Perceptions of EFL Teachers on Brain-Based Strategies

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Abstract

This study examined the perceptions of EFL teachers about brain-based strategies and the factors that hindered them from applying them in their classrooms. Mixed research methodology was applied. The researchers also used a descriptive survey design and collected the data from 93 EFL teachers working in secondary schools through questionnaires and semi-structured interviews. The participants were selected using a comprehensive sampling technique. The findings showed that EFL teachers were often unaware of the human brain's structure, capacity for concentration, multitasking, and impact on curriculum, instructional methods, and assessment choices. They also lacked understanding of the relationship between the brain and learning, including meaning, emotions, sensory input, and the entire body's involvement. The study highlighted the need for teachers to understand natural memory facts, visual and aural tools, body motions, and emotional comforts in the classroom. Factors such as lack of attention, inadequate training, school administration, cultural differences, and diverse learning styles influenced teachers' perceptions of brain-based techniques. In conclusion, this study emphasized the necessity for teachers to comprehend the brain's influence on their pedagogical effectiveness.

Key words: *Brain compatible strategy, brain-based learning, brain-based strategies, brain-based teaching, EFL teaching-learning.*

1. Introduction

Learning commences at birth and persists throughout one's lifetime. We acquire knowledge either casually or accidentally in commonplace and normal circumstances of our lives. Teachers must recognise that learning is fundamental to the educational process. Learning is an ongoing process comprised of multiple stages (Dharmaraj, 2016).

Teaching is a purposeful endeavour conducted professionally to effectuate a beneficial transformation in the learner. Teachers are directed by specific concepts of pedagogy and cognition that significantly impact teaching.

The teacher's involvement is crucial for the successful completion of the lessons. To be a successful teacher, one must employ unique and original teaching tactics to address the individual requirements of students. Teaching methods refer to the strategies employed by a teacher to convey subject information to students, guided by specific instructional objectives to facilitate learning (Grade, 2021).

Teaching methods that correspond with students' learning processes enhance educational results for all learners. Recent empirical research has yielded significant insights into the learning processes prevalent among students across various educational situations. These processes clarify why certain pedagogical methods are more efficacious than others (Australian Education Research Organisation, 2023). Specifically, understanding the learning process requires an understanding of the formation and evolution of the brain. The innovative concept of brain-based learning has a profound impact on teachers and students.

Brain-based teaching is a novel method of instruction that utilises technology and insights into brain function and cognitive functions to enhance the learning process. Brain-based education combines ideas and discoveries from neuroscience, psychology, and education to improve the efficacy of classroom instruction and learning. The adoption of brain-based teaching strategies could profoundly influence how young individuals approach studying and learning. Gain insights into improving teaching methods and understanding the cognitive mechanisms involved in learning new material. Current scientific research on the cognitive processes of learning, including aspects like cognitive development, informs brain-based teaching, which encompasses instructional strategies, curriculum frameworks, and educational programs (Suryakumari & Stanly, 2020).

Therefore, the current research was conducted to assess the perception of EFL teachers about brain-based strategies and to discover the prospective challenges and barriers confronted by EFL teachers to apply brain-based strategies in teaching EFL students.

2. Literature Review

The human brain in its adult stage is a moist and delicate organ with a weight slightly exceeding three pounds (equivalent to 1.4 kg). The object in question possesses dimensions comparable to those of a small grapefruit, exhibiting a walnut-like shape, and can be comfortably held within the confines of one's palm. Situated within the cranium and enveloped by safeguarding membranes, the brain is positioned at the apex of the vertebral column. The brain operates continuously, even during periods of sleep. Despite constituting a mere 2% of our total body weight, the brain accounts for around 20% of our caloric expenditure. Engaging in cognitive processes results in an increased expenditure of energy, as the act of thinking requires the consumption of calories (Sousa, 2022).

An individual cannot be reduced to their brain alone since the brain constantly interacts with other sections of the human body, despite the fact that it serves a vital function. The centre of our mental faculties is the brain. It performs so-called higher processes like language, reasoning, and consciousness as well as vital tasks like controlling respiration, body temperature, and heart rate (OECD, 2007). The brain is not only a three-pound mass of organic matter, it is also a widely recognized and the most remarkable organ in the human body, and is regarded as the most intricate entity currently understood.

