The Neurological Correlates of Leadership and Their Relevance to Education 5.0

Navreet Kaur
Professor
Chitkara Business School
Chitkara University
Punjab
navreet.kaur@chitkara.edu.in

Abstract

Introduction: From an organizational standpoint, Neuroleadership (also referred to as neuro-based leadership) has been described as a leadership style where the leader is aware of the neurological and neuroscientific basis of behaviour and utilizes this understanding to create a positive workplace climate. Education 5.0 is a paradigm shift in the teaching-learning process resulting from digital transformation revolving around new technology, Internet of Things (IOT), and changes in IT mainframes. The shift from Education 4.0 to Education 5.0 marked by online classes and distance learning was accelerated by the Covid-19 pandemic. The need for sound academic leadership concurrently acquired salience.

Objectives: The goal of this research is to gain a scientific understanding of the mechanisms involved in the integration of neuroscience, in general, and cognitive neuroscience, in particular, into the field of educational leadership. In recent decades, the scientific community has shown a great interest in integrating neuroscience into education in order to solve a wide range of educational difficulties. The paper also attempts to investigate the dynamics of the teaching-learning process and accompanying deviations using a neuroscientfic approach.

Methods/Analysis: The present study is a perspective article based on Scopus indexed papers published in the last 5 years (2019-2023). A keyword search of the reputable database was carried out using the string “Neuroleadership” or “Neuroscientific Leadership” or “Neuro-based Leadership” with the TITLE-ABS-KEY as “Education”.

Findings: The results indicate that leaders, whether administrators or teachers, who view the teaching-learning process from a neuroscientific perspective can deal with a vast array of academic challenges such as cultivating creativity, empathy, goal striving, and dealing with rejection sensitivity. A brain-based framework for understanding student behaviour can help facilitate modification of their responses in the classroom.

Novelty /Improvement: The review provides a comprehensive account of research on the link between neuro-based leadership and educational outcomes – a research domain still at the nascent stage. A conceptual framework can also derived from neuro-behavioural data gathered from various studies.

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Leadership in education is about planning or directing education by fostering an environment conducive to learning for both teachers and students. It includes formulating of organizational policies and processes that aid in devising effective teaching practices and the formation of a learning environment thereof. Principals and deans occupy leadership roles in educational institutions and are present at each educational level from primary school to high school, and colleges. Educational leadership is directed towards unleashing the talents and energies of teachers, students, and parents for attainment of academic objectives. It is about guiding students and helping them develop initiative and leadership skills.

Perna (2022) talks about leadership quality in teachers. Going beyond curriculum content and engaging students by establishing connect evokes student desire to follow them and is a testimony to their leadership abilities. The concept of a "teacher-leader" entails the quality of attracting the attention of students and instilling in them the will to learn. They are much like corporate or political leaders defined by their capability to influence. An effective teacher does not focus on instructional techniques, classroom management procedures, or disciplinary methods but on the ability to influence and build a team of students who trust him. The process of streamlining education, by default, places educators in a position of leadership which requires them to take charge of young minds, to have their personal values align with the vision and mission of the institution, to set learning goals, and also to inculcate ethical behaviour. This can be possible only if teachers have a commitment to lead through professional behaviour, organized procedures, explicit communication, and clearly defined expectations. They need to display a sense of responsibility and confidence along with integrity, a strong work ethic, and by developing trust and respect in relationships with various stakeholders – the attributes of a positive authoritative leadership style.

Academic Leadership and Industry 5.0

IT has had a disruptive influence on all facets of business including education. The educational transformation labelled as Education 5.0 marks a new era defined by a balanced development resulting from an integration of human-centred aspects with information from cyberspace and physical space (Iaskyana, 2022). Advanced technology can be a facilitator in the adoption of innovative strategies by leaders – a catalyst in achieving sustainable education goals. Leadership is an art that can change according to demands of the environment. The three essential elements in the creation of smart schools are quality educators, good school management, and effective educational leadership. Adaptation and competence are two necessary conditions in dealing with Industry 5.0 (Imtinan, 2021). In order to successfully navigate the change, leaders need to make adjustments to inculcate in the students 21st century skills associated with scientific and technological progress. Iaskyana (2022) enlists five strategies that will enable education leaders cope with the demands of Industry 5.0:

Transformational Leadership Role

This requires collaboration, communication, and networking within the purview of academic management. A transformational strategy is where leaders serve as role models to educators, design professional development and empowerment programs to hone their own abilities and potential, and build a positive educational climate that results in organizational citizenship behaviour among institutional residents (Marisa and Nur, 2021; Rahmansyah, 2017)

Curriculum Development Strategies

There needs to be flexibility and innovation inbuilt in the curriculum with assessments designed to measure competencies, attitudes and skills of the students. The objective of the education curriculum should be to help students learn critical and creative thinking skills, the ability to collaborate, communicate, and to solve problems. Along with digital and technology literacy, life skills

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competencies such as initiative, self-direction, global understanding, social responsibility, and character education (Rahayu, 2021) are of paramount importance.

