Volume: 26 No 1 (2026); pp. 102-113
P-ISSN: 1411-4585 E-ISSN: 2549-6743
DOI: https://doi.org/10.24036/pedagogi.v26i1.2676
Submitted: 26-02-20; Revised: 26-03-27; Accepted: 26-04-30

Pedagogi
Jurnal Ilmu Pendidikan
http://pedagogi.ppj.unp.ac.id/

Neuro-Centric Pedagogy: Fostering Inclusive and Personalized Teaching

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Abstract

This study examines the implementation of neuro-centric pedagogy as an innovative approach to promoting inclusive and personalized teaching practices among lecturers in public universities. Although most lecturers demonstrate awareness of the importance of understanding students' neurological differences, the integration of adaptive strategies remains limited in teaching. Employing a mixed-methods design, data were collected through survey questionnaires and semi-structured interviews involving 60 lecturers from the Faculty of Education. The findings indicate that lecturers recognize the role of neurodiversity in creating equitable learning environments; however, they encounter challenges, including insufficient professional training, limited institutional support, and inadequate knowledge of neuroscience. Furthermore, access to relevant tools and resources is constrained. This study highlights the urgency of institutional initiatives, professional development programs, and the integration of neuroscientific tools, such as EEG, to strengthen lecturers' competencies. The study contributes to the field of educational neuroscience and emphasizes the potential of neuro-centric pedagogy in higher education.

Key words: Neuro-inclusive pedagogy; special education; UPSI;

How to cite : Redzuan, M. H. B., & Zabhi, M. Z. I. bin. (2026). Neuro-Centric Pedagogy: Fostering Inclusive and Personalized Teaching. *Pedagogi: Jurnal Ilmu Pendidikan*, *26*(1). https://doi.org/https://doi.org/10.24036/pedagogi.v26i1.2676

INTRODUCTION

The emergence of neuro-centric pedagogy represents a significant paradigm shift in higher education and signals a move towards more evidence-based and scientifically grounded teaching approaches. This pedagogical framework emphasizes the integration of neuroscientific insights into instructional design with the aim of accommodating students' diverse neurological profiles and cognitive functioning patterns. Neuro-inclusive education acknowledges that differences in brain structure, neural connectivity, and neurochemical processes play a critical role in shaping students' learning behaviours, cognitive processing capacities, emotional regulation mechanisms, and sensory responses within educational settings. These neurological differences, if not adequately recognized, can contribute to barriers in learning, resulting in disengagement, underperformance, and inequitable learning outcomes. Consequently, neuro- centric pedagogy promotes a departure from the traditional one-size-fits-all instructional paradigm by advocating for flexible, adaptive, and personalized teaching strategies that are attuned to students' individual neurocognitive needs.

Within the Malaysian higher education context, particularly at Universiti Pendidikan Sultan Idris (UPSI), this pedagogical framework is increasingly regarded as essential in fostering equity, inclusivity, and meaningful engagement in teaching and learning. UPSI, being a leading institution in teacher education, serves as a strategic context to explore the early integration of neuro-centric principles into mainstream pedagogical practices. As global trends shift towards inclusive education systems, Malaysian universities are also compelled to respond to diverse student populations, including those with neurological variations such as attention deficit hyperactivity disorder, autism spectrum disorder, dyslexia, and other neurodevelopmental conditions. This situation requires lecturers to be equipped with a deeper understanding of neurocognitive diversity and the ability to translate this understanding into practical instructional strategies that support diverse learning needs.

Prior research has consistently demonstrated that inclusive instructional design can significantly enhance student engagement, motivation, and academic achievement. For example, Azuka et al., (2024) found that instructional practices that consider neurodiversity can help close achievement gaps by promoting equitable participation and improving students' sense of belonging in classroom environments. Similarly, Tafuri, Scala, Di Lorenzo, and Gravino (2024) emphasized that neuro pedagogy, which merges neuroscientific knowledge with pedagogical practice, can offer innovative strategies for addressing the unique learning needs of students with special educational requirements. These approaches not only improve academic outcomes but also foster emotional resilience, self-efficacy, and social inclusion among students.

Despite these positive developments, the operationalization of neuro-centric pedagogy within Malaysian universities remains underdeveloped and fragmented. Most lecturers are still at the preliminary stage of awareness, with limited exposure to neuroscientific theories or tools that could inform their teaching practices. Institutional training programs on inclusive education tend to focus on general disability support and rarely delve into the neurological mechanisms that underpin learning. This results in a significant gap between conceptual understanding and actual classroom implementation. In addition, there is often a lack of institutional policies and structural support to facilitate the consistent adoption of neuro-inclusive practices. As a result, lecturers who attempt to apply neuro-centric strategies often do so in an inconsistent and uncoordinated manner, which leads to uncertainty and uneven quality of teaching delivery.