The contemplation of the brain and its multifaceted functions throughout our existence evokes a sense of humility. Within this convoluted structure of tissue, an immensely intricate interplay of electrochemical reactions unfolds incessantly. A substantial portion of these processes transpires autonomously, devoid of any conscious oversight to guide the continuous symphony (Sweeney, 2009 and Baars & Gage, 2010).

Nowadays, the neuroscientific framework for learning provides a theoretical foundation for educational approaches rooted in a solid scientific basis. This developing field of inquiry is steadily establishing the fundamental concepts of a science of learning. The definition of an individual human process may differ depending on the reference standard utilised, as living organisms have multiple organisational levels. The definition of learning differs based on the perspective of the individual expressing it. The distinctions between cellular and behavioural definitions reflect the divergent perspectives of neuroscience and educational psychology. Neuroscientists contend that learning is a cognitive process involving the perception, processing, and integration of information as the brain responds to stimuli. Educators view this as an active process that facilitates information acquisition, necessitating lasting, measurable, and specified behavioural modifications (OECD, 2007).

The brain consistently receives a constant stream of information through electrical impulses conveyed by neurones situated in the sensory organs. The first phase entails evaluating the relevance of the material to see if it warrants attention. In cases where information is considered trivial or solely reinforces the status quo, it is acceptable for its relevance to gradually decline, so escaping our conscious consciousness. In instances of novel or noteworthy stimuli, the brain demonstrates signal amplification, leading to their representation across several regions. If this activity persists for a prolonged period, it will result in the emergence of a conscious experience. In specific cases, cognitive processes surpass simple thought, leading the cerebral cortex to direct the somatic nervous system, which triggers muscle contractions via neural impulse transmission (Pujara, 2021).

The brain bears similarities to the heart or lungs in various aspects. Every organ possesses an inherent physiological role. The brain acquires knowledge and skills through the process of learning, as it is inherently designed to fulfil this cognitive function. Furthermore, the human brain possesses an exceptionally abundant potential for acquiring knowledge. Every human brain, regardless of age, gender, ethnicity, or cultural background, possesses a unique combination of remarkable characteristics. The human mind possesses several notable cognitive abilities, including the aptitude to recognize patterns and make estimations, a remarkable capacity for diverse forms of memory, the capability to rectify errors and acquire knowledge through the examination of external information and introspection, and an unlimited potential for creative expression (Caine & Caine, 1991).

The process of learning involves establishing connections. Brain-based research provides evidence supporting the notion that instructors can maximize their influence on pupils by establishing connections with them on two distinct yet interconnected dimensions: the academic level, which involves delivering grade-appropriate knowledge, and the emotional level, which entails fostering good interpersonal interactions. In both instances, these associations possess a neurological basis that encompasses the formation of novel brain connections, the reinforcement of preexisting neural connections, and the establishment of neural networks, occasionally denoted as neural superhighways.

Within the educational setting, teachers establish meaningful connections with pupils that encompass both academic and emotional dimensions. It is highly probable that you possess a considerable level of familiarity with academic learning. Therefore, the interpersonal level, often known as the emotional level, has emerged as a recent area of emphasis within the educational setting. The significance of establishing ongoing emotional relationships with our pupils is evident in brain-based learning studies. For pupils to effectively acquire new academic knowledge, it is imperative that their emotional brain signals a sense of safety and significance in relation to the subject being learned (Connell, 2005).

Teaching is an indefinite process that never reaches a definitive conclusion. Ramakrishnan & Annakodi (2018) outlined the teaching strategies related to brain-based learning by quote Renate Caine's analysis in her book, Making Connections, which highlights the need for three essential interaction components in the process. These are stated as follow:

Orchestrated Immersion: Interaction is essential to creating educational settings that engage students in a complete learning experience. This implies a learning environment in which students actively participate and immerse themselves. Teachers must give students deep, authentic learning experiences. Exposing learners to a foreign culture in order to teach a second language is one example. Teachers must use the brain's simultaneous processing ability.

Relaxed Alertness: The goal is to reduce student apprehension while maintaining a challenging teaching environment. Relaxed alertness reduces student anxiety and promotes intellectual stimulation. Students must face a personal challenge. These challenges stimulate a student's cognitive abilities, increasing mental focus.

