SOPRONI EGYETEM

BENEDEK ELEK PEDAGÓGIAI KAR

László Varga – Arianna Kitzinger – Réka Kissné Zsámboki

Changing Perspectives and Attitudes on Early Childhood Research and Education

László Varga – Arianna Kitzinger – Réka Kissné Zsámboki

Changing Perspectives and Attitudes on Early Childhood Research and Education

Edited by Gábor Kovács

UNIVERSITY OF SOPRON PRESS
SOPRON, 2022

Publisher: Prof. Dr. Attila FÁBIÁN
the Rector of University of Sopron

Cover image: Pixabay.com (Victoria_Borodinova)
https://bit.ly/3Jys1cH

Authors:

Habil Dr. László VARGA PhD
University of Sopron
Institute of Educational Sciences and Psychology
Dean
varga.laszlo@uni-sopron.hu

Dr. Arianna KITZINGER PhD
University of Sopron
Humanities Research Centre
Head of the Centre
kitzinger.arianna@uni-sopron.hu

Réka KiSSNÉ Dr. Zsámboki PhD
University of Sopron
Institute of Educational Sciences and Psychology
Vice Dean for Science and International Relations
kissne.zsamboki.reka@uni-sopron.hu

ISBN (pdf) 978-963-334-425-5
DOI https://doi.org/10.35511/978-963-334-425-5

Hungarian Electronic Library:
https://mek.oszk.hu/22900/22927

Supported by EFOP-3.4.3-16-2016-00022 „QUALITAS”
Development of Higher Education in Sopron, Szombathely and Tata

EFOP-3.4.3-16-2016-00022 „QUALITAS”
Minőségi felsőoktatás fejlesztés Sopronban, Szombathelyen és Tatán

SZÉCHENYI 2020
MAGYARORSZÁG KORMÁNYA
Európai Unió
Európai Szociális Alap
BEFEKTETÉS A JÖVŐBE

Table of Content

The authors 4

László VARGA:
ON THE BRIDGE BETWEEN PAEDIATRIC NEUROLOGY
AND EARLY CHILDHOOD PEDAGOGY 5
1. Neuropedagogy in early childhood in Hungary: Foundations and micro-investigation 5
1.1. Learning objectives 5
1.2. Neuropedagogy in early childhood education in Hungary 7
1.3. An empirical micro investigation 9
1.4. Closing remarks 11
2. Current trends, dilemmas and future directions in neuropedagogy
in the field of early childhood 11
2.1. Learning objectives 12
3. Trends, Topics and Issues Related to Early Childhood in Neuroeducation 13
4. Research in Neuroeducation 15
5. Closing remarks 17
6. Conclusion and acknowledgement 17
References 18

Arianna KITZINGER:
THE AGE OF LANGUAGE LEARNING IN MODERN EUROPE 21
Introduction 21
1. An international overview of languages and language learning 22
1.1. The European map of languages 22
1.2. Multilingualism vs. monolingualism 24
1.3. Linguistic diversity 24
2. Bilingualism in education 26
2.1. Language learning at school 27
2.2. Early start of language learning: pros and cons 28
2.3. The process of language acquisition 29
3. From theory to practice: how to implement a bilingual programme in the kindergarten? 32
3.1. The kindergarten method 32
3.2. The kindergarten programme 33
3.3. Activities in the kindergarten 34
3.4. Early English in action 35
4. Conclusion and acknowledgement 39
References 40

Réka KISSNÉ ZSÁMBOKI:
TEACHING MATHS AT EARLY YEARS – FROM LECTURE
METHOD TO DISCOVERY APPROACH 43
1. Activity based learning at early years 43
1.1. Theories about learning 43
2. Early math skills 45
3. From cognition to conceptualization at early years 46
3.1. Thinking and learning by doing 46
3.2. Developmental stages of conceptualization 48
4. Numeracy and numerical innate abilities 50
5. Mathematical competences in early childhood 51
6. From lecture method to discovery approach 53
7. Conclusion 55
References 56

The authors

László Varga Habil. PhD
Dean, Associate Professor

University of Sopron, Benedek Elek Faculty of Pedagogy
9400 Sopron, Ferenczy János u. 5. Hungary
email: varga.laszlo@uni-sopron.hu

He is the founder and leader of the unique early childhood neuropedagogical research group and laboratory in Hungary. Together with prominent professionals, he has established an international research and counselling network. He is the member of international advisory groups of American and European educational scientific journals. In the frame of research and teaching scholarships he has represented Hungarian higher education and educational science all over the world. His main research fields are childhood's effect on personal life paths, children's worldview and children's culture, childhood progress and development, constructivist pedagogy, early childhood neuropedagogy and competence-based education. He was awarded with Apáczai Csere János Prize for his outstanding academic performance in promoting educational practice.

