

From Neurodidactics to Language Teaching and Learning: The Emotional Approach

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Abstract—The latest findings in Neurodidactics in understanding learning processes are forcing a review of the methodological approaches underlying teaching practices, including those used in second language teaching. Therefore, drawing on the principles of Neuroscience, Didactics and Linguistics, a review of the central factors of language learning and acquisition is carried out. A new methodological approach to foreign language teaching based on emotions is proposed: the Emotional Approach. Next, the principles of the Emotional Approach are presented, and its most relevant theoretical and practical contributions are highlighted. These include the functioning of neural connections in second language learning and the critical role played by emotions in the teaching-learning processes. Finally, this study provides the theoretical bases necessary to elaborate future didactic proposals and experimental research on the postulates presented here. Implications for research and practice are also discussed.

Index Terms—second language instruction, neurodidactics, emotions, teachers education, teaching method innovations

I. INTRODUCTION

Over the last decades, different methods and approaches to second language acquisition (SLA) have been proposed and are now widely accepted. Worthy of mention are, among others, Competency-Based Learning, Task-Based Learning, Content and Language Integrated Learning (CLIL), student-centred approach, process-centred approach, and, of course, the Communicative Approach, which the previous ones are closely interrelated (Chen, 2021; Debbag & Yıldız, 2021; Dvoryatkina et al., 2021; Ellis, 2009; Gallagher & Savage, 2020; Khong & Kabilan, 2020; Larsen-Freeman & Anderson, 2011; Lucas-Oliva et al., 2021; Richards & Rodgers, 2014). All of them are born from the advances of Theoretical Linguistics based on cognition and the postulates of Chomsky (1966), Hymes (1972) or Krashen (1983), and leave aside the neuroscientific advances. These advances reveal how language learning and acquisition function at the neural level and the actual relevance of the emotional factor to this process (Dewaele, 2015; Nguyen, 2018; Swain, 2013; White, 2018).

In this regard, Willingness To Communicate (WTC) (Kim & Pae, 2018) and Need For Cognition (NFC) (Makiabadi et al., 2019) have been proven to be emotion-related attitudes (Heydarnejad et al., 2019), which are critical for optimal target language development (Pishghadam, 2016). Thanks to advances in neuroscience, we can better understand how the brain processes learning and language acquisition. The interrelation of concepts from diverse disciplines is fundamental to understanding these problems according to developmental science (Gauvain, 2018; Hernandez et al., 2021) and intersectionality (Collins & Bilge, 2016; Midby et al., 2020). For this reason, we present a new interdisciplinary theoretical approach to second language teaching and learning based on the postulates of Neurodidactics and Linguistics.

II. THEORETICAL FOUNDATIONS

A. Neurodidactics and Second Language Acquisition

Neurodidactics has been defined from different perspectives; however, all definitions concur on two fundamental aspects: firstly, in commenting on the two sciences that constitute it, i.e. Neuroscience and Didactics; and secondly, that this new interdisciplinary science aims to propose objectives "not as a mere hybrid of the Neurosciences and the Educational Sciences, but as a new original composition" (De La Barrena & Donolo, 2009, p. 4).

Neurodidactics comprises multiple dimensions, which can be grouped around two main lines of research, differentiated by the perspective from which they are approached and the type of the main objective they pursue (Ansari et al., 2017; Carrillo-García & Martínez-Ezquerro, 2018; Di Gesù et al., 2014; Szűcs & Goswami, 2007; Willingham &

Lloyd, 2007). In our research, we have chosen to call *Neurodidactics from the Brain* (NfB) the line of research that aims to: a) understand the neural processes and brain transformations that take place when learning occurs or when there are problems for it to occur, and b) study the various reactions of the brain to certain stimuli to explain, first, what happens at the physiological level in the brain when learning occurs and, second, what stimuli activate neurotransmitters that favour or hinder the synapse (the connection between neurons) and, thereby, the creation of new neural networks. In contrast, we have named *Neurodidactics from the Classroom* (NfC) the line of research that aims to transfer to the classroom the discoveries made by NfB about brain processes during learning in order to study how these can be applied theoretically in methodological and curricular designs, or empirically in the classroom. The present study starts from the NfB and ends with a methodological approach assigned to the NfC.