Active Processing: This interactive aspect helps learners grasp and retain material through active cognitive processing. Active processing allows students to continuously and actively interact with material in order to comprehend, organise, and integrate it. To help a student comprehend a topic, it's important to examine the different ways to approach it and understand the learning process as a whole.

3. Methods

This study utilised a mixed-methods approach to fulfil the research aims, as the variables required measurement through diverse instruments employing both quantitative and qualitative techniques. The researchers applied a descriptive survey design to assess EFL teachers' perceptions of brain-based strategies in terms of enhancing their students' EFL learning. The researchers also used closed-ended and open-ended questionnaires as well as semi-structured interviews to collect the necessary data.

3.1. Participants of the Study

The participants of this study were all the EFL teachers who have worked in secondary schools in Dessie City Administration, Wollo, Ethiopia. They were 93 EFL teachers in numbers. The researchers also used a comprehensive sampling technique.

3.2. Data Analysis Techniques

The Statistical Package for Social Sciences (SPSS), version 25, computed descriptive statistical measures such as frequencies, mean values, standard deviation, and standard error to analyse the quantitative data. Furthermore, the researcher utilised thematic analysis when analysing qualitative data.

4. Results

The data that were gathered from the EFL teachers through closed ended and open-ended questionnaires and the semi-structured interviews are presented and discussed as follow.

Table 1: Perceptions of EFL Teachers about Human Brain

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
The brain is not made for steady focus; rather, it is made for fluctuations.	93	3.25	.100	.963
The brain is capable of handling multiple tasks at once.	93	2.22	.135	1.301
The brain processes wholes and parts simultaneously.	93	2.88	.127	1.223
The brain changes itself in reaction to new stimuli.	93	2.55	.165	1.592
Water is necessary for brain function and neuronal message transmission.	93	2.48	.149	1.442
Social factors and experiences shape the brain.	93	3.55	.100	.961
The brain's structure can affect teacher's daily curriculum, instruction, and assessment decisions.	93	2.20	.143	1.380
Valid N (listwise)	93			

The above table, item 1, reveals that most teachers did not understand whether the brain is designed for steady focus or fluctuations. The mean value of the item was 3.25 with a standard error of 0.100 and a standard deviation of 0.963. Additionally, item 3 revealed that the majority of teachers were unaware of whether the brain processes wholes and parts simultaneously, as indicated by its mean value of 2.88, its standard error of 0.127, and its standard deviation of 1.223. Furthermore, the mean value (2.22), the standard error (0.135), and the standard deviation (1.301) of item 2 showed that most of the teachers did not perceive that the brain is capable of handling multiple tasks at once. Moreover, item 4 indicated that most of the teachers did not know that the brain changes itself in reaction to new stimuli. The mean value of this item is 2.55, with 0.165 being the standard error and 1.592 being the standard deviation. Similarly, item 5 indicates that the majority of teachers were unaware of the importance of water for brain function and neuronal message transmission, with a mean value of 2.48, a standard error of 0.149, and a standard deviation of 1.442. Furthermore, item 7 revealed that most teachers were unaware of the influence of the brain's structure on their daily curriculum, instruction, and assessment decisions. The mean value of the item is 2.20 with a standard error of 0.143 and a standard deviation of 1.380. However, item 6, which has a mean value of 3.55, a standard error of 0.100, and a standard deviation of 0.961, indicates that the majority of teachers believed that social factors and experiences shape the brain.

Table 2: Perceptions of EFL Teachers about Relationship between Brain and Learning

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
Learning transforms the brain physically and chemically.	93	2.37	.147	1.420
The search for meaning is innate and comes through patterning.	93	2.44	.141	1.363
Emotions are essential for effective learning.	93	2.45	.155	1.493
Our brains prefer sensory input from multiple sources.	93	2.33	.145	1.401
The entire body is involved in students' learning.	93	2.56	.150	1.448
Learning involves focused attention and peripheral perception.	93	2.56	.158	1.528
Learning involves both conscious and unconscious processes.	93	2.38	.154	1.488
When new knowledge is simple and related to previous experiences, cerebral activity and retention increase.	93	3.55	.113	1.089
Environmental factors alter the structure of the brain, which determines students learning.	93	3.96	.100	.966
Valid N (listwise)	93			