In light of these challenges, this study was undertaken to investigate the current level of awareness, the range of adaptive and personalized teaching practices, and the institutional support available for lecturers at UPSI in implementing neuro-centric pedagogy. It also seeks to identify the barriers that hinder effective integration of neuroscientific knowledge into teaching practices. By doing so, the study aims to contribute to the growing field of educational neuroscience and provide a research-informed foundation for developing comprehensive professional training frameworks and institutional policies that can support the sustainable implementation of neuro-centric pedagogy in higher education.

METHODS

This study adopted a convergent mixed-methods research design with the aim of obtaining a comprehensive and holistic understanding of lecturers' awareness, practices, and challenges related to the implementation of neuro-centric pedagogy in public universities. The convergent mixed-methods design was chosen because it allows both quantitative and qualitative data to be collected simultaneously, analyzed separately, and then merged during the interpretation phase to provide a more in-depth and reliable understanding of the research problem. By employing this design, the study was able to capture both the measurable patterns of practices and perceptions as well as the deeper contextual experiences of lecturers. A total of sixty lecturers from various faculties in public universities were purposely selected as respondents based on their teaching experience, disciplinary background, and willingness to participate in the study. The use of purposive sampling ensured that the selected respondents possessed relevant knowledge and exposure to pedagogical practices, which was essential in providing rich and meaningful data for the study. The quantitative data were collected using structured questionnaires that were designed to measure three main constructs. The first construct focused on the lecturers' awareness and understanding of neurological diversity among students, including their recognition of different learning profiles, cognitive processing styles, and neurodevelopmental variations. The second construct examined the frequency and consistency of adaptive and personalized teaching practices adopted by the lecturers to address the varied learning needs of students. The third construct assessed the extent of institutional support perceived by the lecturers, which included access to training, teaching resources, administrative backing, and professional development opportunities related to neuro-centric pedagogy.

The quantitative data obtained through the questionnaires were analyzed using descriptive statistical methods such as means, frequencies, and percentages to identify general trends and patterns across the sample group. In addition, qualitative data were collected through semi- structured interviews involving ten lecturers who were selected from the same pool of participants to provide deeper insights into their pedagogical experiences, beliefs, and challenges in implementing neuro-centric approaches. The semi-structured interview format allowed for flexibility in exploring participants' perspectives while maintaining a consistent set of guiding questions. This approach provided the opportunity to probe into issues such as the lecturers' motivations, perceived barriers, and strategies used in personalizing their teaching based on students' neurological differences.

The qualitative data from the interviews were analyzed thematically to identify recurring patterns, categories, and emerging themes related to the lecturers' lived experiences and perceptions. The thematic analysis involved multiple readings of the transcripts, coding of significant statements, and grouping of related codes into broader themes that reflected the central aspects of neuro- centric pedagogical practices. After both the quantitative and qualitative analyses were completed, the results from the two datasets were integrated during the interpretation stage. The convergence of findings from both approaches allowed for triangulation, which enhanced the validity, reliability, and credibility of the study. This methodological approach ensured that the results were not only supported by numerical evidence but also enriched with personal narratives and contextual understanding from the lecturers, thereby producing a comprehensive and nuanced portrayal of neuro-centric pedagogy in the context of public universities.

