangulate and share findings among the neuroeducational domains. They are the crucial linchpins whose translational work can exponentially inform educational practices.

*Making the Case for Language*

For the purpose of this study, neuroeducation is defined as a collective discipline that merges neuroscience, cognitive psychology, and language theory (Arwood, 2011). Seminal theorist Lev Vygotsky (1978) posited that the interrelatedness of thought and word is of indisputable importance, while Halliday (1993) contended that developing language is learning to mean: “Because human beings are quintessentially creatures who mean (i.e., who engage in semiotic processes, with natural language as prototypical), all human learning is essentially semiotic in nature” (p. 93). In accordance with this viewpoint, Arwood’s (2011) Neuro-Semantic Language Learning Theory (NsLLT) posits that the brain creates meaning as the basis for language function and suggests that learning occurs as a series of functional processes, as opposed to a set of additive structures. It also provides insights on language as a crucial mediator in learning, behavior, and socialization. If language is indeed the essential condition of knowing (Halliday, 1993), its role in learning and thinking cannot be minimized.

According to Arwood and Young (2000), cognition pertains to the way people process information, or the way they think based on the way their brain functions. The authors contended that while some students are auditory processors, the majority of students are in fact visual learners who need to create pictorial images or visuals in their minds. Yet, the education system is solidly rooted in an auditory curriculum, thereby creating a disparity between students’ needs and schools’ orientations. This particular neuroeducational approach includes methods such as performing hand-over-hand drawing, creating picture dictionaries, and using pictorial images to

represent ideas and concepts. The consideration of language in a neuroeducation model is novel, but Arwood (2011) posited that language is a key mediator in the triad, as language function represents thinking and is paramount to the learning process. Therefore, this research is framed by a novel language-based model of neuroeducation and underpinned by Arwood's Neuro-Semantic Language Learning Theory (NsLLT).

Although neuroeducation has gained traction in recent years, there is a dearth of information on how it is implemented in the classroom. This is especially true for a neuroeducation model mediated by language theory, as it is a nascent field of study. Therefore, this study sought to investigate how neuroeducation has filtered into the school setting, the ways in which educators' practices have been informed by Neuro-Semantic Language Learning Theory (NsLLT), and what those on the *frontlines* perceive as the benefits and challenges of neuroeducation. This research extrapolated salient findings from the literature on neuroscience, cognitive psychology, and language to determine where gaps exist and understand future directions for research.

### *Self-Efficacy*

In order to explore the school-based implementation of an initiative such as neuroeducation, there must be a consideration of teachers' self-efficacy. Bandura (1977) defined self-efficacy as people's perceived capacity – whether accurate or not – to produce a desired effect. Researchers have discussed a lag in teachers' self-efficacy beliefs as they attempt to put a new method into practice (Stein & Wang, 1988; Tschannen-Moran et al., 1998). Teachers' self-efficacy is often contingent upon feedback, encouragement, and support from others (Tschannen-Moran et al., 1998). According to Tunks and Weller (2009), implementation of an innovation increases significantly when accompanied by continuing, regular support. However, as

neuroeducators are relatively scarce and tend to work in isolation, validation and feedback may be lacking.

### *Teacher Isolation*

Another facet to consider in the adoption and implementation of neuroeducation relates to teachers' feelings of isolation, or marginalization, within their respective settings. According to Lortie (1975), the *egg-crate* architecture of schools does little to engender collaboration. Insularity means that teachers have few opportunities to collaborate or observe colleagues at work (Davidson & Dwyer, 2014). A study by McQuat (2007) found that special education teachers are often isolated and marginalized. Moreover, they may lack social capital, which involves relationships, collaboration with colleagues, and ties to external experts and professional development. Although the study was couched in a different context, it may be fair to assume that neuroeducators are similarly isolated and marginalized. Their social capital may be diminished if they are unable to collaborate with likeminded individuals or engage in meaningful professional development centered on a topic to which they have devoted their professional lives.

### **Methodology**

This research study utilized a narrative inquiry design. Narrative inquiry is a dynamic process in which a researcher studies the lives of participants and asks individuals to tell their stories (Creswell, 2014; Clandinin & Connelly, 2000). The researcher then relives and retells those stories in narrative form (Clandinin & Connelly, 2000). At its essence, narrative inquiry is a way to understand experience. As Glesne and Peshkin (1992) explained, the crucial role of a qualitative researcher is that of learner. The researcher is a "curious student who comes to learn from and with research participants" (p. 36) as opposed to an expert or authority on the given

topic. Thus, in order to understand how neuroeducators are navigating implementation of this nascent approach, their stories must be heard.

Five participants from a language-based neuroeducation program, who work in varying educational settings, comprised the study. This research utilized three forms of data collection as a means of triangulation: pre-interviews, classroom observations, and post-interviews.

Intentional heterogeneity was desired in order to illuminate how neuroeducation *neophytes* and *veterans* embed neuroeducation in their instructional practices, and to determine how participants implement neuroeducation in various school sites.