Educator Empowerment Strategies

The focus of education in Industry 5.0 is on inquiry-based and freedom learning through the use of PBL (Problem Based Learning), PJBL (Project Based Learning) models (Mohan and Sharma, 2021; Saini and Dawra, 2022), and case-based learning that improves the ability of students in solving problems (Fitria, 2021). In this context, educators must realize a transformation in their role and school leaders should facilitate educators to develop their competencies in order to achieve educational goals in Industry 5.0 through workshop activities, on-the-job/off the-job training, seminars, and further studies. The outcome should be educators developing educational and research competence, digital literacy, agile thinking skills, and global competence (Prasetiyo et al., 2022). The educator must be a facilitator enabling students to freely access teaching materials in learning by utilizing technology.

Relationship and Partnership Development Strategies

For sustainability of learning and fulfilment of demands of the community, educational institutions must involve the community members in decision making and in customizing of the curriculum. Discussions with the community stakeholders about various academic programs and activities will help in building the institution's brand image. Also, partnering with surrounding business houses, besides direct financial gain would enable professional collaborations that support learning, provide educational tools and learning infrastructure and help implement training and development activities for teachers (Fatchurrohman, 2018).

School Management and Entrepreneurship Development Strategies

School-based management (SBM) is a strategy to improve education and build a democratic, accountable and transparent culture by transferring significant decision-making authority from state and district offices to individual schools. This autonomy can help school leaders set up school creative business units that involve students and educators and intend to foster creativity and the spirit of entrepreneurs in their students. Various entrepreneurship activities instil in students a risk-taking ability and an achievement-oriented mindset (Elitawati and Haq, 2020; Siregar et al., 2021).

The Concept of Neuroleadership and its Relevance to Education

motivational factors include 'reward learning'. Neuroscientific studies on each of these aspects of goal attainment have uncovered the machinery behind goal pursuit and how various ways of behaviour change may go wrong. In his comprehensive research on the neuroscience of goals and behaviour, Berkman (2018) describes executive functions as higher level skills and capacities such as planning, attention, task switching, inhibitory control and working memory. These functions are effortful, operate consciously, engage in the pursuit of novel goals instead of routine ones (e.g., Miyake and Friedman, 2012) and are represented within neural systems and circuits. Roos et al. (2017) found how goal attainment is thwarted due to the activation of sympathetic nervous system and hypothalamic-pituitary-adrenal axis during stress and the consequent influence on executive functions. Neuroscientific investigations centring on brain training have revealed an improvement in executive functions such as, inhibitory control (involving the prevention of ongoing behaviour) with practice at a related task. Goal attainment is not possible without motivation or "the will" to achieve a desired outcome which is perceived as rewarding. The activity of Mesolimbic dopaminergic neurons is associated with The above strategies have an intricate link with neuroscientific mechanisms behind leading and being lead. Viewing the phenomenon of leadership through the lens

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of brain function requires a comprehensive approach to understand it. The phrase "neuroleadership," first used by Rock (2006), is also known as "neuro-based leadership" or "brain-minded leadership." It describes how brain science might improve our understanding of the phenomenon of leadership and assist leaders to adopt more successful strategies and behaviors. It has been discovered that knowledge of the neuroscientific foundations of leadership influences employee behavior, allows workplace transformation, and helps leaders modify how they lead or manage themselves. As a result, businesses in various sectors are able to design mentally stimulating workplaces that maximize worker engagement and provide positive work outcomes. Particularly in the post-COVID workplace and in the VUCA environment, brain-minded leadership is essential. Turbulence in the form of abrupt, unprecedented developments has, like other businesses, impacted the education sector. Authoritarian management is no longer effective; instead, new leadership techniques need to be devised after a thorough understanding of how the human brain functions. The age-old argument over whether leaders are born or made can be connected to the idea of "neuroleadership." The evidence supporting the biological or genetic roots of leadership does not refute the influence of environmental circumstances in altering or affecting brain architecture and functions, which allows room for the argument that leaders are made.