FINDING AND DISCUSSIONS

Category	Anatomic Structures
Corpus callosum	1 = rostrum, 2 = genu, 3 = body, 4 = isthmus, 5 = splenium
Suprasellar	6 = lamina rostralis, 7 = lamina terminalis, 8 = optic chiasm
Third ventricle	9 = chiasmatic recess of third ventricle, 10 = infundibular recess of third ventricle, 11 = pineal recess of third ventricle, 12 = suprapineal recess of third ventricle, 13 = floor of third ventricle/tuber cinereum
Pituitary	14 = pituitary infundibulum, 15 = adenohypophysis, 16 = neurohypophysis
Anterior skull base	17 = crista galli, 18 = planum sphenoidale, 19 = cribriform plate, 20 = chiasmatic groove, 21 = tuberculum sellae, 22 = dorsum sellae, 23 = basisphenoid, 24 = spheno-occipital synchondrosis, 25 = basiocciput, 26 = basion
Other bones	27 = opisthion, 28 = frontal bone, 29 = sagittal suture, 30 = occipital squama, 31 = internal occipital protuberance, 32 = external occipital protuberance
Veins	33 = superior sagittal sinus, 34 = inferior sagittal sinus, 35 = torcula, 36 = internal cerebral veins, 37 = vein of Galen, 38 = straight sinus
Arteries	39 = basilar artery, 40 = anterior cerebral arteries, 41 = pericallosal arteries, 42 = calloso-marginal arteries
Miscellaneous	43 = pineal gland, 44 = posterior commissure, 45 = massa intermedia, 46 = anterior commissure, 47 = forniceal body, 48 = forniceal column
Midbrain/ brainstem	49 = mamillary body, 50 = mesencephalon, 51 = quadrigeminal plate, 52 = superior colliculi, 53 = inferior colliculi, 54 = pons, 55 = medulla, 56 = obex, 57 = floor of the fourth ventricle, 58 = aqueduct of Sylvius, 59 = pontomedullary sulcus
CSF spaces	60 = interpeduncular fossa, 61 = suprasellar cistern, 62 = prepontine cistern, 63 = quadrigeminal cistern, 64 = fourth ventricle, 65 = cisterna magna
Cerebrum	66 = cingulate gyrus, 67 = marginal sulcus, 68 = parieto-occipital sulcus, 69 = calcarine fissure, 70 = cuneus, 71 = precuneus, 72 = lingual gyrus, 73 = paracentral lobule
Sinonasal	74 = sphenoid sinuses, 75 = ethmoid sinuses, 76 = frontal sinuses
Dura/ligaments	77 = tentorium cerebelli, 78 = tectorial membrane, 79 = nuchal ligament, 80 = posterior atlanto-occipital ligament
Cerebellum	81 = cerebellar vermis, 82 = superior medullary velum, 83 = inferior medullary velum, 84 = fastigium, 85 = primary fissure of the vermis, 86 = secondary fissure of the vermis, 87 = tonsil

1. Memory and Learning

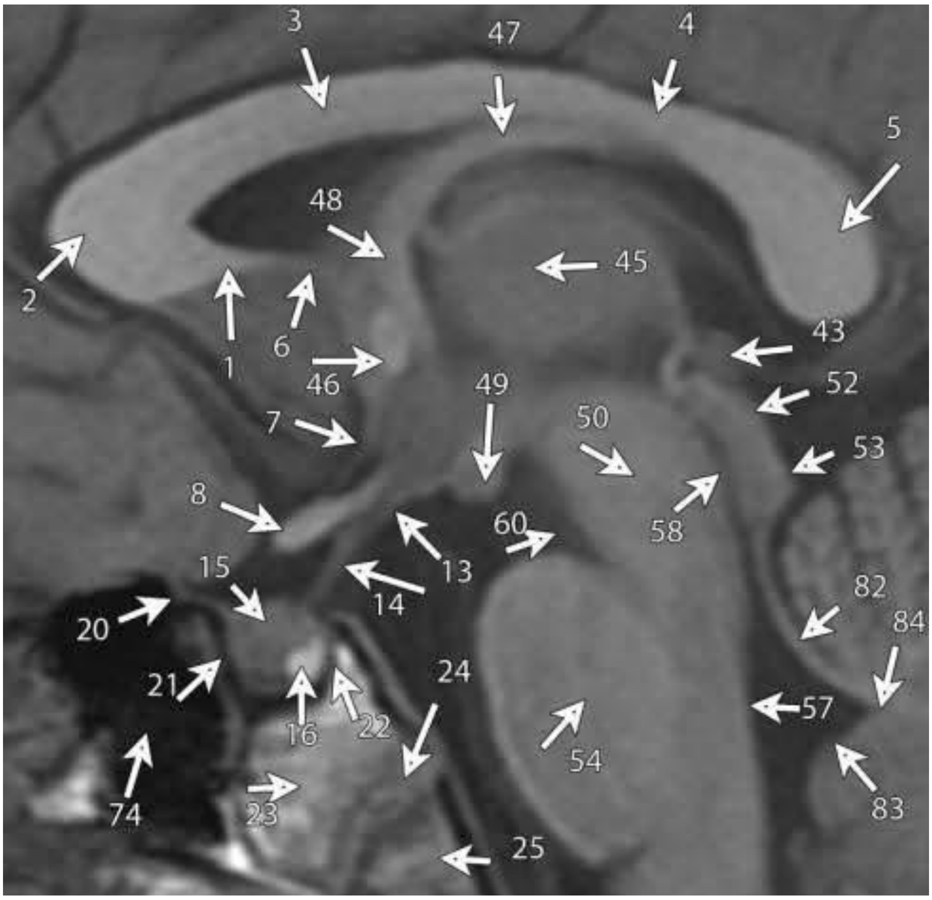


Figure 1. Illustration of the hippocampus and fornix. This figure highlights the hippocampus's role in memory consolidation and the fornix's connection to the hypothalamus, directly linking these neurological mechanisms to challenges faced by neurodivergent learners in higher education."