As it is described in Table 2, Item 8 shows that the majority of teachers did not believe that learning alters the physical and chemical makeup of the brain. The mean value of this item is 2.37 with a standard error of 0.147 and a standard deviation of 1.420. Similarly, item 9, with its mean value of 2.44, a standard error of 0.141, and a standard deviation of 1.363, demonstrates that the majority of teachers were unaware that the search for meaning is innate and emerges through patterning. Furthermore, the mean value of item 10 is 2.45 with a standard error of 0.155 and a standard deviation of 1.493, showing that the majority of the teachers did not believe that emotions are essential for effective learning. Interviewees also stated that most teachers did not consider their students' emotions; however, when students experience positive emotions related to their learning, their minds become active, enabling them to learn, recall new information and their prior knowledge, and understand things more easily. Conversely, when students experience negative emotions, their minds become inactive. For instance, interviewee F explained that learning occurs when students experience positive emotions towards the provided inputs (contents). Item 11 also indicates that the majority of the teachers did not perceive that our brains prefer sensory input from multiple sources. The mean value of this item is 2.33 with a standard error of 0.145 and a standard deviation of 1.401. Moreover, most of the teachers did not know that the entire body is involved in students' learning, as indicated by item 12 with its mean value of 2.56, a standard error of 0.150, and a standard deviation of 1.448. Similarly, item 13, with a mean value of 2.56, a standard error of 0.158, and a standard deviation of 1.528, demonstrated that the majority of teachers did not believe that learning involves both focused attention and peripheral perception.

In the same vein, the mean value, 2.38, of item 14 with a standard error of 0.154 and a standard deviation of 1.488 reveals that the majority of the teachers did not understand that learning involves both conscious and unconscious processes. The interviewee B also stated that the students' minds should be conscious because when their brains are alert and have good concentration, their learning will allow them to be active participants rather than passive.

However, item 15 revealed that the majority of teachers understood that when new knowledge is straightforward and connected to past experiences, it leads to an increase in cerebral activity and retention. The mean value of this item is 3.55 with a standard error of 0.113 and a standard deviation of 1.089. Likewise, the mean value of 3.96 for item 16 with a standard error of 0.100 and a standard deviation of 0.966 indicates that the majority of the teachers perceived that environmental factors alter the structure of the brain, which determines students' learning.

Table 3(a): Perceptions of EFL Teachers about Brain-Based Strategies

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
Natural and spatial memory facts improve learning and comprehension.	93	2.52	.156	1.508
Visual and aural tools help students fully comprehend the topic content.	93	2.47	.153	1.479
Body motions help learners' re-pattern and learn by accessing previously unused brain regions.	93	2.55	.143	1.379
When learners have more alternatives and pathways that match their intelligence, learning becomes more relevant and real.	93	2.54	.161	1.550
Students learn differently based on their experiences, beliefs, and subject expertise.	93	2.47	.162	1.564
Valid N (listwise)	93			

The mean value of item 17 in Table 3(a), which is 2.52 with a standard error of 0.156 and a standard deviation of 1.508, indicates that the majority of teachers did not believe that natural and spatial memory facts improve learning and comprehension. Similarly, item 18 indicates that most of the teachers did not know that visual and aural tools helped students fully comprehend the topic content. The mean value of this item is 2.47 with a standard error of 0.153 and a standard deviation of 1.479. Similarly, item 19, which has a mean value of 2.55, a standard error of 0.143, and a standard deviation of 1.379, reveals that most teachers were unaware that body motions aid learners in re-patterning and learning by accessing previously unused brain regions. Similarly, Interviewee A described that teachers consider the students' body movement as a sign of disturbance and unwillingness to learn.

Furthermore, item 20's mean value of 2.54, with a standard error of 0.161 and a standard deviation of 1.550, indicates that most teachers did not perceive that learning becomes more relevant and real when learners have more alternatives and pathways that match their intelligence. Item 21, which has a mean value of 2.47, a standard error of 0.162, and a standard deviation of 1.564, also indicates that the majority of teachers did not perceive that students learn differently based on their experiences, beliefs, and subject expertise. Respondents in the open-ended item also affirmed that teachers did not treat students according to their differences. Interviewee H also stated that although it is natural for students to have their own private needs and individual learning outputs, their teachers did not consider their differences.