The data were “narratively coded” (Clandinin & Connelly, 2000, p. 131) to find interweaving storylines, apparent gaps or silences, and emerging continuities or discontinuities. Member checking is pivotal to the research process (Creswell, 2014; Maxwell, 2005), and especially so in a narrative inquiry design, wherein the researcher tells participants’ stories. Therefore, study participants had the opportunity to review the transcriptions and final narratives for accuracy.

## **Findings**

### *Application and Assessment of Neuroeducational Approaches*

In regard to application of neuroeducational approaches, a singular theme arose: participants’ use of visual methods, such as drawing, picture dictionaries, and hand-over-hand writing, to meet students’ needs and promote conceptual thinking. One participant explained that schools are often based on auditory learning, although most students are visual learners. As such, she translates that auditory-based curriculum into visual thinking: “We really work off of their learning system. And we take the concept of the big picture. So we do visual methods; we refine their work and provide feedback in the way they neurobiologically learn.” Many participants

underscored the need for parity between the developmental level of the visual being utilized and the developmental level of the individual students. Another participant explained how picture dictionaries have helped foster conceptual understanding in her students during reading groups: Students scan their book to search for unfamiliar words, the teacher tells them the word, the students draw a picture to represent that word/idea, and they tag the picture with the word. According to the study participant, “What’s amazing about that is, once they have the picture with the word connected to it, they know it and they don’t often need to reference their picture dictionary again.” It is crucial that students create their own drawings and visual representations because, as Arwood et al. (2009) assert, visuals are subject to interpretation and also depend on the ascription of meaning by the individual.

Regarding educators’ assessment of neuroeducational approaches, many participants rely on informal assessments to gauge the efficacy of their methods. This is necessary, according to one participant, because many traditional assessments do not measure what it is she wants them to. Rather than seeing whether students can mimic patterns, she wants to understand their thinking and determine whether they can use that thinking in other contexts. Another participant explained that she has created her own assessments as a means of validating her practices and demonstrating student gains. She further contended, “I was told to collect all this data to prove it, because I’m going against the grain.”

### *Barriers*

Discussions with participants regarding barriers to neuroeducation elicited several common themes. While ancillary themes such as lack of time, scarcity of resources, and large class sizes were mentioned by participants, three primary cross-cutting themes emerged from the study. The first theme is self-efficacy, as it pertains to neuroeducation implementation. Four of

the five participants expressed doubts about their self-efficacy as related to their comprehension and application of neuroeducation. The educators voiced concerns about their confidence level, both in regard to deeply understanding neuroeducational tenets and bridging theory with practice. One novice neuroeducator shared, “It’s tough when you’re not feeling 100% solid in it. I know that if people throw a hard question at me and I can’t answer it then I am going to lose the credibility of what I’m doing.” Moreover, teachers’ self-efficacy is often contingent upon feedback, encouragement, and support from others. Yet, most of the participants included in this research study are the lone neuroeducators in their schools, so validation and feedback may be lacking.

The second theme pertains to isolation; teachers lacked the ability to make neuroeducational strides in the absence of collaboration or greater school buy-in. The five participants in this study are early adopters of neuroeducation, therefore they have few opportunities for collaboration and corroboration, which may further compound professional isolation. According to one participant, “Neuroeducation is really new, and I think some people are pretty skeptical. I do a lot of defending what I’m doing...The lack of people to collaborate with is tough.”

The third theme relates to the mismatch between neuroeducators’ beliefs and the prevailing mindset that exists within the education paradigm. For several participants, their views about learning and their teaching methods, which are grounded in cutting-edge language theory, are at odds with the systemic approach to teaching and learning. One participant explained, “I don’t see a lot of educators really wanting to think deeply about learning. There’s just some assumptions that are made and they’re not questioned.” Another participant offered, “Teachers are battling with what came before and what came after them. To impact any real change, it gets

frustrating, and then that frustration sort of leads to giving up.” This participant further explained that she has become disenchanted with the profession because she feels she is “fighting an uphill battle,” to the point where she is considering leaving teaching for good. She said she is exhausted by constantly being asked to prove herself and her neuroeducational methods. Another study participant said schools are not set up in a manner that is conducive to neuroeducation, which requires one-on-one assistance and time; this further underscores the *mindset mismatch* that exists between neuroeducational approaches and traditional approaches to teaching and learning.

### *Benefits*

Despite the aforementioned barriers, four of the five participants expressed a firm belief that neuroeducation is a groundbreaking, efficacious model on which to base their teaching. The three key themes that arose in regard to the perceived benefits of neuroeducation are: the capacity to meet students’ needs, the potential for neuroeducation to result in a paradigm shift, and the established results they have witnessed. For most participants in the study, these benefits have validated the effectiveness of neuroeducation and motivated them to push forward with implementation regardless of the challenges. One participant shared, “Every situation and every student I’ve ever dealt with can be explained by this theory (NsLLT) and through the levels of learning, so that’s what keeps me motivated. I only see the progress, I don’t see any detriment.” Another participant said that due to the neuroeducation-based approaches she has embedded in her teaching, students have made tremendous strides: “I have seen changes in the language, I’m seeing changes in the behavior, I’m seeing changes in their academics, and in their problem solving.”