The hippocampus, a critical structure within the medial temporal lobe, plays a fundamental role in memory consolidation, spatial navigation, and the transfer of information from short-term to long-term storage Eight et al., (2024) .Closely connected to the hippocampus, the fornix serves as a major output tract, facilitating communication between the hippocampus and other brain regions such as the mammillary bodies and hypothalamus, which are essential for episodic memory processing (Aggleton et al., 2019). Students who exhibit variations in hippocampal or fornical functioning often encounter difficulties in retaining newly learned material, recalling factual information, and integrating prior knowledge with new concepts.

From a pedagogical perspective, such neurological differences necessitate the adoption of neuro-inclusive teaching strategies. For example, spaced repetition has been shown to strengthen memory traces by engaging hippocampal circuits through distributed practice rather than massed learning Cepeda et al., (2008). Similarly, visual mapping techniques such as mind maps and concept diagrams leverage dual coding by activating both verbal and visual pathways, thereby reducing the cognitive load on hippocampal structures (Karolinska & Institutet., 2025). Furthermore, multimodal instruction, which integrates auditory, visual, and kinesthetic stimuli, enhances the likelihood of hippocampal engagement and supports students with diverse learning preferences (Creswell et al., 2018).

In educational contexts, lecturers need to recognize that memory impairments are not merely deficits but reflections of neurological diversity. Supporting such students requires intentional scaffolding strategies, including retrieval practice, chunking of information, and context-dependent learning environments (Duong-Tran et al., 2024). Emerging neuroscientific tools, such as

EEG, now allow real-time observation of hippocampal activity, offering new opportunities for data-driven adjustments in lesson delivery (Pradeep & K., 2024). By integrating these approaches, neuro-centric pedagogy can transform potential barriers into pathways for equitable learning, ensuring that students with hippocampal variability are not disadvantaged in higher education (Tafuri & D, 2021).

2. Emotional Regulation

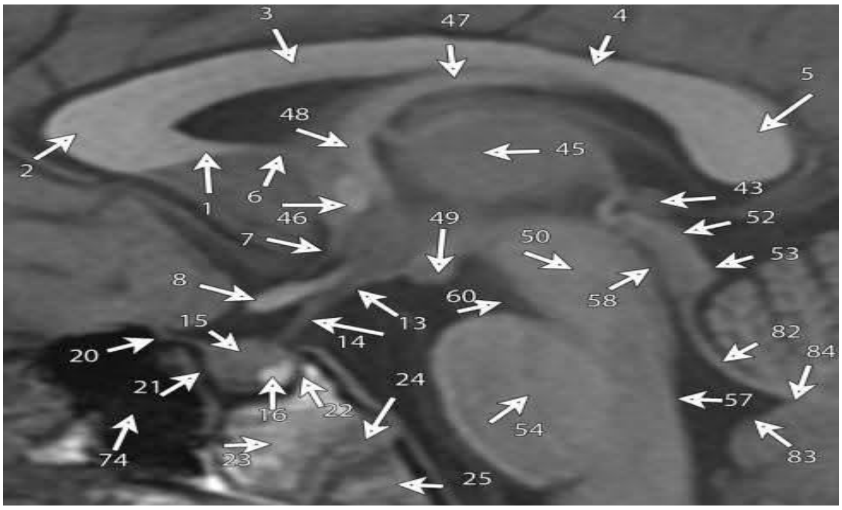


Figure 2. Diagram of the corpus callosum and limbic system

The limbic system, which includes the amygdala, hippocampus, hypothalamus, and cingulate gyrus, is central to processing emotions, regulating motivation, and shaping behavioral responses (Norwich & B., 2019). The corpus callosum, on the other hand, serves as the largest commissural pathway in the brain, enabling interhemispheric communication between the left and right hemispheres. Variations or underdevelopment in these regions can disrupt emotional balance and impair impulse control (Armstrong & T, 2012). For example, students with reduced corpus callosum connectivity may exhibit heightened reactivity to stress, difficulty integrating rational thought with emotional arousal, and challenges in self-regulation.

Research has shown that the amygdala is particularly sensitive to emotional stimuli, especially those related to fear and anxiety (LeDoux, 2015). When students experience academic stress, an overactive amygdala can impair prefrontal regulation, reducing their ability to focus, plan, and engage effectively in learning tasks. Similarly, dysfunction in the anterior cingulate cortex (ACC), a limbic component closely connected with the corpus callosum, can lead to problems in error monitoring, conflict resolution, and emotional flexibility (Bush et al., 2000). This implies that students with variations in these structures may be more prone to frustration, disengagement, or disruptive behaviors in the classroom.

