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Essays

Inteligencia espiritual y neurociencia en el proceso de la motivación para el aprendizaje

Spiritual intelligence and neuroscience in the process of motivation for learning

Inteligência espiritual e neurociência no processo de motivação para a aprendizagem

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Resumen

Al ingresar a la escuela, los alumnos se enfrentan a dos procesos distintos que deben comprender: el contexto social que se genera dentro del aula al explicar nuevos conocimientos y los contenidos que deben estudiar. Esto los coloca en una situación de incertidumbre al intentar desarrollar nuevas formas de aprender o conectar sus experiencias de aprendizaje, y al emplear de manera empírica sus criterios, reflexiones y valores, lo cual, en ocasiones, puede resultar no grato y crear desinterés por el aprendizaje. Por ende, el propósito del presente ensayo es mostrar cómo, a través del manejo de la inteligencia espiritual y la neurociencia, los maestros pueden lograr desarrollar la motivación en sus estudiantes en el proceso de enseñanza-aprendizaje. Para ello, utilizando la inteligencia espiritual y la neurociencia, se busca potenciar la capacidad de los estudiantes para discriminar posibilidades que contribuyan a la resolución de situaciones de aprendizaje. Esto se logra mediante la aplicación de estrategias integrales que estimulan el pensamiento serial, asociativo y unificador. De esta manera, se movilizan estructuras neuronales mentales, emocionales y espirituales en la sincronía de la asimilación, que sirven para identificar cómo actúan los neurotransmisores que intervienen directamente en los diferentes tipos de memoria. Esto se logra a través del conocimiento del funcionamiento de los hemisferios cerebrales, las neuronas espejo y la plasticidad neuronal. Todo ello depende de los aprendizajes que el docente desee establecer en las actividades presentadas a los alumnos con

el fin de lograr la reestructuración cognitiva que posibilite la empatía con el conocimiento y favorezca las habilidades de aprendizaje en los estudiantes.

Palabras clave: funciones cognitivas, memoria, motivación, neuronas espejo, neurotransmisores, plasticidad neuronal.

Abstract

When students attend school, they encounter two different processes that they must understand: the social context that is generated inside the classroom when new knowledge is explained and the contents that they must study. This places them in a situation of uncertainty when trying to understand new ways of learning or connecting their learning experience, and when they use their criteria in an empiric way, reflections and values, which sometimes can be unpleasant and create lack of interest in learning.

Thus, the purpose of this essay is to show how through the management of spiritual intelligence and neuroscience, teachers can develop motivation in their students during the teaching-learning process. To achieve this by using spiritual intelligence and neuroscience, it seeks to enhance the ability of students to discriminate possibilities that contribute to the resolution of learning situations. This is achieved by applying integral strategies that stimulate serial, associative and unifying thinking. In this way, mental, emotional and spiritual neural structures are moved in the synchrony of assimilation, which serves to identify how the neurotransmitters that directly intervene in the different types of memory act. This is reached through knowledge of the functioning cerebral hemispheres, mirror neurons and neuronal plasticity. All of these depending on of the learning that the teacher wishes to establish in the activities presented to the students, to achieve cognitive restructuring, which enables empathy with knowledge, favoring learning skills in students.

Keywords: cognitive functions, memory, motivation, mirror neurons, neurotransmitters, neuronal plasticity.

Resumo

Ao entrar na escola, os alunos enfrentam dois processos distintos que devem compreender: o contexto social que se gera na sala de aula ao explicar novos conhecimentos e o conteúdo que devem estudar. Isso os coloca em situação de incerteza ao tentar desenvolver novas formas de aprender ou conectar suas experiências de aprendizagem, e ao utilizar empiricamente seus critérios, reflexões e valores, o que, por vezes, pode ser desagradável e criar desinteresse pelo assunto de aprendizagem. Portanto, o objetivo deste ensaio é mostrar como, por meio do gerenciamento da inteligência espiritual e da neurociência, os professores podem desenvolver