Table 3(b): Perceptions of EFL Teachers about Brain-Based Strategies

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
We should allow students to be active participants rather than passive observers.	93	4.16	.119	1.145
Brains lose interest in predictable or repetitive classroom stimuli.	93	2.59	.144	1.385
Students must be physically and emotionally comfortable in class to focus on cognitive learning.	93	2.23	.152	1.468
Students must believe the teacher wants to correct them, not just point out mistakes.	93	2.57	.152	1.463
The learner can only attribute meaning to new knowledge after adequate time to analyse and reprocess it.	93	3.30	.128	1.232
If teachers help students understand both new knowledge and its context, they can make strong memories.	93	2.58	.164	1.583
Teachers should actively regulate the social context of students' learning environments to increase learning.	93	2.57	.154	1.485
Valid N (listwise)	93			

Table 3(b) describes item 22 as having a mean value of 4.16, a standard error of 0.119, and a standard deviation of 1.145, indicating that the majority of teachers believed they should allow students to be active participants rather than passive observers. The respondents in the open-ended item also expressed their belief that teachers should empower their students to express their internal feelings, talents, emotions, and temperaments, thereby making them active participants.

However, item 23, which has a mean value of 2.59, a standard error of 0.144, and a standard deviation of 1.385, confirms that the majority of teachers were unaware that predictable or repetitive classroom stimuli can lead to brain fatigue. The interviewee 'I' also said that teachers should set comfortable situations in the classroom, make the teaching and learning modernized, and use modern learning aids for better effective learning.

Similarly, the mean value of item 24, 2.23, with a standard error of 0.152 and a standard deviation of 1.468, suggests that most teachers are unaware of the importance of ensuring students' physical and emotional comfort in the classroom to facilitate cognitive learning. Moreover, item 25 shows that most of the teachers did not perceive whether students must believe the teacher wants to correct them, not just point out mistakes or not, as the mean value of the item is 2.57 with a standard error of 0.152 and a standard deviation of 1.463.

Likewise, item 26 indicates that the majority of the teachers did not perceive that the learner can only attribute meaning to new knowledge after adequate time to analyse and reprocess it, as the mean value of 3.30 with a standard error of 0.128 and a standard deviation of 1.232 showed. Furthermore, the mean value, 2.58, of item 27 with a standard error of 0.164 and a standard deviation of 1.583 indicates that most of the teachers did not perceive that when teachers help students understand both new knowledge and its context, they can make strong memories or not. Additionally, item 28 shows that the majority of the teachers did not know that they should actively regulate the social context of students' learning environments to increase learning. The mean value of this item is 2.57 with a standard error of 0.154 and a standard deviation of 1.485.

Table 3(c): Perceptions of EFL Teachers about Brain-Based Strategies

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
Teachers should combine their knowledge and brain science findings to create learner-centred environments.	93	2.48	.158	1.522
Teachers can promote emotional stability in the classroom by creating a welcoming environment.	93	2.51	.162	1.565
Teachers' knowledge about brain affects their teaching success.	93	2.53	.157	1.515
Rote memorization can be minimised with the aid of brain-based strategies.	93	3.38	.095	.920
Understanding the different types of memory and how they develop helps teachers choose approaches that improve students' retention and recall.	93	2.59	.166	1.596
Teachers can improve students' recall by using teaching strategies that help their brains decide how and where to store new content.	93	2.39	.151	1.452
Teachers must assist students in constructing meaning to keep their brains on the learning target.	93	3.81	.115	1.106
Brain-compatible learning environments improve student performance.	93	2.59	.155	1.498
Valid N (listwise)	93			

As it is shown in Table 3(c), item 29 shows that most of the teachers are unaware that they should combine their knowledge and brain science findings to create learner-centred environments, as indicated by mean value of 2.48, a standard error of 0.158, and a standard deviation of 1.522. The respondents in the open-ended item also described that it is a forgotten strategy though it is one of the best teaching strategies teachers should use. Moreover, item 30, with a mean value of 2.51, a standard error of 0.162, and a standard deviation of 1.565, confirms that the majority of teachers are unaware that they can promote emotional stability in the classroom by creating a welcoming environment. Additionally, item 31, with a mean value of 2.53, a standard error of 0.157, and a standard deviation of 1.515, indicates that the majority of teachers did not perceive their knowledge about brains as having a significant impact on their teaching success. Similarly, item 32 with the mean value of 3.38, a standard error of 0.095, and a standard deviation of 0.920 shows that the majority of the teachers did not decide whether rote memorization can be minimized with the aid of brain-based strategies or not. Likewise, most of the teachers did not perceive that understanding the different types of memory and how they develop helps teachers choose approaches that improve students' retention and recall, as indicated by item 33 with the mean value of 2.59, a standard error of 0.166, and a standard deviation of 1.596.