From a pedagogical standpoint, these neurological realities underscore the importance of empathetic teaching approaches. Lecturers reported that some students display heightened emotional sensitivity, requiring a safe and supportive classroom climate. Strategies such as mindfulness based practices have been shown to regulate limbic hyperactivity by enhancing prefrontal limbic connectivity, thereby improving self-control and emotional balance (Tang, Hölzel, & Posner, 2015).

Furthermore, social emotional learning (SEL) programs can provide structured opportunities for students to develop skills in emotional awareness, empathy, and conflict management (Durlak et al., 2011). Another effective strategy involves cognitive reappraisal techniques, where lecturers guide students to reinterpret stressful events in less threatening ways. Neuroimaging studies demonstrate that reappraisal strengthens prefrontal modulation of amygdala responses, thereby reducing negative emotional intensity (Ochsner & Gross, 2005). For students with pronounced difficulties in regulation, the integration of assistive technologies such as biofeedback devices can also provide real time feedback on physiological stress markers, helping them practice self- regulation more effectively (McCraty & Zayas, 2014). Ultimately, a neurocentric approach to emotional regulation reframes “behavioral problems” not as disciplinary issues but as manifestations of underlying neurological differences. By applying evidence based strategies grounded in neuroscience, lecturers can foster classrooms that are not only academically supportive but also emotionally safe and inclusive.

3. Executive Functions

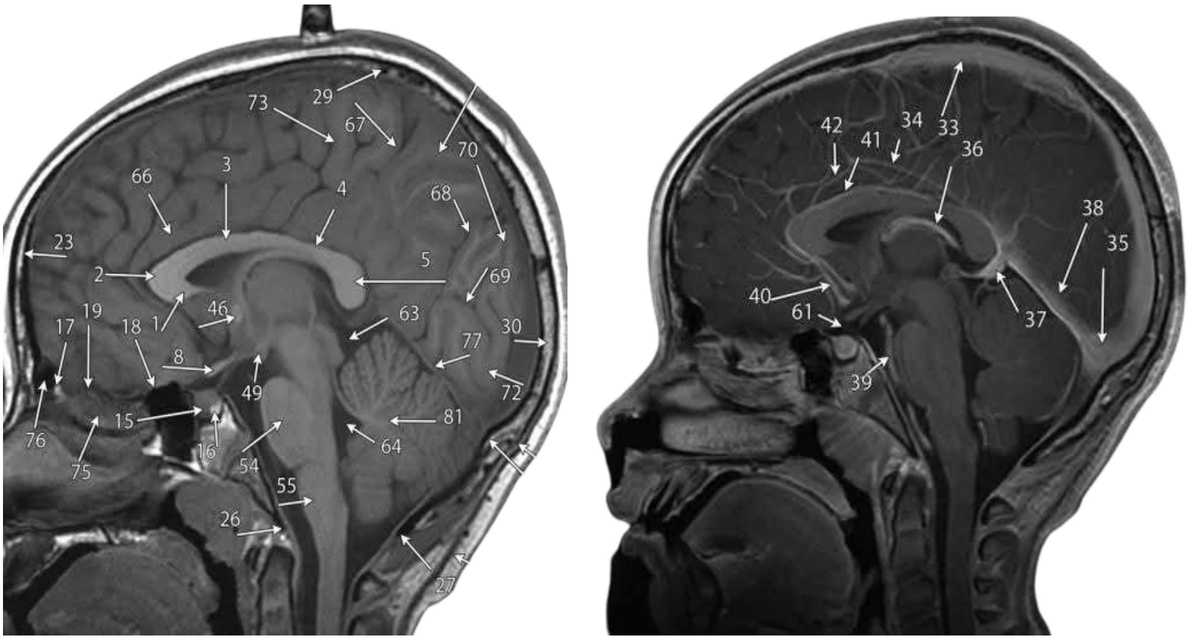
The prefrontal cortex plays a central role in executive functions, encompassing higher order cognitive skills such as planning, reasoning, working memory, attention control, and decision making. In an educational context, variations in prefrontal cortex efficiency among students directly influence their ability to organize tasks, sustain focus during lessons, and apply logical reasoning in problem solving activities. Students with underdeveloped or impaired executive functions often display difficulties in time management, prioritizing academic responsibilities, and adapting to shifting classroom demands, which may result in procrastination or inconsistent performance.

Lecturers observed that while some learners demonstrated advanced reasoning skills and self regulated learning strategies, others struggled with task initiation and goal directed behavior. However, many lecturers admitted to lacking structured training or pedagogical frameworks that specifically address executive function deficits. As a result, instructional approaches remained generic, often relying on traditional lectures, rote memorization, and linear assessments, which fail to scaffold the needs of students requiring more explicit executive support.