a motivação no processo de ensino-aprendizagem. Para isso, recorrendo à inteligência espiritual e à neurociência, procuramos potenciar a capacidade dos alunos em discriminar possibilidades que contribuam para a resolução de situações de aprendizagem. Isto é conseguido através da aplicação de estratégias abrangentes que estimulam o pensamento serial, associativo e unificador. Dessa forma, estruturas neurais mentais, emocionais e espirituais são mobilizadas na sincronia de assimilação, que servem para identificar como atuam os neurotransmissores que intervêm diretamente nos diferentes tipos de memória. Isto é conseguido através do conhecimento do funcionamento dos hemisférios cerebrais, dos neurônios-espelho e da plasticidade neuronal. Tudo isso depende da aprendizagem que o professor deseja estabelecer nas atividades apresentadas aos alunos para conseguir uma reestruturação cognitiva que possibilite a empatia com o conhecimento e favoreça as habilidades de aprendizagem nos alunos.

Palavras-chave: funções cognitivas, memória, motivação, neurônios-espelho, neurotransmissores, plasticidade neuronal.

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Introduction

In the current era, education requires the design and implementation of various comprehensive learning strategies with the aim of turning students into motivated and empathetic subjects in the search for knowledge, whether in the classroom or in distance learning. To do this, it is crucial that the student is motivated so that what has been learned acquires meaning. In fact, if educational systems understood and prioritized teaching in a holistic manner - recognizing that a student who is excited and motivated by learning better develops his or her potential, not only cognitive, but also behavioral, to stimulate his or her ability to learn - it would not be necessary to justify the use of strategies such as meditation, a vital tool to achieve motivation based on spiritual intelligence in the pedagogical context.

In this context, spiritual intelligence finds a solid basis in neuroscience to explain how meditative practices promote the self-regulation of those who practice them. In this psyche-body harmony, the individual finds intrinsic motivation that allows him to self-regulate and motivate himself to learn something unknown, which involves linking new knowledge with what has already been learned and manipulating the accumulated knowledge according to the environments that are presented to him, both within like outside the classroom.

For this reason, and considering it essential that teachers must know how the motivation processes are activated in the students' brains and what skills are useful to understand how they evoke, record, process, conserve and learn information, the following presents how spiritual intelligence, through meditation, manages to be a positive trigger in the

intrinsic motivation of students. Likewise, it is highlighted how teacher knowledge about neuroscience in education provides a feasible way to achieve learning.

Spiritual intelligence

Spiritual intelligence (IES), according to Pérez (2021), is defined as the ability to face and solve problems related to the meaning of life's purposes in a broad, transcendental and significant context. This capacity is considered the necessary basis for the functioning of the intellectual quotient (IQ) and emotional intelligence (EI), as it enables human beings to be creative, to change the rules or alter situations. In addition, it allows them to enhance the ability to discriminate, establish a moral sense, distinguish between right and wrong, and develop the ability to assume unrealized possibilities. Therefore, it is an internal and innate capacity of the human brain and psyche that draws its deepest resources from the universe itself.

The IES allows the brain to find and use meaning in solving problems. It is a form of intelligence that rests in the deep part of the being, connected with wisdom. Therefore, it does not depend on culture, values or religion, and makes it possible to have a more comprehensive vision of the individual and the universe.

According to Gallegos (2019), the IES is considered the higher intelligence that enables the individual to face problems related to the meaning and meaning of life. This allows ethical action and living in internal harmony with others, which is why it is closely linked to human values, such as love, compassion, freedom, gratitude, humility, solidarity, friendship and honesty. It is a quality of consciousness that leads to true happiness. Therefore, Gallegos suggests that cognitive intelligence focuses on the how, emotional intelligence on the what, and spiritual intelligence on the why.

These intelligences evolve from the basic to the higher to represent a comprehensive model that enables the individual to deeply understand the meaning of situations. This implies the capacity for analysis and synthesis, and goes beyond how to reach the why, which makes the advancement of knowledge possible, although two conditions are required for this: the development of mindfulness and the implementation of meditative practices.

Neuroscience supports this perspective by pointing out that there are three types of neural structures: mental, emotional and spiritual. Spiritual intelligence, according to science, offers a third way to brain processes that allow the synchrony of neuronal assimilation that unifies information throughout the entire brain, and facilitates communication between mind and body. Spiritual intelligence, therefore, can be considered a higher process that integrates the right and left hemispheres so that they function in harmony.