From the vantage point of educational outcomes, goal achievement is the biggest challenge for educators. A goal is any desired outcome that wouldn't occur without a set of antecedent acts and without some kind of intervention. An understanding of physiological basis of motivation can enable teacher-leaders to instil goal direction in students. Berkman (2018) in a study defines learning as 'behaviour modification' which has two dimensions – motivational (the will) and cognitive (the way). Cognitive factors include 'executive function' and the will to obtain a reward; the primary neurotransmitter involved is dopamine.

Development of self-esteem in learners is central to a holistic approach to education and closely associated with academic achievement. Both social affiliation and the threat of social rejection are crucial in this regard. Lieberman and Eisenberger (2015) report that neuronal networks associated with physical pain are triggered in response to an experience of social rejection which is unpleasant, enhances defensiveness, generates a stress response resulting in a narrowing of attention on the social threat and a disengagement from other ongoing goals (Muscatell et al., 2016).

In a study using functional magnetic resonance imaging Morelli et al. (2014) found the neural bases of feeling understood and not understood – two psychological states associated with personal and social well-being. Feeling understood activated neural regions associated with reward and social connection (i.e. ventral striatum and middle insula), while not feeling understood activated neural regions associated with negative affect (i.e. anterior insula). Both feeling understood and not feeling understood activated different brain areas (feeling understood: precuneus and temporoparietal junction; not feeling understood: dorsomedial prefrontal cortex) with trait differences in rejection sensitivity amplifying neural responses in these regions. These neural responses were associated with subsequent feelings of social connection or disconnection. The study provides insight into the psychological processes underlying feeling understood (or not) and has implications for the teaching-learning process. Teachers could devise targeted interventions that amplify the benefits of feeling understood or buffer individual students from the harmful consequences of not feeling understood – the two mind states being powerful drivers of social behaviour, as well as a critical component of positive social relationships.

The following research observations by Strategic Leadership Institute (n.d.) will help understand the applicability of neuroscientific principles to education:

1. In the last 50,000 years, there has been only a minuscule change in the genetic make-up of the human brain

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2. The neo-cortex despite its inbuilt capacity to form new neural pathways in response to a changing environment – a process referred to as 'neuroplasticity' – is unable to cope with the varied and continuous demands of the Industry 5.0 workplace marked by exponential technological advancement. It gets overloaded and thus, overpowers the very existence of leaders and stakeholders in all sectors of the knowledge-based economy. This neuro-overload leads to stress and a breakdown of higher functions of decision making, problem solving, communication, goal setting and collaboration with others.

3. The old 'caveman brain' is still more powerful and exerts a much larger influence on behaviour. Despite socio-economic progress, the homosapiens' primordial instinct to survive is still all powerful – the survival being by way of dealing with threats and rewards.

The essential components of learning are rewards and punishments. Teacher-leaders will be able to create a conducive classroom atmosphere if they understand the brain basics behind student receptivity to learn. The student brain is continually scrutinizing the environment (both physical and social) for threats and rewards – actual or perceived. Any aspect of the physical environment such as ventilation or formal or informal behaviour of the teacher or peers will be seen as either threatening or rewarding. The basic approach-withdrawal tendency will make students run away from predators in school or college and approach significant others. Threats will result in a symbolic paralysis of the brain impairing thought and affect – the two precursors of behaviour – leading to 'automated disengagement' from the environment. This will further manifest in depleted memory and judgement, inability to solve problems, ineffective decision making, misperception, defensive mind set, change resistance, poor communication pattern, and interpersonal conflicts. The most harmful outcome is alienation from the learning environment – a non-productive reaction as the brain expends all its energy in dealing with the threat. Learners get into an 'automated engage' state in response to a reward stimulus and can thereafter give optimal performance both at cognitive and emotional levels. Rewards trigger the subconscious tendency to approach leading to a creative mindset.