B. *Neurodidactics From the Brain*

Learning has often been defined as the ability to store information in order to be able to retrieve it when necessary to make associations or to apply it in performing an activity (skills and abilities) (Mora Teruel, 2017; Paz Illescas et al., 2019). In turn, from a neural perspective, learning consists of generating new neural networks (new memories) from the stimuli received in the interaction with the environment. The aforementioned implies transforming experiences in neural connections, which are strongly linked to memory (Di Gesù et al., 2014). This process causes transformations in the changing structure of the brain and occurs thanks to brain plasticity (Ibarrola, 2018). For learning to occur, new synapses must be generated, which means that a neuron has to communicate with other ones through a complex biochemical and electrical process, generating networks through which information is transmitted throughout the brain. These neural networks will become more efficient (forming more numerous or more direct connections) the more this information is used, i.e., with constant and continuous practice, regardless of whether this activation of memories results correct or mistaken from a linguistic perspective (Walker, 2017; Ibarrola, 2018; Saavedra et al., 2015; Squire & Dede, 2015).

However, it is not only the practice that influences the generation and proliferation of such networks, but also all the stimuli of the environment in which the learning takes place; in particular, the emotions that these stimuli arouse in the learner (Squire & Dede, 2015; Willis, 2021). Based on the specialized literature (Conte et al., 2019; Damasio, 2010, 2019; Goleman, 2018; Heydarnejad et al., 2019; Makiabadi et al., 2019), we define the concept of emotion as the reaction to external stimuli (from the environment) or internal stimuli (from the individual's memory or imagination) that automatically triggers the secretion in the brain of various chemical substances, which influence the activation of specific neural systems and affect the whole organism (including muscular and visceral alterations, among others). At first, this reaction happens unconsciously, although we can become aware of it (or rather, of the sensation it generates in us) once the brain's emotional process has been managed and developed.

C. *Motivation and the Learning Process*

The influence of the emotional factor becomes evident when the force of attraction or rejection is activated in the brain. Inhibitory hormones and neurotransmitters are secreted when the brain detects and identifies unpleasant stimuli. Depending on the level of alertness, they hinder or even block the thalamocortical (between the neocortex and the thalamus) and corticocortical (between different areas of the neocortex) afferent and efferent connections (Saavedra et al., 2015). This action will activate reactive brain systems (as opposed to reflexive ones) and prevent the proper performance of cognitive functions and memory systems (Goleman, 2016). Stressful situations (which involve a rise in cortisol) are directly linked to cognitive blocking or the feeling of "going blank" (Willis, 2021). At peak levels of secretion of this *stress hormone*, this state of cognitive inefficiency, commonly referred to as "amygdala hijack", leads to a decrease of up to 50% in linguistic performance. In brief, the desired linguistic acquisition becomes impossible under stressful circumstances or the influence of unpleasant emotions (Ibarrola, 2018).

On the contrary, the brain reacts positively to pleasant stimuli, the experience of which favours learning. A correlation exists between the receptive attitude towards the stimulus (and towards learning) and the rise in the secretion of neurotransmitters in different superior areas of the brain that temporarily modify the way in which diverse neural networks operate (De La Barrena & Donolo, 2009). These modifications favour, streamline and promote synapses and the activation of other neurons, resulting in fast and efficient information processing, which is also pleasurable (Damasio, 2019; Willis, 2010).

It has been widely documented that one of the neurotransmitters with the most significant impact on this process and directly linked to the sensation of pleasure is dopamine. Specific actions have been shown to trigger a *dopamin booster* in the brain (Willis, 2010, 2021). Together with favouring neural synapses, this activity produces a vital sensation of pleasure and well-being and is connected to the sense of reward, thus playing an essential role in increasing motivation toward learning (Ibarrola, 2018; Saavedra et al., 2015; Willis, 2010, 2021). Proven dopaminizing activities include physical activity of one's preference, laughing, positive social interaction, achieving goals, well-done tasks, being read to, acting kindly, and being right (Willis, 2010, 2021). When high doses of dopamine flood the neocortex thanks to these actions, creativity, concentration, analytical skills, and general motivation to persevere increase, regardless of the complexity of the activity and the mistakes that may be made (Damasio, 2019; Willis, 2021). The increase of this neurotransmitter triggers concurrently the secretion of other neurotransmitters such as acetylcholine, "that increase your alertness, focus, memory, and prefrontal cortex executive functions" (Willis, 2010, p. 172) or serotonin, which is

secreted in states of relaxation and calm, is associated with contentment, and favours homeostasis and memory consolidation processes (Squire & Dede, 2015).

This correlation of neurotransmitter secretion forms the basis of what we call the D.A.S. Circuit (see Figure 1) (W. de Fox, 2013; Willis, 2021), based on the Dopamine Reward Cycle (Willis, 2021).