Research in educational neuroscience emphasizes that explicit executive function training such as incorporating scaffolding techniques, metacognitive prompts, and opportunities for collaborative planning can significantly enhance learners capacity to manage complex cognitive tasks. Moreover, strategies such as breaking assignments into smaller manageable steps, integrating decision making simulations, and encouraging reflective journaling have been found to activate prefrontal engagement, leading to improved academic outcomes. Mindfulness and stress reduction practices are also relevant, as chronic stress can impair prefrontal functioning and hinder flexible thinking. Thus, without targeted interventions, students with executive function challenges remain disadvantaged in traditional classrooms. Lecturers are encouraged to adopt evidence-based strategies grounded in executive function research, ensuring that lesson design not only delivers content but also systematically cultivates the cognitive skills necessary for lifelong learning.

Figure 3. Prefrontal cortex regions associated with executive functions

4. Lecturers’ Awareness of Neuro-Inclusive Pedagogy



Picture 4: Contextualising Brain Imaging

This heightened level of awareness aligns with the findings of Azuka et al., (2024), who asserted that inclusive instructional design that considers neurological diversity is central to cultivating learning environments that actively engage students and enhance their academic performance. Their study demonstrated that when instructional materials, assessments, and classroom routines are designed to accommodate different neurological profiles, students with varying cognitive processing patterns are more likely to remain motivated, participate actively, and demonstrate higher achievement outcomes. This underscores the pedagogical value of embedding principles of neurodiversity into curriculum design rather than treating it as an add-on or supplementary consideration.

Similarly, Tafuri & D, (2021) emphasised that neuropedagogy, which integrates neuroscientific knowledge into teaching practices, can generate innovative and adaptive instructional strategies. These strategies move beyond conventional, standardised teaching models by allowing educators to design activities that align with students' neurological strengths and mitigate their cognitive challenges. For example, students with heightened sensory sensitivities may benefit from learning environments that reduce extraneous noise and visual clutter, while students with slower information processing speeds may require scaffolded instruction and extended response time. This approach situates learning as a neurocognitively mediated process rather than a purely behavioural or content-driven endeavour, thus reframing the lecturer's role from a transmitter of knowledge to a designer of neuro-responsive learning ecosystems.

Furthermore, the use of labelled brain imaging, such as sagittal MRI scans that identify critical brain structures, enables lecturers and educators to develop a more precise understanding of the complexity of brain regions involved in cognitive, emotional, linguistic, and sensory processing. These images visually illustrate how structural and functional variations in the brain can influence learning behaviours, attention regulation, memory consolidation, emotional regulation, and students' responsiveness to different instructional stimuli. By engaging with such neuroscientific evidence, lecturers can recognise that challenges in student learning may not stem from motivational deficits or behavioural resistance but from neurological differences that require differentiated support. This perspective encourages educators to replace deficit-based narratives with strength-based approaches that harness each learner's neurocognitive potential.

Neuroscientific insight derived from brain imaging also equips lecturers to move beyond a one-size-fits-all instructional paradigm. Instead, it encourages the design of pedagogical strategies such as multimodal instruction, universal design for learning (UDL), flexible assessment formats, and personalised feedback mechanisms that respond to the neurocognitive profiles of students. For instance, incorporating visual, auditory, and kinesthetic elements into lesson delivery can simultaneously activate multiple neural pathways, thereby enhancing comprehension and retention among students with diverse learning preferences. Similarly, the use of adaptive technologies and assistive software can support learners with executive function difficulties by reducing cognitive load and promoting self-regulation skills.

Overall, the integration of empirical findings with neuroscientific visualisations reinforces the scientific foundation underpinning neuro-inclusive pedagogy. It affirms that teaching is not merely the linear transmission of content but a deliberate and reflective process of constructing learning environments that are attuned to students' neurological realities. This paradigm shift positions lecturers as critical, research-informed practitioners who systematically incorporate neuroscientific principles into their pedagogical decision-making. By doing so, they foster equity and inclusivity while also elevating the depth, quality, and meaningfulness of students' learning experiences. Such a transformation aligns with global educational imperatives of the twenty-first century, which call for instructional practices that not only acknowledge diversity but actively leverage it as a source of enrichment within higher education contexts.