For several participants, neuroeducation has given them a new perspective on the teaching and learning processes, and profoundly informed their practice. The focus on students’

individual learning systems, and the use of visual methods to promote conceptual understanding, have proven beneficial. According to one participant who is a special-education teacher, “For the first time students are receiving a free, appropriate public education. It really makes me question the other types of methods we’ve been doing since they’ve been in school; most since three years old in early intervention or younger. And we haven’t seen much growth and now we’re seeing this level of growth. It makes me question the whole paradigm of what we’re doing. So it becomes to me a social justice and a civil rights issue.”

### **Significance and Recommendations**

Neuroeducation is a burgeoning discipline, so it is likely that its tenets have not yet received widespread awareness or acceptance in the school setting. Notably, several participants shared that their methods of teaching, which are grounded in cutting-edge language theory, run counter to the systemic perspective of teaching and learning. There was also a pervasive sense among participants that misinformation abounds in the educational system, with many teachers lacking an understanding of the crucial role that language plays in the learning process. Clearly, there are significant barriers to neuroeducation implementation. However, for most participants in the study, the merits of neuroeducation far outweigh the challenges.

If language is in fact the missing link, a renewed focus on understanding how learning occurs, coupled with an openness to neuroeducational approaches, may serve to ameliorate issues that persist in education. Implementation and sustainment of neuroeducation may hinge on educators who are willing to accept that the current system does not adequately meet students’ needs. That said, neuroeducation can be cumbersome and dense. It cannot be distilled to a set of strategies, nor is it prescriptive. In order to have a deep-seated understanding of the discipline, constant layering and ongoing refinement of thinking are in order via workshops and professional

development. Yet it is a worthwhile endeavor. Studies such as this add to the body of research on a language-based neuroeducation model, and substantiate the important role of language in the learning process.

Areas for future research include the articulation and dissemination of neuroeducational tenets, as it is still a nascent field of study. A keener understanding of teacher isolation as it pertains to the early adoption of an initiative would also be beneficial to the enterprise. Lastly, a study that centers on the andragogical impacts of neuroeducation would be meritorious.

#### *Articulating and Disseminating the Tenets of Neuroeducation*

Neuroeducation programs, especially those that include a focus on language function as a mediating factor, are relatively scarce. For educators who wish to understand and utilize neuroeducational approaches, but who lack access to a neuroeducation program or neuroeducation-centered professional development, delineating the hallmarks would be beneficial. While a key premise within the literature is that neuroscience cannot be prescriptive, and similarly neuroeducation cannot be distilled to a set of strategies or a blueprint for implementation, there may be merit in defining its key tenets. This would necessitate further unpacking and synthesizing the research, articulating the theoretical aspects, and sharing the visual methods that have been shown to tap into students' learning systems. Doing so would prove useful for educators who wish to embed neuroeducation into their pedagogy. Though not a silver bullet, neuroeducation has the capacity to profoundly impact the educational system.

#### *Studying Teacher Isolation with a New Lens*

One key finding from the study pertained to teachers' feelings of isolation, since they were perceived to be going against the grain. While literature on teacher isolation abounds, most studies focus on isolation in the context of new teachers, rural schools, and general school

insularity. Similarly, there is significant research on teachers' beliefs and theories of change, as they pertain to adoption and diffusion of an innovation or practice. However, few studies center on teacher isolation as a barrier for early adopters of an initiative. Research on this topic could serve to provide a better understanding of isolation and marginalization as they pertain to implementation and sustainment of an innovative approach such as neuroeducation. This would be an informative and useful direction for research, and would fill an existing gap in the literature.

#### *Investigating the Andragogical Impacts of Neuroeducation*

An unforeseen but telling finding arose from the research study. While neuroeducation has, to varying degrees, informed the participants' practices, it also has prompted them to reflect on their own educational experiences and learning needs. Many of the research subjects discussed how their newfound neuroeducational knowledge has illuminated their own learning systems; this in turn likely imbues their teaching. Therefore, it would seem that neuroeducation has both pedagogical and andragogical impacts. There is a dearth of literature on the pedagogical implications of language-based neuroeducation approach, and there are even fewer studies that pertain to the andragogical implications. An investigation of neuroeducation's impact on adult learning would be a fruitful area of future research.

#### **Conclusion**

In order to advance neuroeducation, a paradigm shift is in order. The educational system must move beyond insularity and isolation. If teachers implementing cutting-edge, effective neuroeducation-grounded approaches are relegated to their own classrooms, with no opportunities to share their methods with colleagues or engage in further development, neuroeducation will not permeate the greater school system; it will not flourish. Change is

difficult, but it is worthwhile. Neuroeducation is a holistic model with the capability to profoundly impact teaching and learning, but a wider audience and more neuroeducators – those key linchpins – are needed to propel it. Teachers’ practices should be informed by current neuroeducation research and theory; this will further legitimize the profession and, more importantly, it will serve students well.

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