Additionally, item 34 reveals that a majority of teachers were unaware that they can enhance students' recall by implementing teaching strategies that assist their brains in determining how and where to store new content, as confirmed by the mean score of 2.39, a standard error of 0.151, and a standard deviation of 1.452. Correspondingly, item 36, with a mean value of 2.59, a standard error of 0.155, and a standard deviation of 1.498, shows that the majority of the teachers did not know that brain-compatible learning environments improve student performance. Respondents in the open-ended items confirmed that teachers have not paid attention to brain-based strategies. However, item 35, with a mean value of 3.81, a standard error of 0.115, and a standard deviation of 1.106, reveals that most teachers were aware of that they must assist students in constructing meaning to keep their brains on the learning target.

In addition to these, respondents of the open-ended items and interviewees in the semi-structed interview mentioned factors that influence teachers' perceptions of brain-based strategies. One of the reasons was teachers lacked attentions and knowledge about brain-based strategies and did not use appropriate instructional learning materials. The interviewees also mentioned lack of awareness and commitment due to teachers did not get in-service trainings about brain-based strategies. The other one was the condition of the school related with administration. Furthermore, the teachers did not consider the students’ cultural differences, the environment they came from and their background. For instance, interviewee G stated that some teachers did not consider the different learning styles of students, so they did not identify their students’ interest and did not try to arouse their students’ interest when they conducted their lessons in the classroom. Moreover, most of the teachers were not prepared well to implement active-learning methods.

5. Discussion

5.1. Perceptions of EFL Teachers about Human Brain

Most teachers were uncertain if the brain's structure allows for sustained concentration or variability. However, Keleş & Cepni (2006) asserted that current studies employing diverse imaging techniques have produced new findings suggesting that the human brain does not maintain a stable state. Furthermore, Sweeney (2009) clarified that the brain participates in a dynamic process. Moreover, majority of the teachers were unaware to whether the brain processed wholes and parts concurrently, and they did not recognize the brain's capacity for multitasking; nonetheless, Baars & Gage (2010) stated that the contemplation of the brain and its multifaceted functions throughout our existence evokes a sense of humility.

Furthermore, the majority of teachers were unaware that the brain undergoes alterations in response to new inputs, but Sweeney (2009) noted that several brain regions, like the hippocampus, have the exceptional capacity to continually generate new neurons, a process intricately linked to learning and memory functions. Similarly, Caine & Caine (1991) described that the brain undergoes structural modifications in response to experiential stimuli.

Moreover, the majority of teachers also were oblivious to the significance of water for cognitive function and neural communication; nonetheless, Connell (2005) explained that water is essential for brain function. Our bodies balance salt and water. Caffeine, salt, and sugar in drinks dehydrate us, depleting our brain and body's water supply. Dehydration causes headaches and impairs learning. Therefore, to make cerebrospinal fluid, the brain needs continual water. Likewise, the majority of teachers were unaware of the impact of cerebral structure on their everyday curriculum, instructional methods, and assessment choices.

On the contrary, most teachers feel that social variables and experiences influence brain development. The OECD (2007) affirmed that the brain is a dynamic and changeable organ, demonstrating significant flexibility to its environment throughout an individual's life. Variations in genetic inheritance and environmental influences result in unique brain architecture and functioning among individuals.

5.2. Perceptions of EFL Teachers on Relationships between Brain and Learning

The majority of teachers did not believe that learning alters the physical and chemical makeup of the brain; however, Pritchard (2009) described that as our knowledge expands, the quantity of connections formed increases, leading to a heightened complexity in the already intricate patterns of interconnection. Besides, the majority of teachers were unaware that the search for meaning is innate and emerges through patterning, but Caine & Caine (1991) described that the brain acquires knowledge and skills through the process of learning, as it is inherently designed to fulfil this cognitive function.