Arianna Kitzinger PhD
Head of Centre, Associate Professor

University of Sopron, Benedek Elek Faculty of Pedagogy
9400 Sopron, Ferenczy János u. 5. Hungary
email: kitzinger.arianna@uni-sopron.hu

She originally graduated as a teacher of Hungarian and English language and literature. She wrote her BA and MA theses on Finnish and American literary themes, then another MA thesis on the language policy of the EU. She got her PhD in Linguistics from Pázmány Péter Catholic University, Budapest, in 2015 with a dissertation on the challenges of multilingual and multicultural education. Her new research topic is the socio-linguistic effects of the political transition period in the post-communist states in the 1990s. At present she works as an associate professor at the Institute of Communication and Social Sciences at the University of Sopron, Hungary. In January 2020 she was appointed the head of the Human Sciences Research Centre (HSRC) at Benedek Elek Faculty of Pedagogy where she aims to focus on the internationalisation of research in teacher training.

Réka Kissné Zsámboki PhD
Vice Dean, Associate Professor

University of Sopron, Benedek Elek Faculty of Pedagogy
9400 Sopron, Ferenczy János u. 5. Hungary
email: kissne.zsamboki.reka@uni-sopron.hu

She originally graduated as a kindergarten teacher in 1994 and got a MA degree in Educational Sciences in 2012. She got her PhD in Educational Sciences from Eötvös Loránd University, Budapest, in 2013 with a dissertation on the evolvement of the Freinet-pedagogy in the Hungarian kindergartens. She has more than twenty years work experience in pre-primary education and in pre-primary teacher training. She is the author of some books on mathematics education in early childhood. At present she is the editor-in-chief of the Training and Practice international journal of educational sciences. She serves as a vice dean for international relations and science and works as an associate professor at the Institute of Educational Sciences & Psychology of the University of Sopron, Hungary.

https://doi.org/10.35511/978-963-334-425-5-Varga

László VARGA

ON THE BRIDGE BETWEEN PAEDIATRIC NEUROLOGY AND EARLY CHILDHOOD PEDAGOGY

„Brains are built, not born."
J., Shonkoff[1]

1. Neuropedagogy in early childhood in Hungary: Foundations and micro-investigation

Neuropedagogy is an emerging field of study in Hungary. This paper provides an overview on the professional directions and works in which The International Research Team and Laboratory of Neuropedagogy (NeuPedLab)[2] at the Sopron University, Benedek Elek Faculty of Pedagogy, in Sopron, Hungary is engaged. This material 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 educational material concludes with highlights about the importance of infusing knowledge about the brain and pedagogy to maximize young children's development.

Figure 1. NeuPedLab
(https://www.facebook.com/neuropedagogia/)

1.1. Learning objectives

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.

---

1 Harvard University, Center on the Developing Child

2 NeuPedLab International Research Team and Laboratory of Neuropedagogy; University of Sopron, Benedek Elek Faculty of Pedagogy, Ferenczy János u. 5., 9400 Sopron, Hungary
URL: http://bpk.uni-sopron.hu [2022.03.22.]
URL: https://www.facebook.com/neuropedagogia [2022.03.22.]

Figure 2. Jean Piaget
(https://www.biography.com/scientist/jean-piaget)

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 (Bredekamp 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".*

Figure 3. Maria Montessori
(https://www.montessorisubirats.com)

1.2. 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 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).

Figure 4. Neuroscience and Education
(https://edrsrch.io/neuroeducation-connecting-neuroscience-and-education/)

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.

Comprehensive questions and study activities

- What does the Theory of Constructivism mean and why is it important in early childhood education?
- What are the distinctive areas of neuropedagogy and what current research indicates early brain development?
- Find a minimum of 3 research articles detailing the impact of quality childcare and describe how the research you found supports the importance of positive experiences in early childhood education.

1.3. 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.

Figure 5. Learning in the Kindergarten
(https://www.greysprings.com/products/preschoolbasics)

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.

Comprehensive questions and study activities

- Why is it important to improve the knowledge of early childhood educators in neuroscience?
- List at least 5 positive things that children will experience during Kindergarten.
- Keeping those 5 positive experiences in mind, please provide 5 complimentary strategies as to how one might facilitate a more manageable transition from the current Kindergarten exploratory experience to a more structured academic model in elementary school.

1.4. 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 researchabout 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.