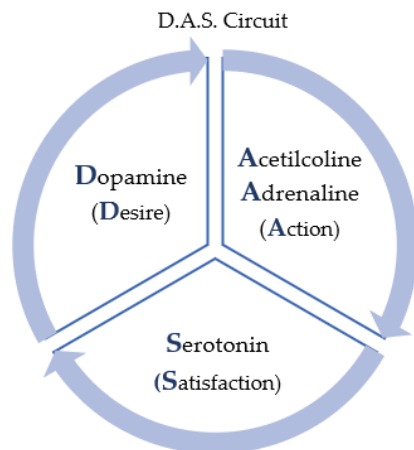


Figure 1 Diagram of the D.A.S. Circuit Operation (Own elaboration)

We secrete dopamine in response to the desire to know if a prediction is correct (initial learning process) and the potential reward for being right. This reward allows the brain to secrete acetylcholine, which promotes memorization, and norepinephrine (better known as noradrenaline), which keeps the brain focused and prepares the whole organism for action. Finally, in response to the satisfaction of a well-done job, the brain secretes serotonin, which regulates the organism, promotes its recovery (homeostasis), generates pleasant sensations of calm and relaxation and collaborates within the memory processes in the hippocampus. This pleasurable sensation will awaken in the brain the desire for the activity that has generated dopamine in the first place, thus giving rise to a virtuous circle. According to Willis (2010), "when dopamine is released during enjoyable learning activities, it actually increases your power to control attention and turn the learning into long-term memories" (p. 172).

D. Motivation and Emotion in Language Teaching and Learning

The motivational factor has been one of the most studied aspects concerning language acquisition in the last decades and has been investigated from a scientific perspective from the 20th century onwards (Rodríguez-Lifante, 2015). Bringing together existing definitions of the concept of motivation and relying mainly on Chournazidi (2016), Ibarrola (2013), Khong and Kabilan (2020), Mora Teruel (2017) and Paz Illescas et al. (2019), we venture to define it as the force, external or internal, conscious or unconscious, that drives us to carry out an activity, generating in its course a series of emotions that will propitiate the force of attraction towards the mentioned activity. Reinforcing this idea, Damasio (2019) refers to these impulses as "triggers or constituents of emotions, but not as emotions in the proper sense" (p. 346). Therefore, the concepts of motivation and emotion are often interrelated in teaching-learning contexts (both share an etymology related to "movement") and are also perceived as two feelings that sometimes seem to express very similar ideas. However, there is a differentiating nuance: motivation is what moves us to perform specific actions because we know that these will please us; emotion —closely related to motivation (Di Gesù et al., 2014, p. 23)— is the reaction generated in the brain that affects the entire organism by disposing it either toward or against those actions (Goleman, 2018).

According to the various neurodidactic and linguistic theories discussed above, the first motor for learning is the learner's interest and desire to approach knowledge and enjoy dealing with it, which is related to intrinsic motivation and depends directly on the emotions that the different stimuli generate in their brains. In other words, emotion is the key factor that decisively determines the success or failure of learning. Many studies have concluded that certain "positive" emotions are beneficial for learning and the acquisition or development of communicative competence in a second language (Ansari et al., 2017; Dewaele, 2015; Di Gesù et al., 2014; Jensen, 2010; Nguyen, 2018; Odendahl, 2021; Oxford, 2015; Rodríguez-Lifante, 2015; White, 2018). Even more numerous are those studies that also demonstrate the detriment of negative emotions such as anxiety or stress on the same point (Chournazidi, 2016; Delgado et al., 2018; Pedrosa & Martín, 2013; Salimzadeh et al., 2020; Suleman et al., 2021; Tsang, 2011; Willis, 2021).

Despite the vast literature demonstrating the critical influence of emotions on learning, the role of the emotional factor in SLA research has not received the necessary attention or, at least, not until very recently (Dewaele, 2015). Authors such as Dörnyei and Ryan (2015), Agudo (2018), Nguyen (2018), Xu (2018) or White (2018) express the need to incorporate the study of emotions in SLA research. However, there are currently no studies that translate these scientific advances into theoretical models that offer a solidly supported methodological framework and establish the

scientific bases that allow these advances to be applied in the classroom. For this reason, this paper offers a methodological approach to language teaching and learning that takes emotions as the starting point and basis for linguistic acquisition. This means that all decisions taken concerning the teaching-learning experience (like the attitude and role of teachers and learners, the strategies and dynamics carried out, or the types of materials and resources) will have to be considered in terms of the emotions we wish to foster and only in their favour.