Furthermore, the majority of the teachers did not believe that emotions are essential for effective learning. Interviewees also stated that most teachers did not consider their students' emotions, yet when students experience positive emotions related to their learning, their minds become active, enabling them to learn, recall new information and their prior knowledge, and understand things more easily; conversely, when students experience negative emotions, their minds become inactive. For instance, interviewee F explained that learning occurs when students experience positive emotions toward the provided inputs (contents).

Additionally, Carter et al. (2019) described that emotions can be conceptualized as physiological alterations that motivate individuals to engage in specific behaviours.

Moreover, the majority of the teachers did not perceive that our brains prefer sensory input from multiple sources. Similarly, most of the teachers did not know that the entire body is involved in students' learning; however, Carter et al. (2019) stated that the principal function of the brain is to facilitate the maintenance of the entire body in an optimal condition with respect to the surrounding environment, with the ultimate goal of maximizing the likelihood of survival. The brain accomplishes this process by perceiving stimuli and subsequently generating responses through action.

Besides, the majority of teachers did not believe that learning involves both focused attention and peripheral perception; however, Caine & Caine (1991) stated that the human brain assimilates information that is consciously perceived and actively attended to. And also, it actively assimilates data and impulses that extend beyond the scope of conscious awareness. Similarly, most of the teachers also did not understand that learning involves both conscious and unconscious processes. The interviewee B also stated that the students learn with a conscious mind because when their brains are alert and have good concentration, their learning will allow them to be active participants rather than passive; however, Caine & Caine (1991) described that we acquire a significant amount of knowledge that surpasses our conscious comprehension. According to them, the current findings indicate that a substantial amount of unconscious processing occurs beneath the level of conscious awareness. The majorities of signals that are seen peripherally enter the brain without the learner's conscious knowledge and engage with unconscious processes.

However, the majority of teachers understood that when new knowledge is straightforward and connected to past experiences, it leads to an increase in cerebral activity and retention. Connell (2005) also stated that the process of learning involves establishing connections. Likewise, the majority of the teachers perceived that environmental factors alter the structure of the brain, which determines students' learning.

5.3. Perceptions of EFL Teachers about Brain-Based Strategies

It was the perception of the majority of teachers that they ought to foster an environment in which students are active participants rather than passive observers. Those who responded to the open-ended question also expressed their conviction that teachers should provide learners with the opportunity to express their interior feelings, talents, emotions, and temperaments, which would result in the students being active participants in the learning process. Furthermore, the majority of teachers understood the importance of guiding students through the process of creating meaning, which helps them stay focused on the course objectives. Meanwhile, the majority of the teachers did not decide whether rote memorization can be minimized with the aid of brain-based strategy or not.

However, the majority of teachers did not believe that natural and spatial memory facts improve learning and comprehension and that visual and aural tools helped students fully comprehend the topic content. Likewise, most teachers were unaware that body motions aid learners in re-patterning and learning by accessing previously unused brain regions. Similarly,

Interviewee A described that teachers consider the students' body movement as a sign of disturbance and unwillingness to learn; however, Ramakrishnan & Annakodi (2018) stated that the integration of physical activity with the learning process significantly enhances the acquisition of knowledge and skills.

Furthermore, most teachers did not perceive that learning becomes more relevant and real when learners have more alternatives and pathways that match their intelligence; nevertheless, Connell (2005) stated that using as many multiple intelligences as possible in a lesson, alternating left-brain and right-brain approaches; and using visual, auditory, and kinaesthetic activities will stimulate different parts of the brain and form new neural connections. In the same vein, the majority of teachers did not perceive that students learn in a variety of ways, depending on their experiences, beliefs, and level of subject matter competence. Those who responded to the open-ended question are also in agreement that teachers did not handle students in accordance with the distinctions that exist among them. Interviewee H further stated that although it is natural for students to have their own unique requirements and individual learning outputs, their teachers did not take into consideration while their teachers were teaching. Since students' learning varies according to their needs, it is crucial for teachers to prioritize understanding their students' needs.

Additionally, the majority of teachers were unaware that predictable or repetitive classroom stimuli can lead to brain fatigue. The interviewee 'I' also said that teachers should set comfortable situations in the classroom, make the teaching and learning modernized, and use modern learning aids for better effective learning. Similarly, Connell (2005) stated that changing the classroom environment during the day (e.g., entire group, small group, one-on-one) stimulates different brain regions. Ramakrishnan & Annakodi (2018) also described that establishing a positive and nurturing classroom atmosphere is of utmost importance since the brain's ability to acquire knowledge is hindered in the presence of stress. In addition to these, most teachers were unaware of the importance of ensuring students' physical and emotional comfort in the classroom to facilitate cognitive learning. Connell (2005) also described that safe classroom is one of the school environment factors that determines the students learning.

