

SHAPING MINDS: EDUCATION'S NEURO-NUTRITIONAL DIMENSION

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Abstract

The paper investigates the role of neurons in the learning process and the emerging field of neuroplasticity, shedding light on how our brains adapt when acquiring new skills. It emphasizes the need for a neuron-oriented curriculum to revolutionize teaching and learning methods. Socioeconomic status is scrutinized for its profound impact on brain development, with studies revealing the structural differences in the brains of children from impoverished backgrounds. Chronic stress, often linked to low economic status, further jeopardizes cognitive development. The paper also highlights the influence of diet on cognitive abilities, emphasizing the importance of essential nutrients, omega-3 fatty acids, antioxidants, and B vitamins. It underscores how a balanced diet can significantly affect a child's mood, energy levels, and learning capabilities. Furthermore, the paper advocates for a comprehensive approach to education, considering the intricate interplay of education, neurons, and nutrition. By recognizing the importance of both mental and physical well-being, educators and policymakers can pave the way for a brighter, more holistic future for students.

Keywords: Neurons, Neuroplasticity, Learning Process, Nutrition, cognitive development.

Introduction

Education is like the tablet that eliminates the ailments of ignorance, illiteracy, and wild behavior, additionally; the tablet energizes or delivers power to the wires of intellect, logic and rationality (author). Thus, to attain this type of education there is a need for a holistic ecosystem of education in which one's mental horizon gets broadened. For such a type of education that makes the students think on a big canvas, there is a need for a quality education system. For this, the different governments in the country made different steps to establish good infrastructure and recruited quality teachers and several studies

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were also conducted by the researchers, and NGOs to study the magnitude of these steps and interventions. Despite these efforts, the entire Indian education system is falling behind compared to the education system of well-developed countries. According to the survey 2020 Indian education system in terms of quality stands at 33rd rank. Approaching the subject of this easy education and neurons, the author has some research questions in mind for instance what are neurons? What is the role of these neurons in the process of learning? What is the social impact on the connections of these neurons? What are the activities that will help the student to provide more energy to their neurons?

In the Indian milieu, neuroscience and learning is the area to which educationists, teachers and researchers have not paid much devotion. In the field of education, the utmost of studies done by Indian universities was on the issues of dropouts, school infrastructure, education and women empowerment, education status of subaltern groups, academic achievement concerning socioeconomic status etc. From the survey of the literature, it is inferred very few works were done in the domain of the human brain concerning learning. Educational Physiologists and neuroscientists are still exploring this area and are trying to develop the "Neuron-Oriented Curriculum". With the help of this neuron-oriented curriculum, a novel technique of teaching and learning approaches will be uncovered in the world.

Neurons

Coming on to the first question: what are neurons? These are nerve cells electrically charged when communicating with another nerve cell through special connections called synapses. A typical neuron consists of a cell body (soma) dendrites and a single axon. Hence this is the simple meaning of neurons.

Neurons and learning

Throwing light on the second question: the role of neurons in learning. This is quite significant to know how these neurons play a heart role in learning. The literature survey reports that when one learns a novel

skill, some alterations occur in the brain called neuroplasticity. Lara body brain Researcher at the University of British Columbia in her talk how do we learn? According to her, whenever we learn new skills or facts we learn through the process of neuroplasticity. Furthermore, according to her, this neuroplasticity process consists of three phases. All these three phases of neuroplasticity support learning, these phases are mentioned below:

Chemical signals: As the amount of transferring these chemical signals takes place in the neurons, learning takes place and this learning leads to short-term memory.

Altering the structure: when the connections between the neurons change and it takes a little bit of time and this supports long-term memory.

By altering the brain functions: this takes place whenever we use the brain region so it becomes more exciting to use it again.

So it is because of this neuroplasticity that students or humans acquire new things. Consequently, from the neuroscience perspective when two neurons communicate with each other, this is the time when learning takes place (R. Douglas, 2020). According to neuroscientists learning and memory, formation is made by the strengthening and weakening of the connections among the brain cells, when two neurons frequently interact they form a bond that allows them to transmit more easily and accurately (Donald J. Ford, 2011).

