

LASZLO VARGA¹ – TUNDE SZECSEI²**Neuropedagogy in Early Childhood in Hungary:
Foundations and Micro-investigation³**

Neuropedagogy is an emerging field of study in Hungary. This article provides an overview on the professional directions and works in which The International Research Team and Laboratory of Neuropedagogy (NeuPedLab) at the Sopron University, Benedek Elek Faculty of Pedagogy, in Sopron, Hungary is engaged. First, the article reports on the theoretical approaches of neuropedagogy in Hungarian early childhood education. In the context of international research, the article also reports on the findings of a pilot study on Hungarian early childhood teachers' understanding and willingness to use information about brain development in their everyday practice. The article concludes with highlights about the importance of infusing knowledge about the brain and pedagogy to maximize young children's development.

Keywords: Brain development; constructivism, kindergarten, neuropedagogy, pedagogical approaches

Neuropedagogy in early childhood education in Hungary

The International Research Team and Laboratory of Neuropedagogy (NeuPedLab) is a unique scientific institute at the Sopron University Benedek Elek Faculty of Pedagogy in Sopron, Hungary. Based on the Hungarian and international interdisciplinary scientific research in early childhood education, the institute aims to explore the avenues for applying the current results of neuroscience as they are applicable in the field of pedagogy. Members of this research team: pediatric neurologists, researchers of educational sciences, psychologists and classroom teachers, collaborate on studies in order to develop new pedagogical theories and educational innovations built on current knowledge in neurology, neuroscience and pedagogy.

Research studies on young children's brain development and emotional development indicate the critical importance of early years in child growth and development and the child's

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future life (Bergen and Woodin, 2017). When the research findings related to young children's brain and emotional development are integrated with essential issues of pedagogy, a scientific dialogue between classroom teachers and neurologists is expected to surface with the intention of exploring the possibilities for initiating new directions in pedagogy (Nouri, 2016). The human brain is a complex organ which is perceived as a challenging area both for scientist and teachers to better understand (Adam, 2012).

Neuropedagogy includes two vital and distinctive areas: (1) the impact of research in pediatric neurology for pedagogical practices, and (2) knowledge about learning (Howard-Jones, 2011). During the first eight years of life the brain develops with such enormous speed and depth that by the age of three the neural network is well-developed. Brain development during these first eight years allows children to learn about their environment. These years are a window of opportunity, a sensitive period for learning. Around the age of eight, this window of opportunity narrows and the sensitive period of learning closes (Bergen and Woodin, 2017). Research indicates the quality of child care has an impact on the development of the brain structure and neural network. Therefore, it is vital to determine the nature of experiences to which children are exposed during these vital years. If these positive and productive experiences are limited and/or children have no access to activities and experiences to explore their environment and their self, the inadequate neural network in their brain will hinder their exploration and learning (Farmer-Dougan and Alferink, 2013). Children's interest in understanding the world around them is the first and essential way of learning for young children. On the other hand, the constant stress, traumas, and physical and emotional neglect and abuse will result in learning difficulties and other cognitive and social impairments (Bergen and Woodin, 2017). In the field of neuropedagogy, pediatric neurologists examine the neurological development of children, while teachers utilize learning strategies that are conducive to young children's learning and the utilization of brain capacity. As Csíkszentmihályi (2010) notes effective investments in early childhood leads humans to a happy life. Therefore, early childhood educators have responsibilities and opportunities to positively impact the early years to later life.

Allow me to do it on my own

The concept of neuropedagogy is built on the theory of constructivism. Jean Piaget, the Swiss psychologist and the founding theorist of constructivism pointed out that knowledge which is a result of the child's reaction to the environment, is constructed through interaction with real

objects in authentic situations. Overall, Piaget (1970) determined knowledge as the result of the brain activity in which the child constructs an understanding through interactions with his/her environment.