III. METHOD

In order to meet the proposed objectives, we framed our research methodologically under the parameters of what Bunge (2012, 2013) defines as formal science or formal true. According to the author, formal knowledge seeks to achieve external consistency, that is, to establish interrelationships between ideals and principles that, with a rational and logical consistency, provide answers from abstraction and generalization to facts of reality, generating new ideas. The contributions of this research correspond to the three principles that define formal knowledge: a) it is rational, defined by concepts, judgments, and reasoning; its starting point and endpoint are ideas; b) it is based on deductive inference, i.e., a set of rules is logically interrelated in order to produce new ideas; and c) these ideas are systematically organized, generating ordered sets of propositions, that is, new theories.

The theoretical review of this study is developed following the stages of the framework synthesis approach (Esterhazy et al., 2021; Gough et al., 2012, 2017).

Although the parameters of formal science govern the study, it also seeks to comply with one of the main characteristics of factual science: the knowledge offered by science is valuable (Bunge, 2013). In other words, "it is effective in providing tools" (Bunge, 2013, p. 26) that influence the facts of reality and constitute the basis of knowledge that will impact improving society.

IV. THE EMOTIONAL APPROACH FOR LANGUAGE TEACHING AND LEARNING

The various aspects that define the teaching and learning experience are mainly determined by the teaching method on which the teacher has based his or her proposal. In turn, this is defined according to the theoretical principles of the methodological approach on which it is based (Larsen-Freeman & Anderson, 2011; Richards & Rodgers, 2014). This means that, to influence the teaching-learning process, it is necessary to access its root, which lies in the methodological approach. Based on the extensive existing literature (Dvoryatkina et al., 2021; Khong & Kabilan, 2020; Kim & Pae, 2018; López-Beltrán & Carlson, 2020; Midby et al., 2020; Zou et al., 2021), we define an approach as the set of principles, assumptions and beliefs about the language and its acquisition process, which constitutes the theoretical level of highest abstraction and enables various interpretations and realizations. These will be specified in the methods, which constitute the directly underlying theoretical level at which specific decisions are made regarding skills, content, strategies, etc. In short, the approach provides the philosophy and theoretical foundation for the conception of language and its acquisition, and the method defines these principles through the establishment of the objectives, contents and strategies that are specified in the syllabus and reflected in the procedures (Cerdas Ramírez & Ramírez Acosta, 2015; Richards & Rodgers, 2014).

A. *Theoretical Principles of the Emotional Approach*

The innovative aspect of the Emotional Approach is to assume that "just" involving the learner in communicative contexts through a challenge/problem/project/game/final task, etc. is not enough. The really important point consists in doing it in a way that activates the right emotions. Otherwise, the challenge/problem/project/game/final task, etc., will not have the desired effect. Thus, the teaching-learning method developed under the Emotional Approach parameters should follow the following main principle: all stimuli and learning proposals will be at the service of emotions, i.e., it is necessary to ensure an activation, management and maintenance of the emotions that foster learning. To this end, it is required to constantly evaluate whether the stimuli involved in the didactic proposal (including everything it entails) respect this basic principle or if it needs to be readjusted.

Although the Emotional Approach is undoubtedly applicable to any field of knowledge, in this paper, we develop the theoretical basis for its application in the teaching-learning of second languages (see summary in Table 1)). These theoretical bases offer the foundations for future methodological concretions of the proposed approach.

TABLE 1
THEORETICAL PRINCIPLES OF THE EMOTIONAL APPROACH (OWN ELABORATION)

Main Principle	
All stimuli and learning proposals will be at the service of emotions: it is necessary to ensure an activation, management and maintenance of the emotions that foster learning. It is required to constantly evaluate whether the stimuli involved in the didactic proposal respect this basic principle or if they need to be adapted.	
Linguistic principles	Didactic principles
<ul style="list-style-type: none"> – Language lies in neural connections. – Language is an interconnected set of inseparable structures and skills. – Error and feedback are an inherent part of the process of: <ul style="list-style-type: none"> ○ self-construction of the scaffolding; ○ interlanguage development; ○ self-learning capability. 	<ul style="list-style-type: none"> – Emotions determine learning. Thus, teaching must: <ul style="list-style-type: none"> ○ generate interest; ○ awaken curiosity; ○ pose modest and manageable challenges; ○ eliminate stress. – Unconscious learning is possible under the appropriate emotions. – Desire to communicate and to gain knowledge is required. – Declarative knowledge fosters procedural learning and favours an emotional state. – Genuine learning is discovered and constructed by the learner. – Authentic use of language is essential. – Action should be driven by dopaminizing tasks: <ul style="list-style-type: none"> ○ social interaction; ○ clear objectives and evaluation of progress; ○ ongoing feedback; ○ prediction-resolution of attainable challenges.