Hence, from the biological milieu, the more synaptogenesis took place, the more one learns the new skills so at what velocity these new connections develop in the mind determines the degree of learning. If these connections are slowly developing that means one can learn the skills very slowly. Teaching and learning are predominantly neurobiological phenomena, in learning the teacher execute certain actions to ease learning and the student intern directly or indirectly promises to act in ways to receive that learning (Melinda T. Owens and Kimberly D. Tanner, 2017). Hence, to make teaching and learning effective the teachers have to understand the brain morphology of the students and the entire teaching-learning ecosystem in which the student is learning.

Socioeconomic status and Brain

In this regard, a groundbreaking study by Kimberly Noble, a neuroscientist and pediatrician at Columbia University, and Elizabeth Sowell from children's hospital Los Angeles, California (2015) studied the brains of 1099 children, adolescents and young adults in various USA cities with the help of M.R.I scans. The study reported that for children from the poorest families, income disparities of a few thousand dollars were associated with a major difference in the brain, primarily in the areas with language and decision-making skills. Hence this study shows how poverty impacts the brain structure of children, adolescents and young adults (Shannon Proudfoot, 2020). The other study was conducted by Martha Farah, a cognitive neuroscientist and her team, who scanned the brains of 44 African Americans, and they found that infants associated with lower socioeconomic status had smaller brains (Sara Reardon, 2015).

Sometimes stress caused by poor socioeconomic conditions not only affects the brain but the entire biological system of the person. If the stress is not controlled on time the person becomes the target of many lifestyle diseases that directly or indirectly impact the learning outcomes of the person. In this regard a study on Stress alters children's genomes was conducted in 2014 by Jyoti Madhusoodanan, the study reported that poverty and unstable family environments shorten chromosomes protecting telomeres in nine-year-olds. Research findings are evident about the possible impacts of poverty on cognitive development (Sebastian, J. Lipine, 2017). From the above-cited studies, it is evident that low economic status is not good for the cognitive development of children. This directly or indirectly negatively impacts the learning of the child. Moreover, this low economic status in most cases leads to high stress which according to research is not fruitful for the well-being of cognitive development of children. According to the Premier Neurology and wellness center in Stuart,

Florida USA. The negative impact of high-stress areas is that stress damages memory, stress can make alterations to mind structure, a

person with stress is more prone to mental illness, stress kills brain cells and stress shrinks the brain.

In the prevailing education system especially in India which is based on grades, a significant population of the country believes that if their children achieve good grades in the class, he or she are considered intelligent. This high-grade mindset puts several students under stress that directly and indirectly negatively influences their studies and learning process. From the examination of literature, it is divulged that during the process of learning novel connections were created in the brain and also prevailing ones are strengthening this is in normal conditions. However, a recent study done by the University of Bonn 2022 published in Science daily, this study was conducted on rodents, the study reported that during the stressful environment rodents lost their 15 percent of their contacts, this means that stress negatively disturbs and harms the movement centers of brain (University of Bonn. 2022). Therefore, teachers should generate the positive environment rather than the stress full conditions. As in the positive environment the learning capabilities increases among the students. As a result, the school administration and the teachers need to be trained how to maintain the positive environment in the class as well as in the campus. To flourish this there is requirement of special programs to train the teachers in order to design the neuron oriented lessons.

Diet and Neurons

Diet can play a significant role in supporting the health and function of neurons, which are the cells responsible for transmitting information in the brain and nervous system. Here are a few key points about diet and neurons

Essential Nutrients

Consuming a balanced diet that includes essential nutrients is crucial for optimal neuronal function. Nutrients such as omega-3 fatty acids, antioxidants (vitamin C, vitamin E, and beta- carotene), B vitamins, magnesium, and zinc are particularly important for brain health.

Omega-3

Fatty Acids: Omega-3 fatty acids, found in fatty fish (such as salmon, mackerel, and sardines), flaxseeds, chia seeds, and walnuts, are critical for brain health. They help maintain the structure of brain cells and support communication between neurons.

Vitamins: Vitamins, such as B6, B12, and folate, play a crucial role in maintaining the health of neurons and producing neurotransmitters. Good dietary sources of B vitamins include whole grains, legumes, leafy greens, eggs, poultry, and lean meats.

Antioxidant-Rich Herbs and Spices: Herbs and spices like turmeric, ginger, cinnamon, and rosemary contain compounds with antioxidant and anti-inflammatory properties that may help protect neurons and support cognitive function.