2. Current trends, dilemmas and future directions in neuropedagogy in the field of early childhood

During the past 25 years, research on brain structure and function has expanded our understanding of the relationship between brain development and learning. This field of study is referred to with several terms such as neuroeducation, neuropedagogy, and Mind, Brain and Education. Although a strong interest in neuroeducation is present among researchers and teachers, often misleading recommendations from neuroscience research are made for classrooms. This article provides an overview of neuroeducational research studies in early childhood education to demonstrate how this field of study impacts teachers' and parents' understanding of best practices and optimal development. Also, to address the concern of the valid and reliable research in neuroeducation, we outline the principles of neuroeducational research based on Nouri (2016), and propose directions for future research.

2.1. Learning objectives

During the past 25 years research on brain structure and function has expanded our understanding of the relationship between brain development and learning. Educators, parents and scientists recognized the importance of this knowledge for supporting children's optimal development. This new paradigm of learning has been referred with different terms. For example Nouri (2016) uses the term of *neuroeducational studies* which is "defined as a growing interdisciplinary field based on synergetic connection between neuroscience, cognitive science, psychology, and education in an effort to improve our theoretical and practical understanding of learning and education" (p.59). Other theorists call this field of studies as, for example, *educational neuroscience*, *neuroeducation* (Smeyers, 2016), *Mind and Brain and Education* (Howard-Jones, 2011) *neuropedagogy* and *neurodidactics* (Kraft, 2012). Similar to Nouri's definition Patten and Campbell (2011) delineates *educational neuroscience* as a field of study that "produce{s} results that ultimately improve teaching and learning, in theory and practice" (p. 6). Though different names are used synonymously for the disciple; all seem to convey the idea that instead of being a single discipline, it is an interdisciplinary field that aims to explore a holistic understanding of learning and education.

Nouri (2016) firmly separates neuroeducational studies from the so called "brain-based learning" due to the recent criticism about brain-based learning for its overgeneralizing and oversimplifying neuroscientific findings for the use of education. Zambo (2013) also expressed her concern about misusing ideas related to neuroscience and applying neuromyths, as she refers to these simplified and misinterpreted ideas of neurological studies in education. Similarly, Howard-Jones (2010) warns about neuromyths that play a significant role in molding teachers' views and understanding of the relationship between brain and education. These neuromyths often misguide teachers; for example when teachers advocate for so called hemisphere strategies to remedy learning disabilities based on the notion that people are rather right or left-brained, though none of these "myths" are substantiated with data in the field of neuroscience. To eliminate the problem of oversimplification, overgeneralization and misuse of information in neuroscience, researchers calls for merging several disciplines such as cognitive psychology, neurosciences, psychology, cultural anthropology and education, so that with a multidisciplinary approach, neuroscientists can assist teachers in better understanding the brain structures and functions (Hruby and Goswami, 2011).

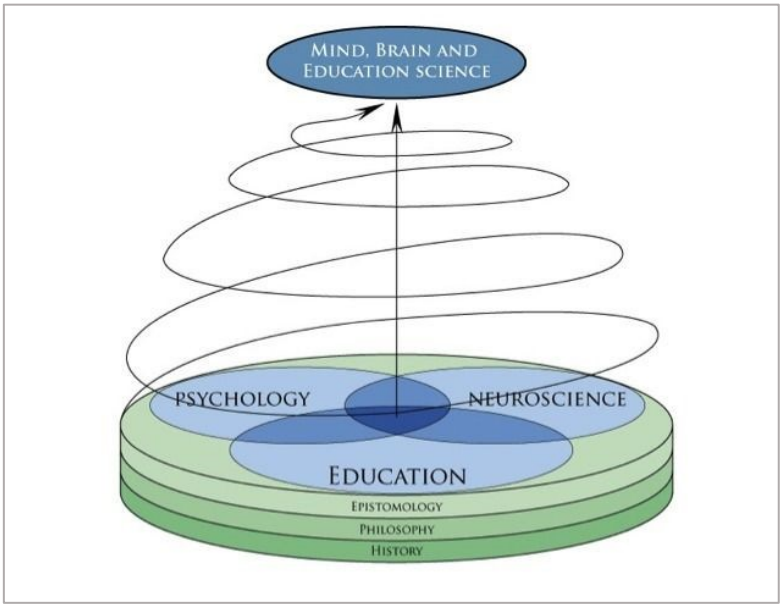

Figure 6. Neuroeducational studies
(https://hu.pinterest.com/pin/154107618470178730)

In this paper, we will provide an overview of neuroeducational research studies in early childhood education to demonstrate how this field of study impacts teachers' and parents' understanding of best practices and optimal development. In addition, to address the concern of obtaining and using the valid and reliable research in neuroeducation, we also outline of principles of neuroeducational research based on Nouri (2016), and propose directions for future research.