5. Adaptive and Personalized Teaching Practices among Special Education Lecturers

Table 1. Adaptive and Personalized Teaching Practices among Special Education Lecturers

Adaptive & Personalized Teaching Practices	**Action (%)**	**Level**	**N**
Use of assistive technology	70	High	42
Modification of assignments and assessments	63	High	38
Flexible lesson planning	58	Moderately High	35
Adapting strategies based on learning styles	50	Moderate	30
Responsive approach	42	Moderately Low	25

Although lecturers' awareness levels regarding neuro-inclusive pedagogy are high, the actual implementation of truly adaptive and personalized teaching practices remains relatively limited. The findings indicate that while most lecturers possess a strong conceptual understanding of the importance of individualized instruction, translating this awareness into consistent classroom practices presents several challenges. Respondents reported that some of the initiatives currently being practiced include the use of assistive learning applications such as text-to-speech tools, visual scheduling software, and interactive learning platforms to support students with diverse neurological profiles. In addition, several lecturers described modifying learning tasks, teaching materials, and assessment formats to better accommodate the varying cognitive and sensory needs of their students. This includes providing alternative assignments, differentiated question formats, and flexible assessment timelines. Some lecturers also noted that they design more flexible lesson plans that allow for variation in content delivery, pacing, and modes of engagement, which is crucial in supporting students who may require more time or alternative methods to grasp complex concepts.

A number of respondents highlighted their efforts to adapt teaching strategies according to individual learning styles and preferences, such as incorporating multisensory instruction, offering visual and kinesthetic learning activities, and integrating students' personal interests into lesson content. However, these adaptations were often carried out on an ad hoc basis, depending on the availability of resources, the lecturer's experience, and the immediate classroom situation. As a result, these practices tend to lack systematic planning and are not consistently applied across courses or semesters. This aligns with Sánchez-Díaz, Morgado, and Cabeza-Ruiz (2024), who emphasized that although educators may recognize the value of inclusive strategies, the absence of structured institutional support and formal training often limits their ability to embed such practices into their daily teaching routines.

Furthermore, lecturers expressed concerns that heavy workloads, large class sizes, and administrative responsibilities reduce the time available for planning and implementing individualized interventions. They also reported that existing institutional policies and curricular frameworks rarely provide clear guidelines or adequate resources for designing neuro-inclusive learning environments. Consequently, lecturers rely heavily on personal initiative and informal peer collaboration to develop adaptive approaches, which contributes to inconsistency in practice and outcomes. This challenge is echoed by Hayes et al., (2024), who found that students with neurological differences often struggle to thrive in higher education when pedagogical support is fragmented or insufficiently coordinated. Overall, the data from Table 1 underscore a critical gap between high levels of awareness and the systematic practice of adaptive and personalized pedagogy. To bridge this gap, there is a pressing need for structured professional development, collaborative planning opportunities, and institutional frameworks that explicitly prioritize neuro-inclusive teaching. Providing lecturers with ongoing training on evidence-based adaptive techniques, access to assistive technologies, and time allocations for individualized lesson planning could enhance their capacity to translate awareness into sustainable and effective classroom practices. Strengthening these aspects will be essential in ensuring equitable learning opportunities and improving the academic outcomes of students in special education programs.