Spiritual intelligence and neuroscience

Spiritual intelligence had its beginnings in 1997 with Michael Persinger and Ramachandran, who carried out research on the existence of the "divine point" in the human brain, which is located between the neural connections of the temporal lobes of the brain. They were supported by studies such as positron emission tomography scans. In fact, in these studies, these areas of the brain were observed to light up when individuals talked about spiritual topics (Pérez, 2021).

Contributions in the field of neurology, according to Matthieu and Singer (2021), point out the existence of a neural process dedicated to unify and give meaning to experience that serves to literally fix the experience through unifying with synchronous neural oscillations throughout the brain. In fact, Singer's work on these unifying neural oscillations provides clues to a third type of thinking: unitary thinking, and its corresponding model of intelligence: spiritual intelligence (IES).

The unifying experience originates from neural oscillations at 40 hertz, located especially in the temporal lobes, which triggers a sensation of exaltation and intense joy. These oscillations show the way the body and mind relate to each other, which serves as the neural basis of spiritual intelligence.

From a neurological point of view, everything related to intelligence is directed or controlled by the brain and its neural extensions. The brain is responsible for the conscious mind and consciousness of the individual, since it generates thoughts and allows the individual to experience emotions and organize spiritual life, that is, the sense of what is important and values. During the first months of life, basic neural connections are established, such as heart and breathing rates, and as development occurs, the individual creates new connections through experience. This means that although we are born with a certain number of neurons, which decrease throughout life, new neural connections are also created that enhance intelligence.

For their part, neurons are the cells in charge of establishing these connections through axons, which are branch-shaped structures that connect one neuron to another. Each neuron receives stimuli in the dendrites that can stimulate or inhibit, and these stimuli travel to the cell body (Felten *et al* ., 2022). The axon terminal of a neuron secretes chemicals, known as neurotransmitters, to transmit signals. In this sense, it can be considered that there are three neural functioning systems in the brain.

Serial thinking: intelligence quotient (IQ) or intellectual intelligence

This approach views thinking as linear, logical, and unbiased. To do this, the brain carries out this operation through neural tracts that resemble networks of telephone cables.

The electrochemical signal is transmitted along a series of neurons through the axon-dendrite connection, which works in a serial manner. These neural tracts, which are distributed throughout the body, learn according to a fixed program whose rules follow formal logic and solve rational problems (Matthieu and Singer, 2021).

Associative thinking: emotional intelligence (EI)

This type of thinking forms associations between things, emotions, bodily sensations and the environment, and allows you to recognize patterns and learn physical skills, so it is a thought that involves the heart and the body. The brain structures responsible for associative thinking are neural networks. In this type of thinking, each neuron acts on many others and receives the action of the others simultaneously, which serves to learn more complex associative patterns. Unlike neural tracts, neurons in neural networks have the ability to rewire themselves in conjunction with experience, making them capable of learning.

This associative learning is carried out by trial and error, and the biochemical mechanism of learning occurs through the synapse, whenever two neurons fire together. The advantage of associative thinking is that it is in dialogue with experience and can learn through experimentation.

The two types of thinking described above reflect rational and emotional intelligence, which correspond to active memory. This active memory is a characteristic of serial active thinking and supplies information in any specific task. When the mind is faced with various options in a serial thought process, active memory allows the alternatives to be retained long enough to make a decision. In this type of memory, all alternatives are stored, with full awareness to be able to choose the best option in each situation. This implies that the individual can handle the same alternative in different situations by making only small modifications or adapting their response according to the circumstance. In this process, active memory and serial thinking are revealed.

Unifying Thought: Spiritual Intelligence

Spiritual intelligence (IES) is characterized by being the intelligence of meanings, creative, transformative and with unifying thought. It implies a sense of unity in the understanding of a situation and is highlighted by an essential holistic understanding. It is expressed as the ability to capture the general context that links the different parts that make up an experience. This unifying capacity is fundamental for intellectual and emotional intelligence (Gallegos , 2019), and contributes to give unity and meaning to the experience to assume the values and context that allow us to define life.