3. Trends, Topics and Issues Related to Early Childhood in Neuroeducation

The expectations and pedagogical practices in early childhood are rapidly changing to respond to the changing societies worldwide. Although with the help of technology, specifically with brain imaging, we understand more about child development; in many countries the over-emphasis on academic skills such as reading and math skills, and the neglect of social emotional development seem to trigger pedagogical practices that are developmentally inappropriate for young children, and hinder the implementation of balanced approaches to child development (National Association for the Education of Young Children, 2015). Tobin (2013) warns about the disappearance of play and appropriate physical movement in young children's every day activities as a result of the restricted learning outcomes and inadequate teaching methods with which teachers erroneously prioritize academic skills and disregard children's physical and social emotional needs. To ensure that young children are engaged in developmentally appropriate activities and interaction, Haslip and Gullo (2018) urge the support for conducting research and distributing the findings to educators, parents, and policy makers. This need for research-based practices in early childhood classrooms is targeted in the field of neuroeducation which uses the theories and techniques of neurosciences to inform pedagogical practices and further educational research. Without the intention to provide a comprehensive overview of topics in which neuroeducational research offered pedagogical implications for early childhood educations, we include intentionally selected topics of research that targeted essential skills and activities for young children.

Self-regulation, which children develop during the first five years, is a fundamental skill for life-long learning. Self-regulation includes skills to maintain attention, to be resistant to distractions and to avoid conflicting behavior. Early childhood teachers have a main role in helping children regulate their behaviors, emotions and reactions (Blair and Raver, 2015). Based on the research studies addressing the neurological processes for this effect of music implementing music, rhythm and movement to promote self-regulation is proposed (Williams, 2015). Although the impact of formal music training on neurological development is well-known (George and Coch, 2011), Williams (2015) argues that the infusion of coordinated rhythmic activities could serve as effective pedagogical approaches to address the neurological foundations of self-regulation. Similarly, Neville et al. (2008) found that children who participated in regular music training demonstrated higher level of auditory selective attention. Thus, research findings regarding the neurological base for improved self-regulation can guide teachers in applying music, movement and rhythm in the everyday classroom activities.

Social competence and mental health are vital emerging capacity during the early years; therefore, there is increased interest in research related to the neurobiological base of these skills. Neuroscience can identify leverage points for advancing brain development. In particular, parents' and caregivers' presence, and the frequency and quality of interaction with young child have an impact on the neurodevelopment of the brain, and ultimately influence the child's emotional regulations and social cognition (Szalavitz & Perry, 2011). Therefore, the parents' and educators' responsive interaction with children can facilitate the social emotional well-being of children.

Figure 7. Well-being of children
(http://www.oecd.org/social/family/child-well-being)

Neuroscience offers insights into children's neurological activities during reading or other literacy-related activities. For example, with examining preschoolers' brain wave length, Tan and Molfese (2009) found that children can discriminate between words of different syntactic classes, though not at the same level as adults. Caffara et al (2018) used MEG data about young children's (4-8 years old) reaction to written, and spoken words and visual objects. They found that the process of learning to read not only impacts written word processing but also affects object recognition: "suggesting a non-language specific impact of reading on children's neural mechanism" (p. 21). In addition, Hirsch (2013) points out that emotions are critical in cognitive development, more specifically in literacy development. Ultimately, with healthy emotions, as important building blocks in brain, children are more probable to succeed in literacy-related activities. These findings highlight the interconnection and interdependency between social emotional development and advancement in literacy skills, which teachers should consider when planning literacy activities.

The benefits of play is well-documented in general; though some studies specifically point out the neurological advantages of play during childhood. For example, pretend play promotes brain development through emotions and cognition in executive function; and stimulates synaptic connections (Szalavitz and Perry, 2011). In addition, Fletcher (2011) argues that play settings are the optimal environment for children to develop self-regulations, to exhibit pro-social behavior and to learn to control aggression. Furthermore, Burdette and Whitaker (2005) highlights the positive effect of free play with physical activities that involves gross motor play; children develop vital executive function skills such as attention as well as social skills that ultimately enrich emotional and cognitive development.