Creating a Brain-Engaging Environment: Implications for Educational Leadership

A useful manual for creating an atmosphere that supports both emotional well-being and cognitive function is Rock's (2008) SCARF Model. As was previously indicated, two strong drives associated with the survival response—minimizing perceived threat and maximizing possible reward—guide social behaviors that are powered by brain systems. Our brain classifies inputs as either good (non-threatening) or bad (dangerous), depending on the circuits that are activated. This leads to approach and avoidance responses. The limbic system's amygdala houses these reactions. Upon re-exposure to the stimulus, the amygdala triggers an appropriate emotional reaction based on its level of activation. Our limbic system is governed by the Approach/Avoid reaction, which has a major effect on cognitive function. Incentives boost curiosity, self-assurance, and inventiveness, which in turn increases our inclination to interact with people and activities. Threats reduce the ability to perceive fine details and think critically, which increases generalization and protective behavior. Any workplace contains five intrinsic elements, collectively referred to as SCARF, that provide social encounters involving perceptions of either reward or threat. Leaders may create a safe and emotionally supportive work environment for their team members by concentrating on these five social dimensions:

1. Status: Our perception of our own value and our social position in respect to others around us. Giving learners praise for their efforts and providing them with learning opportunities will help them feel important. Teacher-leaders shouldn't give out too many instructions, publicly criticize students, or keep some of them out of social situations.

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2. Certainty: The degree to which future events seem foreseeable. Inquiring about student's expectations, communicating plans and tactics, and upholding transparency can all help achieve this. If the educator acts in a mysterious or unpredictable manner, uncertainty will rise.

3. Autonomy: Our perception of our level of control over our lives and the circumstances that surround us. Allowing students to make their own decisions, assigning them complete assignments, allowing them to participate in decision-making, avoiding micromanagement, and a dictatorial leadership style.

4. Relatedness: Our sense of security and belonging in a group setting. This might be promoted by telling stories, promoting social interaction, and providing mentorship. If social interactions are discouraged, particular students isolate themselves and unhealthy competition is fostered.

5. Fairness: How we perceive equity, justice, and respect, as well as how appropriately we think we are treated. If accomplishment is acknowledged, values are created, ground rules are made and followed, trust is built via openness, and favouritism is avoided, then learners and other stakeholders will experience organizational justice and equity.

Optimum performance and creativity is not possible under constant neurological fear-states. The SCARF model defines the parameters that are necessary ingredients of a brain-friendly work place and will enable educators and other stakeholders to flourish at work.

The fundamental ideas behind the phenomenon of neuroleadership are the brain's plasticity, sensitivity to incentives, the strength of mirror neurons, and the important role that emotional processes play in behaviour (Nelson, 2022). According to the theory of brain plasticity, an individual can get rewarded for learning something new. It has been discovered that rewards associated with social interaction release more dopamine than other types. A unique class of neurons known as mirror neurons fires when a person performs an action or watches someone else perform one that is identical to or similar to it. In other words, when one person watches someone else perform an action, their neurons fire just like they would if they were performing the action themselves. The procedure is crucial. The procedure is crucial for empathy, emotional intelligence, and learning. Employee behaviour will be shaped by the leaders' emotional and physical conditions. Everyone in the company will contribute to fostering a cooperative and collaborative work environment. Leaders may better navigate the ups and downs of the economic environment by implementing a brain-based workplace. The process is crucial for empathy, emotional intelligence, and learning. The physical and emotional states displayed by educators will define student behaviour. Creating a collaborative and cooperative work atmosphere will be mirrored by all individuals in the organization.

To conclude, the fact that learning changes individual brains can drive teachers to incorporate neuroscience ideas in classroom practices. Neuroscience behind Vygotsky's (1978) Zone of Proximal Development (ZPD), for example, says that despite biological and neurological constraints at a particular stage of development , an individual is able to learn concepts when assisted by others, highlighting the principle of neuroplasticity (UNESCO International Bureau of Education, 2021). An understanding of neuroscience is of much utility in special education programs for students with disorders like ADHD, dyslexia, dysgraphia, etc. (Howard-Jones et al., 2016). Educational Neuroscience Concepts (ENCs) such as 'learning strengthens synapses while remembering reactivates plasticity' or 'emotions facilitate memory and decision making' affect pedagogical decision-making and student perceptions. Through classroom observations and interviews it was found that ENCs influenced teachers' (1) thoughts about pedagogy and students; (2) actions in planning and execution of lessons; and (3) responses to events in and out of the classroom. Thus, neuroscience supplied teachers with practical knowledge that made the teaching process dynamic (Chang et al., 2021). The higher leadership in an educational institution can organize training programs based on the SCARF

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Model. The five dimensions of the model are conducive to choice-based learning where students are given the freedom to select their own educational path that aligns with their unique goals and aspirations. They become self-regulated learners and work in groups to construct their knowledge.

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