From the neurological perspective, the IES is described as the ability to reformulate and put back on context experience, transforming the understanding of reality. The existential dimension of the IES is not limited to being just a mental state, but is considered a form of knowledge, a way of being that modifies the understanding of one's own life, also known as a *tertiary process*. By cultivating the HEI, creativity is developed, critical and self-critical awareness is fostered, interpersonal relationships are strengthened, and the individual acquires a deep knowledge of himself, which leads to inner balance and a full understanding of the here and now.

Meditation

Meditation emerges as a powerful tool to enhance learning processes in students. If the teacher intends to promote conscious learning in students to facilitate the processing, understanding and application of knowledge, so that they can adapt it to specific contexts, they must incorporate tools such as meditation. This practice allows for a pause in the students' cognitive processes, as it allows the mind to rest and relax. Then, when reactivated, students are in better conditions to learn and achieve meaningful learning.

Repeated practice of activities such as meditation generates significant changes in executive functions. In this sense, research using neuroimaging techniques supports the evidence of greater activation in frontal and subcortical areas, relevant for sustained attention and emotional regulation. Likewise, studies on meditation carried out with positron emission tomography (PET) show greater activation in the frontal and limbic cortex, predominantly in the left hemisphere, associated with positive feelings and the exercise of sustained attention. Likewise, single photon emission (SPECT) demonstrates an increase in frontal and thalamic metabolism, which suggests a greater prominence of concentration and focused attention networks.

Now, there are several types of meditation, and in this context we will refer specifically to *mindfulness meditation*. This practice is perceived as an act of intentionally focusing attention on the present moment with acceptance. In *mindfulness* meditation, an attitude of curiosity and openness towards the experience is adopted to recognize what is being experienced without judging whether it is pleasant or unpleasant. Conscious attention to one's own experience facilitates the development of self-regulation skills and promotes a deep recognition of sensory, bodily, emotional and cognitive events at every moment. This, in turn, contributes to the increase in metacognitive knowledge (Meza, 2023).

In fact, changes have been observed in some brain areas, including the prefrontal region related to working memory and decision-making processes. Additionally, changes

have been identified in the temporoparietal region, which is associated with empathy, compassion, and perspective.

Mindfulness meditation is the compassionate and kind perspective with which the practitioner observes their experience. In other words, this practice facilitates the observation of one's thoughts, sensations and emotions, calming the mind and promoting introspection. By adopting an attitude of compassion and kindness, it is easier to see others with greater clarity, equanimity, objectivity and without prejudice. Therefore, it can be stated that this approach contributes to the development of more collaborative, empathetic, critical and self-regulated individuals (Pérez, 2021). But how to implement it in the classroom?

Through these meditative practices, teaching-learning processes are promoted, since the development of mindfulness allows individuals to become more aware of their learning processes, which can identify their needs or lacks of knowledge through introspection. This happens because a relaxed student will explore his psyche and activate his serial thinking to find solutions to situations with better-informed criteria. In other words, when an individual is in a harmonious mind-body state, homeostasis is generated not only in the body, but also in thought, which reduces the probability of making uninformed decisions, which contributes positively to the classroom environment and the academic performance of students.

Furthermore, these practices favor the development of a high level of awareness and lead to a more precise reflection on the content taught by teachers. In this way, the significant internalization of concepts is facilitated to achieve a deeper cognitive link of learning by establishing neural connections when processing recent information.

From a neuroscientific perspective, it has been established that meditation and contemplative techniques have a direct impact on the emotional state of the individual. This becomes evident in the learning process, since when learning something the emotional brain categorizes the experience as fun, boring, fascinating or tedious, which directly influences the disposition adopted when learning.

Currently, however, living in a world saturated with stimuli makes it difficult for individuals to maintain attention on a specific task. This is especially relevant for students in the adolescence phase, who are affected and influenced not only by external factors, but also, to a large extent, by the emotions associated with the physiological and anatomical changes typical of this stage. Therefore, maintaining attention becomes increasingly complicated, which obviously affects the academic environment.

