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Revamping the Teacher Education Training System in Nigeria: Implication of Incorporating Neuropsychology and Neurobiology

NWACHUKWU, Kingsley Ezechinyere; IBARA, Remi Funke; ALEX-GIDEON, Yemisi; ORIPIRITE, Owanga; & ORJI, Ogechi Chioma

Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Rivers State, Nigeria

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***Corresponding Author:** Nwachukwu, K.E*

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Abstract **Original Research Article**

The paper critically analyses the need to revolutionize the teacher education system of Nigeria with specific reference to infusion of neurobiology and neuropsychology with teacher training courses. It stresses the need to comprehend internal mechanisms of the brain to process information and how this can be integrated to improve teaching strategies, student engagement, and learning process. Despite various reforms undertaken, the teacher education system of Nigeria is plagued with the problem of obsolete syllabi, limited professional opportunities, and lack of cognizance of cognitive and neurobiological processes of teaching. The report opines that infusion of neurobiological and neuropsychological insights into teacher training can revolutionize teacher-student relationships, specifically with respect to accommodating various learning patterns and coping with cognitive and affective demands. The report opines that teacher education courses require reorganization to integrate modules of neuroscience to equip prospective teachers with the appropriate equipment to facilitate more inclusive, participative, and effective learning environments. In the final reckoning, the report advocates policy reforms to make integration of neuroscience with teacher training the highest priority to make teachers better equipped to handle demands of learning conditions of the day.

Keywords: Revamping, Teacher Education, Training System, Neuropsychology, Neurobiology.

INTRODUCTION

Teacher education is the backbone of the Nigerian education system and provides teachers with skills and information that are required to bring about students' achievements in school. Teacher education in Nigeria has experienced tremendous transformations to mirror changes in world trends in education, education policy, and society. Nevertheless, some issues like an outdated curriculum, lack of finances, lack of emphasis on professional development, as well as poor infrastructures, have repeatedly hindered the system (Ojo, 2020). Colleges of Education (COEs), universities, and polytechnics, which provide programme offerings of diploma and degrees in education, coexist as principal organisations that train teachers. Pedagogical practice of teachers in class is significantly influenced by these institutions.

The system found it difficult to cope with the nation's fast-changing teaching requirements, even as teacher preparation remained a determining factor in teaching quality. Teacher training courses have a traditional curriculum that makes content transmission more important than current teaching methods that take into consideration students' cognitive as well as affective developments (Adeyemi & Adu, 2021). Teacher training courses do leave teachers without those competencies to engage active students in contemporary learning environments due to a lack of training in modern methods of enhancing student engagement or updating acquired skills. Teachers also have access

too far less continuous professional development that denies access to new methods of enhancing student engagement or updating acquired skills. There have been calls in recent years that teacher training courses must include up-to-date scientific evidence, particularly from neuropsychology and neurobiology. These are fascinating fields that demonstrate how the brain processes and retrieves information and how this can inform more efficient teaching methods that provide for a diverse range of learning styles (Ogunyemi, 2022). Teachers would be better placed to realize how young people learn and to tailor teaching to a diverse range of intellectual and affective needs if they were included in teacher training. This would be a revolutionary step to enhancing Nigerian schooling by creating a new generation of teachers that are subject specialists as well as knowing how to most effectively teach through the science of learning.

The Need for Reform in Teacher Training System

The urgency of reform of teacher training in Nigeria has been more acute as the teaching environment becomes more flexible and requires a more scientifically-informed approach to teaching. Despite numerous efforts to reform the system through the years, teacher education in Nigeria continues to suffer from many shortcomings that affect negatively the academic output of all of its constituents. One significant weakness is that curriculum is outdated and is still predominantly centered on teaching of theoretical information. It does not incorporate new teaching techniques that are sensitive to how students' minds and hearts mature. As a result, many teacher training programs do not equip teachers adequately to address effectively the diverse needs of modern classrooms (Olajide & Omojuwa, 2022). One of the most important reform arguments is that teachers' training is no longer proportionate to teachers' skills needed to adapt to students' diverse learning methods, strengths, and difficulties. Teacher training courses are still relying on conventional content transmission methods without a sufficiently strong focus on psychological and neurobiological processes of learning. This has caused a disjunction between how teacher training courses are taught and what is experienced in class (Eze & Okeje, 2021).

According to Nwachukwu & Ogunshola (2019) contemporary students are more diverse than they have ever been. They have diverse cognitive skills, learning difficulties, as well as emotional needs. Teachers have to understand as much about students' learning as about what they instruct and about how the brain processes to affect learning. Teachers do not find it easy to adapt to a class of students with diverse learning difficulties, including those with special educational needs (SEN), without this. One approach to filling this gap is to infuse teacher training programs with neuropsychology and neurobiology. These discourses provide teachers with important insights into neurological learning processes and can assist teachers in putting into practice processes of information intake that are suitable to retention and utilization of the brain. Understanding neurobiological processes can further enable teachers to come up with ways of instructing that will capture students' attention, facilitate recalling information that has already been learned, and foster intellectual and emotional well-being (Babatunde & Ajayi, 2021). Integrating these ideas enables the teacher training system to be reformed in a direction that equips teachers with skills and knowledge to deal with challenges that occur in classrooms of this century.