Mediterranean Diet: The Mediterranean diet, which emphasizes fruits, vegetables, whole grains, legumes, fish, and healthy fats like olive oil, has been associated with a reduced risk of cognitive decline and neurodegenerative diseases. It provides a variety of nutrients beneficial for brain health.

Hydration: Staying adequately hydrated is important for the overall health of your brain and neurons. Even mild dehydration can impair cognitive function, so it's essential to drink enough water throughout the day.

Antioxidants: Antioxidants help protect neurons from oxidative stress, which can damage cells and contribute to age-related cognitive decline. Foods rich in antioxidants include berries, citrus fruits, dark leafy greens, and colorful vegetables like bell peppers and tomatoes. Therefore, the food we consume provides our body with the fuel to think and energy to move our muscles. It not only influences our physical, mental and social wellbeing, but also impacts the learning abilities of a child, which if not corrected on time will continue to be with him as an adult. If a child consumes a healthy diet the body reflects it. The child feels healthy and energized. Whereas, a malnourished child will surely have to bear the repercussions of not providing their bodies what they need to function properly. The said children experience mood swings, feel tired, unfocused, lethargic, and sick which makes them irritable and anti-social and negatively impact

their learning (perceiving) abilities. A study (*Junk food' diet and childhood behavioural problems: results from the ALSPAC cohort, 2007*) that children who consumed highly processed food were more likely to be hyperactive than those who did not. Further the study suggest that processed foods can also cause volatile mental and physical energy, fatigue, and poor concentration

Diet is an important parameter that determines our health and fitness, in this article we classify the diet into two parts, one diet what we eat to maintain our biological health. Another diet is social diet this means our interaction with the members of our society, social food for our brain.

So, in the context of biological diet a significant number of the children, adolescents in this modern period loves to eat outside their homes. They probably love the food that ultimately not good for their health. It is because of this we see how the modern youth and even children became victim of life style diseases. These life style diseases ultimately affect their cognitive power and some left their studies because of these life style diseases. In the context of India, the school children's like mostly the street food, Maggi etc. the reason of this their parents are not aware about the negative effects of these type of food on the health of their children. We see the school going, collage going even university going students are gathered near the fast food corners and most like the eating of Chinese Momos, Barger, etc. in additions to this due the sedentary life style of some students made it worse for their health and their learning capabilities. According to the Society for Neuroscience, that diets with tall levels of saturated fats actually harm learning and memory. Regrettably, foods with saturated fats are repeatedly the most affordable and widely offered in schools (Grace Chen, 2022).

Conclusion

The paper has illuminated a multifaceted connection between education, the human brain, and dietary habits, underscoring the significance of a holistic approach to learning and personal growth. In the journey to enhance educational systems and foster cognitive development, several key takeaways emerge:

1. The paper has unraveled the intricate role of neurons in the learning process, shedding light on the fascinating realm of neuroplasticity. By understanding how our brains adapt and form new connections during skill acquisition, educators can embrace a neuron-oriented curriculum to revolutionize teaching and learning methodologies.

2. **Socioeconomic Status and Brain Development:** This study has laid bare the profound impact of socioeconomic status on brain structure, particularly among children from disadvantaged backgrounds. Chronic stress stemming from poverty exerts a detrimental influence on cognitive development, emphasizing the urgency of addressing economic disparities in education.

3. **Nutrition's Crucial Role:** The pivotal role of nutrition in cognitive abilities cannot be overstated. A balanced diet, rich in essential nutrients, omega-3 fatty acids, antioxidants, and B vitamins, can significantly affect a child's mood, energy levels, and capacity to learn. Understanding the link between diet and cognitive function underscores the need for nutritious school meal programs and parental education on healthy eating habits.

The paper presents a compelling case for a comprehensive, interdisciplinary approach to education. It underscores that education is not merely the transmission of knowledge but a synergistic interplay between the intellect, neuroscience, and physical well-being. Policymakers, educators, and parents alike must recognize the symbiotic relationship between education, neurons, and nutrition and strive to create an ecosystem where every child can thrive intellectually, emotionally, and physically. By embracing this holistic perspective, we can foster brighter, more empowered generations poised to overcome the challenges of tomorrow.

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