For this reason, meditation is presented as a mean to work on attention, with actions such as focusing on breathing, bodily sensations and heartbeats. This process requires a relaxed and attentive state of wakefulness, in which internal dialogue and mental distractors lose intensity until they disappear, which serves to calm the mind.

Initially, this state may only last a few seconds, but with practice it is prolonged and can lead the student to a state of tranquility that reduces anxiety and stress, since this seeks to develop greater skill in attention in the students, perceptual capacity and long-term memory.

Neuroscience and education

This association is presented as a new vision of teaching that focuses its educational and technological strategies on the functioning of the brain, specifically on the integration of knowledge of biology, neurology, neuroscience, psychology, cognitive science and education to perfect the teaching process and learning. This perspective involves the application of what is known about the brain in terms of its functions and implications for learning, that is, it explores how the brain learns and what circumstances stimulate such learning.

To achieve lasting learning, it is essential to highlight the participation of various brain structures and processes responsible for consolidating learning as meaningful as it is required. Therefore, it is of utmost importance to describe some of the components involved in this process.

a) Neuronal plasticity

Neuronal or neural plasticity is the ability of neurons to acquire new information. The nervous system uses plasticity to adaptively change its structural and functional organization in response to various stimuli and the environment. In other words, our brain is “plastic”, since it has a great capacity to adapt throughout life. Each time we consolidate a form of learning, we leave a mark in the way the brain's neurons connect with each other, which creates new connections that will transmit modified and reconfigured information, ready to be applied.

This ability manifests itself when we learn, remember or memorize something. If this quality is inhibited, the brain can deteriorate and degenerate, becoming unable to respond to conditions of damage or injury. Therefore, it is advisable to use cognitive functions and establish challenges with dynamics that exercise this capacity, which will promote synaptic reorganization and the possibility of growth of new synapses to establish new networks that allow the individual to reorganize new knowledge, transform it and use it in different stages.

b) Mirror neurons

Described by Giacomo Rizzolatti in 1996, mirror neurons allow us not only to imitate behaviors, but also to understand what happens to the people around us, which is why they are activated when an action is executed and when observing the execution of that same

action in another individual. In other words, its function is related to empathic, social and imitative processes, such that it would not be possible without a plastic brain capable of modifying actions (Catuara, 2020).

This phenomenon is feasible because mirror neurons are connected to the limbic system, which is related to the regulation of emotions, memory and attention. During the teaching-learning process, these neurons enable the student to develop empathy with the content, which facilitates the acquisition of knowledge. When these neurons function, individuals as social beings generate cooperative actions that promote learning. For this reason, the teacher must enhance mirror neurons through classes that integrate debates, dialogues and collaborative work between students. This would cause an increase in the activation of this type of neurons and would provide a great advantage when it comes to the student assimilating the knowledge that is being taught.

How to enhance mirror neurons in students?

Let us remember that these neurons have an imitative component. If the teacher enters the classroom space with a serene, positive and creative attitude, the student will analyze that information, generate their own sequencing and incorporate imitative traits in their behavior. This makes it empathetic with knowledge and, even more so, with the teacher, by valuing their effort, creativity and enthusiasm to transmit learning, given that the purpose of these cells is to reflect the activity that is being observed.

c) Neurotransmitters

Also known as *neuromediators*, they are chemical substances responsible for transmitting information from one neuron to another through a synapse. The synapse is understood as a chemical discharge that causes an electrical current when a point of contact is established between neurons. In the teaching-learning process, the most relevant neurotransmitters are dopamine, adrenaline and serotonin (Felten *et al* ., 2023).

Dopamine regulates memory and cognitive processes associated with learning and decision making. Likewise, it is responsible for maintaining in the individual a state of expectancy, desire and satisfaction in the search for discernment, which is experienced as a reward. When learning, one experiences joy for having managed to understand this new knowledge, in addition to increase attention and memory, thus creating new neural connections.

On the other hand, adrenaline, also called *the activation and performance hormone*, allows the brain to focus its attention on one thing, hence pausing distractions from the environment. This physically and mentally activates the individual to place them in a state of

alert; In addition, it facilitates the consolidation of certain learning in emotional memory, which allows it to be recovered more easily in the long term.