Neuropsychology and Neurobiology: Understanding the Science of Learning

Neuropsychology and neurobiology are important sciences to understand how processes of cognition happen when learning is occurring and to guide teaching methods that are effective. Neuropsychology is referring to how brain function is connected to action of behaviour just as much as to processes of cognition such as memory, attention, and executive functions. Neurobiology is referring to researching biological processes of learning such as neurons, synapses, and neurotransmitters. Making use of those sciences to guide teaching allows teaching methods to be framed to correspond to how information is processed and stored naturally (Ogunyemi, 2022). Incorporating neurobiological and neuropsychological principles into teacher training is crucial to improving classroom practice. Typical teaching practice often privileges content transmission over understanding how students receive and retain information. Yet understanding

how to operate within the brain could help teachers design learning environments to stimulate cognitive activity, improve memory retention, and accommodate students' diverse learning needs. Neuropsychological insights, for example, could help teachers understand how attention and affective states affect learning so that they could design environments that foster fewer distractions and more attention (Jensen & Reed, 2020).

Neuropsychological and neurobiological studies have indicated that if teachers are made aware of how the brain processes learning, they can develop more efficient and inclusive teaching methods that facilitate diverse cognitive functions. By knowing this information, teachers are empowered to eliminate a top-down approach of treating all students alike and will develop methods that fit each learner uniquely, which leads to better results in a wide range of classrooms (Jensen & Reed, 2020).

Rationale behind Incorporating Teacher Education and Neuropsychology and Neurobiology

Inclusion of neurobiology and neuropsychology in teacher training is necessary in developing teachers that are not only subject-matter-informed but also comprehend how students learn. Teacher training is largely centered on generic teaching practice and subject matter proficiency but less often disregards cognitive and neuroscientific processes of efficient learning. Since the school system is confronted by a growing tide of pressure to create inclusiveness, differentiation, and cognitive activity into learning space, it is worthwhile including scientific understanding of the brain. This enables teachers to understand and meet diverse needs of students (Jensen, 2008). Incorporating neurobiology and neuropsychology in teacher training enables teachers to develop teaching methodologies tailored to individualized needs of each learner and design an inclusive, interactive, and efficient learning space.

Studies have repeatedly revealed that an understanding of the neurological and psychological dimensions of learning is capable of enhancing how teachers control classrooms, plan lessons, and interact with students. Observations from neuropsychology about how information is processed and stored in the brain as well as how it is recollected can guide teachers in producing lessons that can reconcile varied learning habits and intellectual capacity (Berk, 2019). Neurobiology is similarly capable of providing teachers with a deeper understanding of how biological variables such as brain maturation, neurotransmitter action, and neuroplasticity affect learning. This enables teachers to employ teaching methods that foster intellectual development and facilitate recollection from memory. This consequently enhances academic performance (Shank, 2019). Investigations of how neuroscience helps teaching show that teachers experienced in these principles have classrooms that foster pupils' intellectual and affective development (Shank, 2019). These subjects must be included in teacher training due to growing sophistication in teaching requirements. More pupils have learning issues, developmental disorders, and behavioural difficulties. Neuropsychology and neurobiology offer the understanding and methods required to interpret problems from a teaching viewpoint. This leads to more efficient teaching and social results from learners.

Implications of Neuropsychology and Neurobiology Understanding Neuropsychology and Neurobiology: A Brief Overview

Neuropsychology and neurobiology provide significant details regarding how to process information within the brain and how to promote learning. Neuropsychology is about how brain functioning influences cognitive processes such as memory, attention, and problem-solving. By examining which areas of the brain correspond to which behaviours, neuropsychology helps us understand how diverse parts of the brain operate to achieve specific cognitive activities (Ogunyemi, 2022). Executive functions needed to promote learning processes such as decision-making, planning, and self-regulation all heavily rely on the prefrontal cortex.

Neurobiology deals with how biological processes in the brain create these cognitive processes. It is about how neurons, synapses, and neurotransmitters work together to facilitate learning. Neuroplasticity is a governing neurobiological principle of how the brain is capable of reorganizing itself to suit learning experiences. Neurobiological studies have been

indicating that learning stimulates the creation of new neural circuits that enhance intellectual functions in the long term (Shank, 2019). Understanding such neurobiological processes enables educators to design teaching methods that suit how the brain learns naturally to facilitate more efficient and interesting learning experiences among learners.