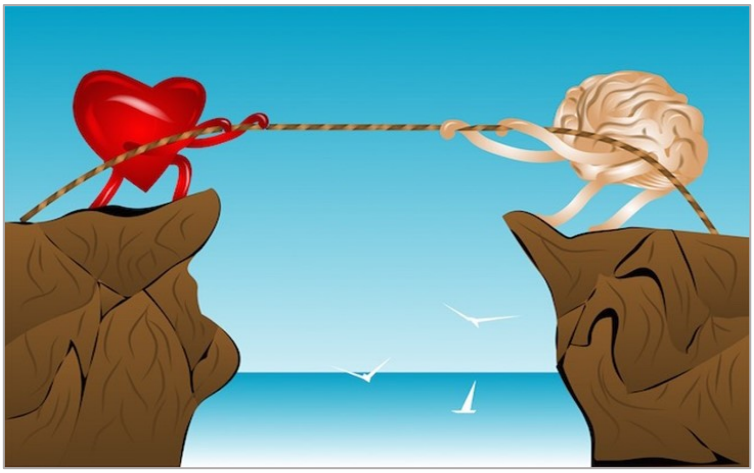

Figure 8. Emotional and/or cognitive?
(https://eletmod50.com/az-on-szive-erzekeli-az-erzelmi-allapotot)

Overall, these examples for neuroeducational research related to young children's self-regulation, social competence, literacy skills and play clearly demonstrate the holistic and interdisciplinary nature of investigations of these issues related to child development. Further, in order to offer evidence-based implications for early childhood classrooms and to eliminate neuromyths which misguide teachers and parents, design and conduct quality research in in neuroeducation is imperative.

Comprehensive questions and study activities:

- Please provide 5 technique to support the development of emotional self-regulation skills in the preschool classroom.
- Please describe the way and which music can promote emotional self-regulation by offering specific examples of musical activities that can be used in a preschool setting?
- What is the benefit of play? How can play support a child's overall well-being? Please offer 3-5 examples of what the benefit of play is and how it can support a child's overall wellbeing.

4. Research in Neuroeducation

Research in neuroeducation, which is conceptualized as an area within education, is needed in order to provide brain-related evidence-based suggestions and implication for educators. Nouri & Mehrmohammadi (2012) defined the boundaries and nature of neuroeducation and also outlined the principles of neuroeducation research. Specifically, Nouri (2016) identified five principles for scientific inquiry in neuroeducation based on which the conclusions and implications drawn from the research findings can offer relevant, evidence-based and usable outcomes. First, neuroeducation is interdisciplinary in nature because researchers incorporate the knowledge from diverse fields which include psychological, neural and pedagogical foundations of learning and development. Because of this interdisciplinary approach to a problem to investigate, there is an increased chance to propose solutions to educational issues from the perspectives of neuroscience and other disciplines (Schwartz & Gerlach, 2011). To the present, few studies have been conducted with a collaboration of researchers in the field of neuroscience, and pedagogy (Nouri, 2016). The second principle of neuroeducational research describes it as *applied* research which

ultimately produces findings that improve educational practices. Ultimately, educators and scientists are encouraged to collaborate and identify and examine questions that will advance educational practices (Nouri, 2016). Neuroeducational research has the potential to offer valid and reliable findings with an application for classrooms. Third, neuroeducational research can use a variety of methodological designs; thus both qualitative and quantitative methods could offer a new level of understanding related to learning and development. The fourth principle is an expectations regarding the researchers' ability to adjust neuroeducational research and their own philosophical standpoint. Specifically, a researcher with a certain philosophical orientation determines what questions and issues to investigate (Hendricks, 2017). The final principle is that neuroeducation is value-saturated because of the ethical and moral issues involved (Nouri, 2016). In addition to the evaluation of the impact of research findings, it is essential to consider the ethical issues in the application of neuroscience research in education. Furthermore, Zochi and Pollack (2013) emphasizes the importance of *neuroethics* as a new field which responds to the ethical issues in the context of cultural and social structures. Based on these five principles of neuroeducational research, Nouri (2016) argues for a common definition for neuroeducational research which incorporates these principles:

"Neuroeducational research is an interdisciplinary endeavor to develop an insightful understanding and holistic picture of problems related to learning and education. It thus epistemologically is based on an integrated methodological pluralism paradigm. This requires researchers to understand multiple methods and methodologies and employ as they formulate their own research projects. Researchers have a critical role to play in providing systematic evidence and conclusions that are scientifically valid and reliable and educationally relevant and usable." (p. 64)

Regarding the future directions in neuroeducational research Nouri (2016) suggests the implementation of the four stage approach proposed first by Pincham et al., (2014). First, educators and researchers in collaboration identify educational areas in need for which neuroscience might find solutions. At stage two and three neuroscience researchers design and conduct an investigation of a problem in a laboratory and analyze whether the findings can be employed in an educational setting. At the final stage, teachers and researchers in collaboration reflect on the research findings from the perspective of their discipline. Overall, it is essential to maintain a collaborative relationship between educators and neuroscience researchers to carry out neuroeducational research which advances the pedagogical practices and positively impacts students' learning.