Lastly, serotonin, also known as the *happiness hormone*, plays a crucial role in education by facilitating the learning process as it increases the speed of learning.

How to activate neurotransmitters in the classroom to enhance students' cognitive skills?

When teaching, the teacher must use teaching strategies that significantly disseminate learning among students. To enhance the activation of essential neurotransmitters in this process, it is crucial to establish teaching strategies that challenge students, such as challenging activities in which students put their skills into practice.

Collaborative work is another strategy that the teacher can use to promote the neural activation of students. When students engage in collaborative work and have the opportunity to demonstrate their skills to others, brain chemical events are triggered, such as the release of dopamine, which boosts their motivation. Adrenaline kicks in, keeping you alert and analyzing all possibilities, and finally, serotonin kicks in as you see that the knowledge or skill was manifested, practiced, and recognized.

Positive and constructive feedback from the teacher to the students is another strategy that promotes motivation. When students express and share what they have learned, reconfiguring knowledge with their personal touch, meaningful learning is evident.

d) Activation of emotion and motivation

Learning linked to emotions is essential, since the brain needs to be excited to learn more effectively. Surprise, curiosity and creativity fuel emotion and facilitate longer-lasting and better quality learning. Motivation, as an intrinsic state that drives actions, is closely related to neurobiological processes and neurotransmitters.

When we perceive an external stimulus, it is evaluated by the amygdala, our emotional radar, which determines whether the stimulus produces pleasure, pain or displeasure. If the stimulus is unpleasant, it is stored in emotional memory; but if interest is aroused, dopamine is released, a neurotransmitter that prompts the brain into action, which drives the desire to obtain what it is perceived.

Therefore, it can be stated that the activation of interest and desire for an action is the first step to motivation. The conscious brain is activated when the amygdala comes into operation, which happens when something around us generates emotion. This emotion can arise through various actions, such as facing challenges, participating in collaborative work, experiencing power, enjoying learning or feeling comfort, among others.

When interest connects with the limbic system, dopamine is released, a neurotransmitter that activates various brain areas and puts us in active mode, wanting more. This motivation drives us to action, and for this, another chemical discharge is needed that is obtained with the release of adrenaline, another neurotransmitter involved in the motivational process. Thus, in milliseconds, a message is sent to the rational brain located in the prefrontal part, where the executive functions responsible for action are located. This means that, if the individual does not move to the action phase, his motivation process is frustrated.

Adrenaline allows you to maintain the action for the time necessary to achieve the desired reward, which causes a state of flow that makes it easier to reach the last phase and experience satisfaction. This manifests itself with the release of the neurotransmitter serotonin, responsible for pleasure, the feeling of relaxation, tranquility and happiness.

e) Types of motivation

Intrinsic motivation: This form of motivation is rooted in the individual, as it emanates from their own needs. It is driven by internal factors and is linked to self-determination, autonomy, competence, relationships and personal satisfaction. Meeting these needs provides the individual with a sense of fulfillment and contributes to their self-esteem.

Extrinsic motivation: This type of motivation comes from the external environment, either through rewards or punishments. It is important to note that extrinsic motivation can lead students to perform actions solely with the objective of obtaining an external reward, instead of seeking intrinsic satisfaction derived from the learning process itself. Therefore, it is crucial to encourage the development of intrinsic motivation and promote the transition from extrinsic to intrinsic motivation.

f) Multisensory learning

This educational methodology focuses on the integration of all the senses to achieve comprehensive learning that encompasses the mind, consciousness, senses, emotions and body. In other words, it seeks to unify the individual's physical and mental resources to enhance a more natural and effective learning process. According to this perspective, it is recognized that the brain tends to learn optimally when it is stimulated through the five senses and respiratory, cardiac and brain rhythms are synchronized.

This methodology also considers the psycho-evolutionary traits of the students and addresses specific problems that may arise in the classroom, adapting to the individual difficulties of the students. Among the models used for multisensory learning are the neurolinguistic programming model, the multiple intelligences model, and the brain quadrants model. In this context, we will focus on the last mentioned.