Integrating neurobiology and neuropsychology into teacher education allows teachers to better grasp how learning is processed within the brain. This allows teachers to engage in evidence-based teaching that is as compatible as possible to how the brain learns naturally as well as that which is as compatible as possible to cognitive needs of individual students. This in turn allows to facilitate improved academic accomplishments as well as more inclusive classrooms.

Cognitive Development and Its Impact on Learning

Cognitive development is an important aspect of learning that influences how individuals collect information, how they think about it, and how they apply it. Cognitive development refers to the development of mental processes like memory, attention, thought processes, and problem-solving that happens during childhood and adolescence. Understanding cognitive development is important among educators because it helps educators understand their students' cognitive potential as well as modify teaching methods to a student's development stages (Berk, 2019).

Neuropsychological research reveals that learning is based on cognitive abilities such as attention and working memory. Working memory helps students retain information in short-term memory and operate it temporarily, whereas attention helps students focus on crucial tasks and discount irrelevant stimuli. These cognitive abilities are made possible through specific sections of the brain, and as students mature, their ability to support these skills is fortified. Such teachers are capable of creating teaching techniques that are appropriate to the cognitive development of students and build better interest and learning attainment (Oyekanmi, 2023).

Besides that, neurobiological studies of neuroplasticity provide additional evidence of how improvements in cognitive abilities can be facilitated from learning experiences. As far as the brain is capable of forming new connections between neurons when faced with cognitive demands, teachers can facilitate cognitive growth through giving their students tasks that necessitate higher-order thoughts, problem-based work, and critical thinking. This neuroplasticity principle indicates that through suitable teaching methods as well as learning environments, teachers are capable of facilitating cognitive development so that students are able to attain their potential (Shank, 2019). An appreciation of cognitive development as well as neuroplasticity enables teachers to embrace methods that maximize students' existing potential as well as their potential cognitive development in the long-term (Nwachukwu 2025 unpublished).

Neuroscience in Classrooms: Transformative Learning Processes

We can make teaching more effective by incorporating neuroscience into teaching practice. Neuropsychology and neurobiology have much to teach about how information is processed through an individual's brain and how it leads to learning. These sciences reveal that learning is a multistage process that stimulates diverse portions of a brain that correspond to control of emotions, memory, as well as attention (Duman & Sanacore, 2020). Neuropsychology investigations narrow in on a point that is critical to learning: attention. Focusing on material that is appropriate directly corresponds to how much a student will remember and apply new material. Neuroscientific evidence is also that active participation and affective commitment to learning can lead to improved retention and improved comprehension (Sousa, 2017).

Applying these results to teaching enables teachers to make wiser lesson planning and to engage their students. Understanding how memory is consolidated in the mind enables teachers to plan lessons to ensure that material is retained. This could mean spacing out periods of learning and repeating important concepts (Duman & Sanacore, 2020). Teachers can also make lessons emotionally engaging as emotionally charged experiences stimulate part of the brain known as the amygdala that is responsible for memory and learning. Offering emotionally safe learning environments enables

teachers to tap into students' intellectual and affective responses. This enables students to have a more emotional connection to material (Sousa, 2017). Neuroscience is rich in workable solutions that can improve teaching and student performance in a diverse set of classroom situations.

The Teacher-Student Relationship and the Role of the Brain

Teaching students how our brain functions actually help to enhance student-teacher communication. Attention, memory, and emotional control are central cognitive processes of learning, and how a teacher expresses to a child can make all the difference to such processes. Neuropsychological experiments show that teachers' expression of emotions and behaviour have a direct impact on students' affective status and cognitive processes that in turn affect learning processes (Medina, 2014). A teacher showing gratitude or understanding is able to stimulate our brain reward sites that will make students more willing to work through material and learn.

In addition to this, teachers' skills in controlling class dynamics can affect neurocognitive development of students. Teachers that foster a positive classroom space and a safe alliance within class will most likely stimulate social circuits of the brain as pertaining to learning. Communication that is efficient towards a direction that teachers utilize affirmational speech and adaptative comments could assist to regulate brain emotional reaction to learning to make it more favourable to cognitive processing (Immordino-Yang, 2016). As teachers understand more about how their own interaction affects learners' neural and affective responses, they are in a good position to promote cognitive investment as well as affective well-being in class.

Potential Problems in Infusing Neuropsychology and Neurobiology into Teacher Education

Although integrating neuropsychology and neurobiology into teaching courses holds much potential, a series of challenges could prevent its full integration. Among its main inhibitors is that teachers have little specialized knowledge about how brain-based learning works. Teacher courses have a specializations emphasis in teaching content and methods but often have a gap of including an emphasis in courses of studies that would utilize neuroscience (Berk, 2019). Another issue is that it is challenging to translate neuroscience into worthwhile teaching methods. Because it is so complicated, it is easy to write about the science of neuroplasticity and how our brains come to be that way but to make this operational in actual classrooms is challenging and requires subtlety (Zull, 2011). Teachers have no prerogative to apply methods that emanate from such a science if they have no appropriate support nor training (Zull, 2011).