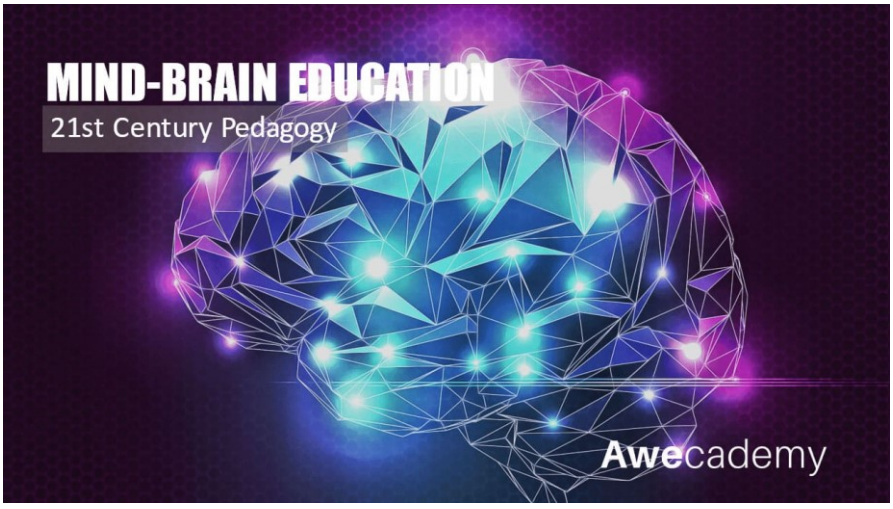

Figure 9. Neuroeducation research
(https://www.learn.awecademy.org)

Comprehensive questions and study activities

- What is Nouri's five principles of scientific inquiry?
- What is the definition of neuroeducational research and why is it important to have a common consensus regarding this topic?
- Please explain the significance of the collaborative relationship between educators and neuroscience researchers? How does this collaboration manifest in the context of classroom practices in curriculum implementation? (Please provide 3-5 examples)

5. Closing remarks

Neuroscience and neuroeducation/neuropedagogy is attractive. Researchers and teachers want to understand brain functions and brain structures so that they can facilitate learning. Especially, early childhood educators and parents are open to and interested in the newest findings of neuroscience so that they can better facilitate child's behavior, motivation and attention for future success. Although there is a need for further research-based guidance in education, caution must be taken. Neuromyths that are misconception about the mind and brain functioning could cover and hide real relationship between brain and education, and might cause unwanted side-effects in education. Because of the wide-spread misconceptions about brain and the applicable recommendations, further research is needed. As Pasquinelly (2012) put"knowledge must be pursued, conveniently disseminated, and taught (p. 93). With this emerging new knowledge, early childhood teachers will be better equipped to implement a developmentally appropriate curriculum.

6. Conclusion and acknowledgement

Interpretation and understanding the first years of human life, early childhood and childhood have undergone paradigmatic changes in the last few years. The latest national and international researches emphasize childhood as a key factor in the course of life of the individual. Developing and educating children is crucial for the progress of a nation and the development of the economy, since only happy, well-balanced, talented children are able to build a prospering and sustainable society. In case the investment in children and families happens in a bright way, the next generation will surely pay it back. Looking at our children from a wide perspective we can say that they are the citizens, workers, parents of tomorrow, the founders of the society of the future and the basis of the development of the economy. Intelligent investment is a kind of key in establishing a happy life, so there is an unlimited chance and extreme responsibility on our shoulders, since early years last forever. It is therefore vitally important that student teachers have very high quality initial teacher education, supported by well-educated and knowledgeable lecturers and pedagogues. It is also important that qualified teachers and other adults working with our youngest children have access to, and opportunities for continual professional development throughout their career. Having highly qualified teachers for young children is vital as the early years are such an important stage of children's development and pave the way for all future learning.

The period up to eight years is considered to be the peak time for brain development. From birth to about the age of eight the brain is a super-sponge. This is the brain's most absorbent stage, where it actively learns from its environment. "Windows of opportunity" are sensitive periods in children's lives when specific types of learning take place. Information flows easily into the brain through 'windows' that are open for only a short duration. Then the 'windows'

close, and much of the fundamental architecture of the brain is completed. Scientists are continually learning more about how young children's brains develop. At the same time, teachers are looking for effective strategies to help children use their brains to their fullest capacity.