The perception of learning is constantly changing. Some people associate learning with the years in school; however, learning takes place throughout life. After acknowledging the importance of school-based learning, in adulthood we experience learning in other alternative ways such as learning outside the school, learning from home and cultures, acquiring knowledge in real life situations, and learning without direct teaching. The current findings of neuropedagogy support the importance of learning even before school-based learning, because young children develop their personalities, their approaches and relationship to the world around them during the early years of life. Therefore, it is vital to provide an environment for optimal development during the first eight years of life. Ultimately, learning is an essential but complex process in which we, human beings are engaged from birth to death.

Constructivism, a new paradigm of learning theories which emerged in the 20th century, focused on the child's inner world rather than on the process of learning. In Hungary, Nahalka István (2002) served as a key figure in research and application of constructivism in pedagogy. According to the constructivist learning theory, the child is unable to receive the knowledge as a passive participant but rather the child is an active participant in the construction of the new knowledge (McDevitt and Ormond, 2016). Therefore, the role of a child as an active learner generated a symbol of "self-made man". In addition, the child's brain, which plays an important role, is responsible for interpreting, and constructing new information. This way the child actively builds new information on his/her prior background knowledge expanding "the mental map" of the surrounding world in his/her brain. Furthermore, the learning process is driven and lead by the child who is constructing the new knowledge (self-made child); at the same time the teacher or caregiver take a supporting role. The knowledge is not delivered by the teacher, adult or caregiver, but rather the process of learning is facilitated by the teacher in an optimal environment to promote children's construction of new structures and concepts. This theory of learning emphasizes the role of teachers in exploring the child's prior or background knowledge and in creating a supportive learning environment (Bredenkamp and Copple, 2015). Overall, the child is the main "actor" in this construction of knowledge and the teacher provides a pedagogically appropriate approach to facilitate this learning process. Montessori's motto expresses the role of the child and teacher in the constructivist learning process "Support me so that I can do it on my own".

What we know and what we do—an empirical micro investigation

In an empirical study in neuropedagogy, we examined the ways of support that early childhood educators provide to young children to optimize brain development. (Borbas and Varga, 2017). Our theoretical framework included constructivism and research in neurology and pedagogy. This pilot study used a paper-pencil survey which was distributed in ten kindergartens. The 45 participants were between 35-46 years old with different lengths of teaching experience. In this study, we intended to explore the early childhood teachers' knowledge about brain development and their willingness to explore and use the recent findings of scientific studies in neuroscience. The results indicated that the majority of the teachers (75%) has basic knowledge about theories related to young children's neurological development. Most participants (86%) expressed interest, and willingness to expand their knowledge about the implications of neuro studies in the field of education. Even higher percentage of teachers (91%) believed that they would need more professional development in methods and approaches that are conducive to and aligned with brain development. The results of this pilot study indicated that studies in neuroscience are needed to improve of early childhood educators' professional skills and knowledge.

The results of our study also indicated the teachers' professional understanding of constructivism and its support for brain development. Unlike traditional school-based experiences, recent activities in kindergarten promote critical thinking, creativity, "aha moments" and constructive explorations which are supported with intentional pedagogy and planning. In addition, some traditional school models and curricula e.g., hurried delivery of information, lack of time for in-depth exploration, meaningless regulations, and focus on errors - hinder creativity, and innovative solutions for problems. In the traditional school model, students are rarely encouraged to find several alternative solutions, individual views and opinions are not welcome and arguments or different viewpoints are discouraged; overall individual views and opinions are expelled (Deli-Buda, 2007). On the other hand, developmentally appropriate education in kindergarten offers numerous and unlimited opportunities for exploration allowing trial and error approach in an environment in which children's interest and motivation is carefully nurtured (Bredekamp and Copple, 2015). For children's uninterrupted development, it would be essential to have a transition between kindergarten and school which would demonstrate the characteristics of support for learning present in the kindergarten.

The quantitative analysis of the data indicated that the kindergarten teachers have basic knowledge about the brain's development and its neurological consequences. The participants expressed a positive attitude about the enhancement of their knowledge related to brain development. Overall, the responses suggested that the teachers are willing to increase their pedagogical knowledge, and expressed interest in applying this new knowledge in their practice. This interest in professional development is promising; teachers who are aware of the need to expand his/her knowledge about the brain are more likely to effectively meet the challenges of the paradigm change which includes the infusion of cognitive sciences and pedagogy.