Additionally, professional development courses that focus on neuroscience incur a cost that is a concern in some countries that have limited financial assets. Despite such issues, the benefits of integrating neuropsychological and neurobiological knowledge into teacher training are overwhelming. Such challenges could only be overcome through a joint effort of reorganizing teacher training courses so that they would incorporate neuroscience courses of studies as well as providing ongoing professional development so that teachers would have facts and tools to facilitate improved practice teaching.

CONCLUSION

The infusion of neurobiology and neuropsychology into teacher preparation is a fruitful step within our process of conceptualizing and refining teaching practice. By infusing knowledge of this area, teachers can transcend formulaic teaching practice about only disseminating information. Instead, teachers can learn and practice evidence-based practice that is congruent with the process by which the brain processes, stores, and retrieves information. The emphasis of neuropsychology on the cognitive processes of memory, attention, and executive function and neurobiology on plasticity and biological processes of the brain gives us a solid basis to improve teaching practice and construct supportive learning environments.

The rewards of putting neuroscience into teacher education run very, very deep. Educators with knowledge of neurobiological and learning cognitive processes can design classrooms that not only better engage students but better meet diverse students' affective and cognitive needs. Additionally, knowledge of how the brain works enables teachers to design lessons that enhance memory retention,

foster critical thinking, and aid students' cognitive development while stimulating natural learning. However, there exist some challenges to wider usage of these concepts, primarily due to insufficient training and difficulty of applying neuropsychology's principles to day-to-day teaching practice. To overcome such obstacles, teacher training schemes will need to make significant adjustments, such as developing curricula that bridge neuroscience and ongoing professional learning opportunities among teachers. The integration of teacher training with the infusion of neurobiology and neuropsychology will enhance learning outcomes and yield a more dynamic and responsive education system answering to the dynamics of teacher and learner demands. By understanding science about learning, teachers will better be able to provide productive development of cognition, emotional health, and academic achievement among diverse populations of students.

RECOMMENDATIONS

1. Strategies for Integrating Neuropsychological and Neurobiological Concepts

Teacher education should be combined with knowledge of neuropsychology and neuroscience. Teachers should be trained on how learning and behaviour are influenced by the working of the brain and how this can aid students to learn to process, store, and utilize information. The approaches should entail coming up with a curriculum that allows cognitive processes, memories, and neuroplasticity to correlate with effective teaching strategies. Teacher training should allow teachers to design lessons that attract students' attention and memory and that can be suited to various learning styles by neurobiological insights. The importance of emotional involvement during learning should be emphasized because emotional experience enhances retention of memories and cognition processing (Adewale & Olusola, 2021).

2. Design Suggestions for Curriculum

Curricula of teacher education should be redesigned and comprise modules of neuropsychology and neurobiology with basic knowledge of the workings of the brain, processes of learning, and cognitive growth. The curriculum should not only contain theoretical knowledge but its practice too, e.g., how to apply learning strategies based on the brain. A comprehensive approach should be made to integrate neuroscience with classical pedagogy. Teacher educators should be trained to vary their teaching strategies based on the stage of students' cognitive evolution. This will necessitate consultation between educational scholars and teacher educators to make the curriculum scientifically valid and practically applicable (Musa & Alabi, 2019).

3. Teacher Training to Create Neuroscience-Based Teaching

To provide teachers with the right tools to practice teaching through neuroscience, continuing professional development (CPD) programs should be designed. The programs should focus on application of neurobiology and neuropsychology to the classroom, including proper ways of conceptualizing activities that will increase cognitive engagement and enhance retentiveness. The teachers should be equipped with training to apply brain-based methods to communicate with students with different learning needs, with particular emphasis on students with learning impairments or special educational needs. The programs can be made accessible through the offering of workshops, online modules, or through the context of in-service training to provide educators with repeated exposure to new findings relating to neuroscience (Okunola &Ali, 2020).

4. Policy Directions to the Stakeholders of Education

Policymakers of education should facilitate the integration of neuroscience with the teaching and learning process by investing resources in research and development here. Policies should require teacher preparation programs to integrate neuroscience-informed teaching strategies. Moreover, education stakeholders, such as school leaders and government officials, should be incentivized to invest in professional learning opportunities that provide teachers with an understanding of brain-based learning. Funding should be aided to facilitate collaboration between neuroscientists, educators, and curriculum developers to keep educational practice always abreast of recent research on cognitive science (Adewale & Olusola, 2021). Moreover, the inclusion of neuroscience within education policy can contribute to the formation of nationwide standards

to improve student outcomes across teaching practices.

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