This educational material contributes to this dialogue by summarizing what we already know about the learning process in the brain and suggests how it might inform the teaching and learning process in the classroom.

I would like to express my very special thanks to my colleagues, Tünde Szécsi, Veronika Mák, Réka Kissné Zsámboki and Suzy Rosemond for their excellent work and professional assistance during the project. My sincere and heartfelt thanks also go to the participants of this international research.

REFERENCES

Ádám, Gy. (2004). *A rejtőzködő elme.* Budapest: Vince Kiadó.

Bergen, D. – Woodin, M. (2017). *Brain research and childhood education. Implications for educators, parents and society.* New York: Routledge.
DOI: https://doi.org/10.4324/9781315465173

Blair, C. – Raver, C. (2015). School readiness and self-regulation: A developmental psychobiological approach. *Developmental Psychology, 66,* 711-731.
URL: https://doi.org/10.1146/annurev-psych-010814-015221 [2022.03.22.]

Borbás, M. L. (2017). *Kisgyermekkori neuropedagógia. A kisgyermekkori agyfejlődés megtámogatása az óvodai nevelésben*. Sopron: SOE BPK, Kézirat.

Bredekamp, S. – Copple, C. (2015). *Developmentally appropriate practice (DAP) in early childhood programs. (6th edition)* Washington, D. C: National Association for the Education of Young Children (NAEYC).

Burdette, H. – Whitaker, R. (2005). Resurrecting free play in young children: Looking beyond fitness and fatness to attention, affiliation and affect. *Archives of Pediatric and Adolescent Medicine, 159*, 46-50.
DOI: https://doi.org/10.1001/archpedi.159.1.46

Caffara, S. – Martin, C. – Lizarazu, M. – Lallier, M. – Zarrage A. – Molinari, N. – Carreiras, M. (2017). Word and object recognition during reading acquisition: MEG evidence. *Developmental Cognitive Neuroscience. 24.* 21-32.
DOI: https://doi.org/10.1016/j.dcn.2017.01.002

Csíkszentmihályi, M. (2010). *Flow – Az áramlat – A tökéletes élmény pszichológiája*. Budapest: Akadémiai Kiadó.

Deli, É. – Buda, M. (2007). *Tanulástanítás? Élvezetes tanulás*. Budapest: Dinasztia Tankönyvkiadó.

Farmer-Dougan, V. – Alferink, L. (2013*). Brain development, early childhood and brain-based education: A critical analysis.* In Weassreman, L. – Zambo, D. (Eds.) *Early childhood and neuroscience - links to dedvelomen*t *and learning.* New York: Springer.
DOI: https://doi.org/10.1007/978-94-007-6671-6_5

Fletcher, K. (2011). *Neuropsychology of early childhood*. In A.D. Davis (Ed.), *Handbook of pediatric neuropsychology* (pp. 31-36). New York: Springer.

Fraiberg, S. (2014). *Varázsos évek. Hogyan értsük meg és miként kezeljük a korai gyerekkor problémáit.* Budapest: Park Könyvkiadó.

George, E. – Coch, D. (2011). Music training and working memory: An ERP study. *Neuropsychology, 49(5).* 1083-1094.
DOI: https://doi.org/10.1016/j.neuropsychologia.2011.02.001

Haslip, M. – Gullo, D. (2018). The changing landscape of early childhood education: implications for policy and practice. *Early Childhood Education Journal, 46.* 249-264. DOI: https://doi.org/10.1007/s10643-017-0865-7

Hendricks, C. C. (2017). *Improving schools through action research: A reflective practice approach. (4th ed).* New York: Pearson.

Howard-Jones, P. A. (2010). *Introducing neuroscience research: Neuroscience, education and the brain.* New York: Routledge. DOI: https://doi.org/10.4324/9780203867303

Howard-Jones, P. A. (2011). A multiperspective approach to neuroeducational research. E*ducational Philosophy and Theory, 43(1*), 24-30. DOI: https://doi.org/10.1111/j.1469-5812.2010.00703.x

Howard-Jones, P. A. (2011). From brain scan to lesson plan. *Psychologist,* 24(2). 110-113.