The results also indicated that the most recent research findings in neuroscience have had an impact on teachers' pedagogical practices.. Overall, the results indicated a dominance of constructivism in the participants teaching philosophy regarding learning, and ultimately a neuro-constructivist approach in kindergarten pedagogy was present. In particular, the support for the children's developing neurological system is the most optimal when the following criteria are present: consideration of children's interest and prior knowledge, a supportive environment and the guidance both at social and cognitive levels.

The results of the pilot study also suggested the importance of the infusion of the neuro-constructivist approaches and the teachers' practical methodological approaches. This infusion ultimately leads the teachers to create and maintain a project-based kindergarten model with activity- and experience-based curriculum. In addition, the environment is instilled with love, attention, emotional support, and empathy during the learning process. In this model, the children's emerging and developing competencies are supported and guided with intentionally designed activities and experiences. The play-learning-work triad dominates in the daily activities which offers authentic environment for optimal brain development. Children's emotional well-being is supported with positive experiences through puppetry, music, drama and art activities as well as through free play; all of these become a contributor to optimal brain development. All these results suggests Selma Fraiberg's though "Early years are years for miracles" (Fraiberg, 2014).

Prior to this Hungarian micro-investigation, Zambo, (2008); Zambo & Zambo, (2012) conducted studies about in-service teachers' and teacher candidates' knowledge, thoughts and views about neuroscience and education. In these studies, more than 850 teacher candidates and classroom teachers participated. The findings suggested that most teachers and teacher candidates are interested in neuroscience and use resources to expand their knowledge. They

indicated the need for incorporating information about neuroscience in teacher preparation programs because they believed that this information would better prepare them to more effectively work with children, especially, children with special needs. Specifically, those teachers who expressed full support for the inclusion of neuroscience in educational practices perceived neuroscience as the most current and evidence-based information for teachers to diagnose children with learning difficulties and utilize differentiated instruction for diverse learning styles. On the other hand, teachers who had reservation about neuroscience acknowledged the benefits of neuroscience; however, they also pointed out the limited nature of neuroscience and requested more information in psychology and child development to gain a holistic understanding of development and learning. In addition, a small number of teachers were hesitant to consider the findings of neuroscience research because of the lack of the quality of research and they emphasized the need for carefully controlled studies about classroom practices. As Zambo & Zambo (2011) found that these so called non-believers perceived children as much more than what a brain scan can capture, and stressed the variety of other characteristics and impacts that young children hold and experience.

The need for effective teacher preparation in terms of teachers' competencies for interpreting the findings of neuroscience research is well documented by Zambo, Zambo & Sidlik (2013). In their study, they found that teachers are easily misled, because they find information accompanied with fMRI images more credible than information presented with a graph or no image. Zambo, Zambo & Sidlik (2013) warns about the neuromyths which are "widely used" teaching and learning ideas and concepts with no scientific evidence. Overall, this line of research substantiates the findings of the micro-investigation with Hungarian teachers which also found that teachers were knowledgeable about the use of neuroscience research findings in education to some extent; and they were willing to increase their knowledge. In the future, the Hungarian micro investigation can be expanded, for example with higher number of teachers and a more targeted teacher population, to gain further insights into teachers' views about neuroscience and its impact on teachers' classroom practices.

Closing remarks

In Hungary, a new image of children, a new perspective on childhood and a new educational-pedagogical approach to young children are emerging. Research about different areas of child development has changed and molded our understanding of childhood and our approach to education. One of the main areas that produced significant changes is the scientific

research about brain development and the brain structure. The results of these international studies suggest the need for a paradigm change, a change in perspectives in terms of young children development and education.

It is time to reconsider the pedagogical landscape of Hungary, especially in early childhood education, including the content of early education, and the role and responsibilities of pedagogical programs and curriculum. For these changes, the result of neuroscience, pediatric neurology should serve as an important foundation and promote pedagogy that is built on knowledge about the brain.

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