6. Institutional Support and Continuous Training

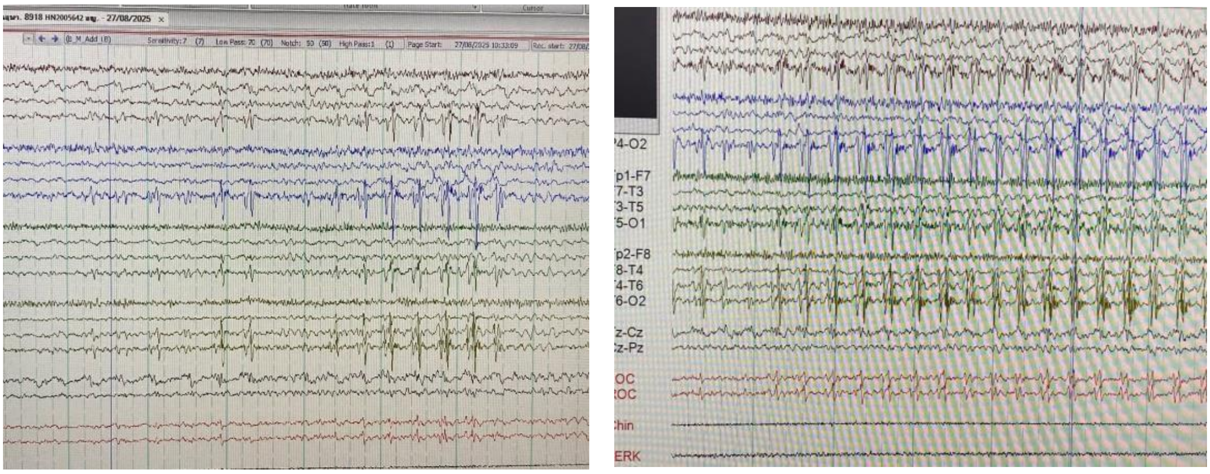


Figure 1: EEG (Electroencephalogram) Scan

Although lecturers face various challenges in implementing neuro-inclusive pedagogy, there are institutional support initiatives that can be regarded as positive pioneering efforts in this domain. For instance, lecturers reported that Universiti Pendidikan Sultan Idris (UPSI) has organized several professional development courses related to inclusive education. While these initiatives are commendable, many lecturers emphasized that the content of such courses needs to be substantially expanded and deepened to include explicit coverage of neurodiversity, particularly regarding the cognitive, emotional, and sensory variations that shape students' learning processes. Without this dimension, professional development programmes risk remaining superficial and failing to provide educators with the specialised knowledge necessary to address the neurological uniqueness of students in their classrooms.

This institutional effort resonates with international practices, such as those introduced by the Karolinska & Institutet., (2025), which developed a comprehensive self-learning toolkit to support educators in designing neuro-inclusive learning environments. This toolkit offers evidence- based guidelines on adapting curricula, instructional methods, and assessment strategies to the neurocognitive profiles of diverse learners. Similarly, Ainscow et al., (2019) stressed that embedding neuro-inclusive principles into learning design is essential to ensuring that students with neurological variations can participate equitably in higher education. These principles include differentiated instruction, universal design for learning (UDL), and multimodal teaching approaches that account for varying sensory and processing strengths among students.

As an avenue for improvement, this study suggests that comprehensive and systematic continuous training programmes should be institutionalized to strengthen lecturers' competencies in managing neurodivergent students. Such programmes should move beyond introductory overviews to include immersive modules on neurocognitive assessment, classroom adaptations, behaviour regulation strategies, and the integration of assistive technologies. This recommendation aligns with Mitchell & D, (2025) assertion that sustained research and training in neuro-inclusive pedagogy can enrich educators' instructional skills and promote more profound and reflective pedagogical interactions. Continuous training not only sharpens lecturers' technical competence but also cultivates their empathy, reflexivity, and cultural sensitivity qualities essential for inclusive teaching.

Furthermore, the EEG (Electroencephalogram) recordings displayed in this section symbolically link neuro-inclusive pedagogy with the field of educational neuroscience. EEG technology captures the brain's real-time electrical activity, enabling researchers and educators to observe neural patterns underlying students' attention, memory, emotional regulation, and cognitive load. Reviews in the field of neuroeducation, such as those by Pradeep & K., (2024), highlight that EEG-based studies can reveal the neural correlates of learning processes and identify early indicators of cognitive stress or overload. This neurobiological insight allows educators to refine their teaching strategies, adjust lesson pacing, and incorporate breaks or sensory supports when neural fatigue is detected.

By incorporating EEG data as part of institutional research and training frameworks, universities can extend support to lecturers not only through theoretical input but also by offering hands- on exposure to evidence-based tools. This approach encourages lecturers to adopt empirically informed practices and to design instructional environments grounded in real neurological data rather than assumptions. Consequently, the integration of EEG evidence can help address the persistent challenge of insufficient specialised training, while simultaneously fostering a shift in educational culture from reactive to proactive, from generalised to personalised. Ultimately, embedding neuroscience-informed training within institutional policy reinforces the broader mission of higher education to promote equity, inclusivity, and excellence in teaching for all learners, including those who are neurodivergent.

CONCLUSION

This study demonstrates that the implementation of neuro-inclusive pedagogy through adaptive and personalized approaches among Special Education lecturers at Universiti Pendidikan Sultan Idris (UPSI) is an effort that is gaining increasing attention, although its implementation still faces challenges. Findings show that lecturers' awareness of the importance of understanding students' neurological diversity is at a high level. This proves that there is an intellectual commitment to creating a more equitable and inclusive teaching environment.

However, in terms of practice, only some lecturers consistently apply adaptive and personalized strategies. Although the use of assistive technologies, task modifications, and flexible instructional planning are increasingly practiced, these approaches often occur in an ad hoc and unsystematic manner. This situation is influenced by several key challenges, including time constraints, lack of specific training, limited institutional support resources, and the absence of clear institutional policies to strengthen neuro-inclusive pedagogy. Therefore, this study emphasizes that to ensure neuro-inclusive pedagogy can be fully implemented, integrated support from various stakeholders is needed. Continuous training, provision of sufficient technological resources and facilities, and the development of clear and comprehensive institutional policies should be prioritized. The implications of this study prove that neuro-inclusive pedagogy not only enhances teaching effectiveness but also strengthens equity and inclusivity in higher education, in line with the 21st-century demand to celebrate diversity and empower all students.

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