Hruby, G. G. – Goswani, U. (2011). Neuroscience and reading: A review for reading education researchers. *Reading Research Quarterly, 46*(2) 156-172. DOI: https://doi.org/10.1598/RRQ.46.2.4

Kraft, V. (2012) Neuroscience and education: Blind spots in a strange relationship. *Journal of Philosophy of Education 46(3*). 386-396. DOI: https://doi.org/10.1111/j.1467-9752.2012.00868.x

McDevitt, T. – Ormrod, J. (2016). *Child development and education (*6rd Ed.), New York: Prentice-Hall.

Nahalka, I. (2002). *Hogyan alakul ki a tudás a gyermekekben? Konstruktivizmus és pedagógia*. Budapest: Nemzeti Tankönyvkiadó.

National Association for the Education of Young Children (2015*). Developmentally appropriate practice and the common core state standards: Framing the issues*. Washington, DC.: National Association for Education of Young Children.

Neville, H. – Andersson, A. – Bagdade, O. – Bell, T. – Currin, J. (2008). *Effects of music training on brain and cognitive development in underprivileged 3 to5-year-old children: Preliminary results.* Learning, arts, and the brain: The Dana Consortium Report on Arts and Cognition, the Dana Foundation. (pp. 105-106). New York. :

Nouri, A. – Mehrmohammadi, M. (2012). Defining the boundaries for neuroeducation as a field of study. *Educational Research Journal, 27(1).* 1-25.

Nouri, A. (2016). The basic principles of research in neuroeducational studies. *International Journal of Cognitive Research in Science, Engineering and Education. 4(1*), 59-66. URL URL: https://ijcrsee.com/index.php/ijcrsee/article/view/125/476 [2022.03.22.] DOI: https://doi.org/10.5937/IJCRSEE1601059N

Patten, K. E. – Campbell, S. R. (eds.) (2011). Educational neuroscience. *Educational Philosophy and Theory, 43(1*). 1-6.Pasquinelli, E. (2012) Neuromyths: Why do they exist and persist. *Mind, Brain and Education, 6.* 89-96. DOI: https://doi.org/10.1002/9781444345827

Piaget, J. (1970). *Válogatott tanulmányok*. Budapest: Gondolat Kiadó.

Schwartz, M. – Gerlach, J. (2011). The birth of a field and rebirth of laboratory school. *Educational Philosophy and Theory, 43(1),* 67-74. DOI: https://doi.org/10.1111/j.1469-5812.2010.00709.x

Smeyers, P. (2016). Neurophilia: Guiding Educational Research and the Educational field? *Journal of Philosophy of Education, 50(1),* 62-75. DOI: https://doi.org/10.1111/1467-9752.12173

Szalavitz, M. – Perry, B. (2011). *Born to love*. New York: Harper Collins Publishers.

Tan, A. – Molfese, D. (2009). ERP correlates of noun and verb processing in preschool-age children. Biological Psychology, 80(1), 46-51. N DOI: https://doi.org/10.1016/j.biopsycho.2008.04.014

Tobin, J. (2013). *The disappearance of the body in early childhood education*. In. L. Bresler (Ed.), *Knowing bodies, moving minds: Towards embodied teaching and learning* (pp. 111-126). New York, NY: Springer.
DOI: https://doi.org/10.1007/978-1-4020-2023-0_8

Williams, K. E. (2018). Moving to the beat: Using music, rhythm, and movement to enhance self-regulations in early childhood classrooms. *International Journal of Early Childhood, 50(1)* 85-100.
DOI: https://doi.org/10.1007/s13158-018-0215-y

Zambo, D. (2008). Childcare workers' knowledge about brain and developmentally appropriate practice. *Early Childhood Education Journal. 35*, 571-577.
DOI: https://doi.org/10.1007/s10643-007-0223-2

Zambo, D. – Zambo, R. (2011). Teachers' beliefs about neuroscience and education. *Teaching Educational Psychology, 7(2).* 25-41.

Zambo, D. – Zambo, R. (2012) Beliefs of college students inside and outside education. *Education Quest, 9(1).* 87-93.

Zambo, D. – Zambo, R. – Sidlik, L. (2013). Preservice teachers' perception of neuroscience, medicine and students with ADHD. *Journal of Excellence in College Teaching, 24(3).* 51-67.

Zambo, D. (2013*). The practical and ethical concerns of using neuroscience to teach young children and help them self-regulate*. In Wassreerman, L. H. – Zambo, D. (Eds). *Early childhood and neuroscience- links to development and learning. (*pp. 7-22). New York: Springer
DOI: https://doi.org/10.1007/978-94-007-6671-6_2

Zocchi, M. – Pollack, C. (2013). Educational neuroethics: A contribution from empirical research. *Mind, Brain, and Education, 7(1),* 56-62.
DOI: https://doi.org/10.1111/mbe.12008