Moreover, most of the teachers did not perceive whether students must believe the teachers want to correct them, not just point out mistakes or not. Likewise, the majority of the teachers did not perceive whether the learner can only attribute meaning to new knowledge after adequate time to analyse and reprocess it or not; however, Ramakrishnan & Annakodi (2018) recommended allocating a designated period of time at the conclusion of a class for the purpose of engaging in reflective contemplation and collaborative discourse pertaining to the subject matter. They stated that comprehension may not be immediate, but rather may manifest at a later time. Therefore, the inclusion of processing time and reflection is crucial within the learning environment.

Furthermore, most of the teachers did not perceive that when teachers help students understand both new knowledge and its context, they can make strong memories. Similarly, the majority of the teachers did not know that teachers should actively regulate the social context of students' learning environments to increase learning. Likewise, most of the teachers are unaware that teachers should combine their knowledge and brain science findings to create learner-centred environments.

The respondents in the open-ended item also described that it is a forgotten strategy though it is one of the best teaching strategies teachers should use. Moreover, the majority of teachers are unaware that they can promote emotional stability in the classroom by creating a welcoming environment. Additionally, the majority of teachers did not perceive their knowledge about brains as having a significant impact on their teaching success, but Connell (2005) stated that as a teacher, it is vital to consider the implications of one's cognitive preference, whether it leans towards left, right, or middle brain, and how this may impact their teaching practice.

Likewise, most of the teachers did not perceive that understanding the different types of memory and how they develop helps teachers choose approaches that improve students' retention and recall. Additionally, the majority of teachers are unaware that they can enhance students' recall by implementing teaching strategies that assist their brains in determining how and where to store new content. Similarly, the majority of the teachers did not know that brain-compatible learning environments improve student performance. Respondents in the open-ended items confirmed that teachers have not paid attention to brain-based strategies.

5.4. Factors That Influence Teachers' Perceptions of Brain-Based Strategies

Numerous factors influence teachers' knowledge of brain-based techniques. One of the factors was that teachers lacked attention and knowledge regarding brain-based techniques and did not use suitable instructional resources. The interviewees also noted a deficiency in awareness and dedication resulting from teachers not receiving in-service training on brain-based strategies. The other aspect pertained to the school's administrative state. Moreover, the teachers failed to acknowledge the students' differences in culture, their environmental context, and their backgrounds. Interviewee G also indicated that certain teachers did not acknowledge the diverse learning styles of students, resulting in their inability to recognize their interests and a lack of effort to stimulate engagement during classroom instruction. Furthermore, the majority of teachers were inadequately equipped to employ active-learning techniques.

6. Conclusion

According to the findings of the study, English as a Foreign Language (EFL) teachers knew very little about the nature of the human brain, its ability to maintain concentration over time, its ability to multitask, and its influence on the curriculum, teaching methods, and assessment options. They also lacked knowledge of the relationship between the brain and learning, which includes the search for meaning, emotions, sensory input, and the participation of the entire body in the learning process of students.

Teachers did not fully understand the impact of brain-based strategies on rote memorization, despite the fact that they acknowledged the significance of creating an environment in which students actively participated and guided them through the process of creating meaning. This is due to the fact that students learn differently based on their experiences, beliefs, and subject matter competence.

In addition, the study brought to light the necessity for teachers to comprehend the significance of natural and spatial memory facts, visual and aural tools, bodily motions, and the importance of ensuring that students are both physically and emotionally comfortable within the classroom setting. Furthermore, it emphasized the importance of teachers regulating the social context of their students' learning environments, creating learner-centred conditions, and promoting emotional stability.

Additionally, a variety of issues influence teachers' perspectives on brain-based strategies, such as the lack of attention, the inadequate training they were given, the administrative states of the schools, the cultural disparities among students, and the various learning styles the students have. Teachers also have a difficult time identifying the interests of their students and engaging them in the learning process, and they frequently lack the resources necessary to use active learning strategies.

Therefore, it is recommended that teachers ought to understand the brain and how it affects their teaching.

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