- Brain quadrant model

The study of the brain division establishes that each hemisphere is specialized in a type of thinking and perception. This model, referred by Ned Herrmann as the "whole brain," divides the brain into two hemispheres, each with particular characteristics. When combined, these hemispheres enhance integral abilities, forming what Herrmann calls the "total brain" (Macazana *et al* ., 2021).

Right hemisphere

This hemisphere is in charge of spatial reasoning, visualization and the development of creativity. A form of non-verbal, imaginative and holistic thinking is identified in it, that is, it is oriented towards totality instead of segmentation or particularity. It prioritizes the synthesis and integration of information, which gives it an intuitive vision. In addition, it stands out for its artistic and spatial capabilities. It is known as the listening hemisphere, since it is considered the part of the brain that listens to the constant dialogue of the speaker. Work intuitively, subjectively, relationally, holistically and with a capacity for divergent thinking.

Left hemisphere

This hemisphere is characterized by being the center of sequential and temporal thinking. It is based on the sequencing of reflex arcs that provoke stimuli and is linked to language, logical, numerical, analytical and methodical thinking. Therefore, it is an analytical, causal, theoretical, symbolic, abstract, verbal, sequential, linear and objective way of working. People with a dominant left hemisphere often require organized workspaces, as clutter can lead to conflict. In this hemisphere, convergent thinking is manifested, where information is obtained using already available antecedents to form new information or ideas.

Cognitive functions

Cognitive functions, according to Meza (2023), are the mental processes that make it possible to receive, select, store, transform, process and recover information from the environment. These abilities help human beings understand and relate to the world around them. Cognitive functions include attention skills, memory, language, visuospatial skills, and executive functions.

Attention

Attention is a fundamental brain process for learning, occupying a central place in cognitive processes. It is the ability to generate, direct and maintain a state of activation appropriate to effectively process information. Attention intervenes in the selection of stimuli that reach the brain, using those that are necessary at the moment of performing an action (Felten *et al* ., 2022). To learn something, it is necessary to pay enough attention to the new knowledge so that it can be memorized, because if attention is not focused on the new content, there is no memorization or mastery of the subject.

Memory

Memory is the process by which knowledge is encoded, stored, consolidated, and effectively retrieved. This process allows us to remember facts, ideas, sensations and relationships between concepts, as well as stimuli that occurred in the past. From a neurological perspective, the hippocampus is the brain structure most related to memory, involving other areas of the brain. Memory can be primed through cognitive stimulation.

For its study, it has been divided according to different criteria, such as the time the information remains in the system, the type of information and the sensory organ used. A distinction is made between implicit and explicit memory (Felten *et al* ., 2022).

- Related to the time that the information remains in the system, three types of memory are identified:

  Sensory memory: It is the shortest type of memory, as it records the information received for only a few milliseconds.

  Short-term memory (STM): It is a limited, transient memory, vulnerable to interference; It is a component of working memory.

  Long-term memory (LTM): It is a stable, long-lasting memory that stores information indefinitely. It has episodic, semantic and implicit memory as subsystems.

- *Working or operational memory (WM):* It is a conscious, constant memory, so it does not rest, since it works in the present. It is rational, contains transitory information, regenerates and manipulates short-term memory.
- According to the type of information, it is divided into verbal and non-verbal: The first is in which the information is expressed through words, and in the second the information is handled through images, sounds, sensations.
- Depending on the sensory organ used: We say that a visual, auditory, olfactory, gustatory and haptic memory is presented according to the stimulated sense, that is, when sight, hearing, smell, taste and touch are stimulated, these types of memories are presented. .

- Implicit or procedural memory: It is the memory of habits and skills, perception, linked to adaptation and survival, where classical conditioning is established. It is rigid, long-lasting, automatic, difficult to verbalize and is expressed unconsciously.
- Explicit or declarative memory: This type of memory is expressed consciously, formed by reinforcements of lived experiences and knowledge of the world. It can be acquired quickly, it is flexible, and it is the most complex relational learning memory, as it analyzes, contrasts and integrates.

Other cognitive functions include gnosias, which is the brain's ability to recognize previously acquired information, and praxias, which refer to acquired motor skills. In other words, praxias are organized movements that are performed to achieve a specific goal.

The combination of all these cognitive abilities makes up executive functions, which are complex mental activities used to organize, guide, regulate and evaluate the behavior necessary to adapt to the environment and achieve goals.

Comprehensive strategy

For the teacher, teaching represents the great challenge because, even though there is currently a vast range of tools available to transmit knowledge, the existence of unmotivated students, not very empathetic with their own learning, is observed, who at the end of a cycle school do not comply with the learning established in the plans and programs. It is not a question of writing a universal recipe so that all students at different levels achieve what is established by educational systems.

It is simply organizing a formal procedure, aimed at obtaining a clearly established goal, taking into account that its application in daily practice will require the improvement of procedures, techniques and methodologies, whose detailed choice and design are the responsibility of the teacher.

Planned actions with the objective that the student achieves the internalization of learning and the stated objectives are achieved, which implies the projection of the teaching-learning process with a plurality of decisions, made by the teacher in a conscious, reflective, critical, integrative, that rescues those unique talents that appear in each of its students, relating affordable techniques and activities to achieve learning objectives.

An important aspect in this type of strategies is to promote the development and integral growth of the student, involving them as an active agent of their personal evolution, which allows them to improve their living conditions through the satisfaction of their basic and complementary needs. The creation of harmonious and respectful environments is an indispensable factor in favor of the conservation of a society. Another significant feature is

the development of spiritual intelligence, through meditative practice, generating cognitive-emotional self-regulation in the subject, deploying intrinsic motivation, which functions as a starting point in carrying out educational actions individually or collectively.

Now, for students to achieve the long-awaited change and motivation towards learning, they should not start from it, but from that Being that throughout time has been a transmitter of knowledge, a guide in the construction of learning or facilitator. If reference is made to the teacher, a change is indeed required, the teacher must be the first to undergo this metamorphosis, be convinced of the implementation of integrative strategies that project and develop the intrinsic motivation of the students and long-term memory that should be understood as those tools that are the basis that build the student as an integral Being at all times and context.

Conclusions

Spiritual intelligence and neuroscience are topics that are perceived in a complex way, especially when linking them and using them as an instrument in education. However, it is through them that we find a way to enhance motivation in students.

But how to achieve motivation in students? What should I do to enhance long-term memory? And once the above is established, how can motivation and long-term memory be related effectively? These are some of the many questions that teachers must ask themselves when attempting to address the content.

To begin the process of developing motivation, the individual must be made aware of himself, as an individual and social entity, to encourage him to carry out meditative practices, to be in communion with nature and to be a silent witness of the intelligence that resides in every living thing. In short, practicing the habit of not judging at all times will activate, at a neuronal level, the desire to want to know more.

Therefore, awareness must be promoted that as an individual they have shortcomings and that, according to their cognitive status, it is necessary to seek to transform themselves into an individual more capable of serving society. Once this desire to search for knowledge is established, the student must be aware of what his or her innate potential is, since each individual has unique talents and a unique way of expressing them. Awareness of the student's unique ability to acquire knowledge and use it as a starting point will allow them to analyze, explain, resolve and transform actions, which will help make new learning easier to assimilate.

In other words, the student will be able to establish that learning in his or her long-term memory because it will be knowledge that was established as something pleasant,

arising from his or her own need to learn. By recognizing your lack of that knowledge and establishing the connection with your talent(s), you will be able to appropriate it, thus triggering, at a neurochemical level, action and satisfaction for having managed to acquire this new knowledge. This turns the experience into an achievement and success, which will help fix the learning in long-term memory.

Since it is the student himself who finds his own answer to understand that action, in his cognitive networks he is able to comprehensively visualize both the whole and the part of this new knowledge. Therefore, when you need to use this knowledge, you will be able to display it in different ways, since it belongs to you and you can manipulate it at your free will.

However, it should not be forgotten that all individuals, especially in the basic training stages, require this extrinsic motivation. Therefore, the teacher has the responsibility to provide it in a positive and empathetic way.

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