B. The Conception of Language in the Emotional Approach: Theory of Language

The Emotional Approach is developed in line with the parameters of the Communicative Approach (Canale & Swain, 1980; Hymes, 1972; Widdowson, 1978), particularly with its strong interpretation, which claims that language must be used in order to learn it (Howatt, 1984). However, it offers an eclectic view on the conception of language and its acquisition, which can be summarized in three fundamental principles:

1. Language lies in neural connections. Language is conceived as the result of a series of neural connections created in the brain. Thus, the proposals should be designed to favour the creation of the aforementioned connections. In this regard, it finds some affinity with the cognitive model (Albashtawi, 2019) as well as with the functional model (Węsierski, 2021) or the interactional model (Brown & Lee, 2015; Węsierski, 2021).
2. Language is an interconnected set of inseparable structures and skills. The various language components complement each other; therefore, it is essential to develop all pragmalinguistic skills (oral and written expression and comprehension) in parallel.
3. Error and feedback are necessary for optimal linguistic acquisition. The error, and the feedback on it, are crucial to developing the interlanguage and the capacity for self-learning. Through error, learners can identify their shortcomings, and through self-correction, they will be able to develop their scaffolding and improve their understanding of how the language works (Corder, 1981; Toledo-Vega et al., 2021).

C. The Conception of Language Teaching and Learning in the Emotional Approach: Theory of Language Learning

Regarding the Theory of Learning, the Emotional Approach also respects the postulates of the Communicative Approach but offers a broader perspective, influenced by Neuroscience and determined by the role of emotions in learning. This conception relates to the constructivist model (Dewey, 1986; Piaget, 1995, 2006; Vygotski, 1984) and particularly with the attention to individual factors (Chomsky & Krashen, 2021; Walker, 2017; Fitzpatrick et al., 2020). Seven fundamental principles summarize this conception:

1. Emotions determine learning. In order to learn, the right emotions must be aroused. For this purpose, it is necessary to generate interest (through the topics raised), awaken curiosity (using the power of the story), pose modest and manageable challenges, and eliminate stress (through emotional management and a thoughtful design of strategies).
2. Some unconscious learning is possible. With repeated exposure to language samples, the learner's brain may unconsciously acquire grammatical and lexical structures, mainly if the learner is in the *flow* (Csikszentmihalyi, 2008) and with the right emotional conditions.
3. The desire to communicate (WTC) and to know (NFC) is required. For learning to be complete and effective, it is necessary to generate in the learner the desire to communicate (express their thoughts) and to understand (know the content of the message).
4. Declarative knowledge fosters procedural learning, favours emotional state, provides confidence, and reduces stress.
5. Genuine learning is discovered and constructed by the learner. Negotiation of meanings, discovery learning, and consistent working with content through various strategies (multimodal text comprehension, writing, presentation, discussion, etc.) create stronger neural connections and, therefore, the acquired knowledge will be more accessible.

6. Authentic use of language is essential. To increase receptivity and foster motivation, real language samples should always be used in authentic communicative situations.
7. Dopaminizing tasks have to be the basis for action. The brain rewards positive social interactions, the feeling of progress, the achievement of goals and the possibility of making accurate predictions with rewarding neurotransmitters (dopamine). Thus, the teaching-learning process should: encourage social interaction, set clear objectives, evaluate progress, provide ongoing feedback and continuously offer the possibility of predicting or solving attainable challenges.

D. The Role of Actors

(a). The Teacher Role

Teachers working under the Emotional Approach must be aware of the learning culture of their students and respectful towards it. Through the different strategies within their reach, they should try to identify the profile of students they are teaching to adapt their proposals to their students' needs and avoid excessive estrangement or stressful situations. Teachers must remain in the background, giving the student the leading role, and assuming the functions of guide, linguistic and didactic advisor, manager of emotions and administrator of the tasks.

Taking the above into account, teachers will seek to fulfil the following functions:

1. Managing emotions and creating a cordial and relaxed classroom atmosphere, as close as possible to a social gathering of people with common interests, where students feel involved, free to express their thoughts and, most importantly, to make mistakes.
2. Provide feedback on their pragmalinguistic performance and give the necessary hints to encourage self-correction and discovery learning. More than solving doubts, teachers should offer learners the tools to solve them independently.
3. Select (or design) and administrate materials and tasks according to learners' interests and needs and the established curriculum.
4. Encourage interaction among students as well as with the teacher.
5. Conduct a constant assessment of the students' progress and pragmalinguistic needs, the emotional state and classroom atmosphere, and the teaching-learning experience itself, in order to adopt the required adjustments at any time and in any context (pace, complexity, learning style, subject matter, content to be emphasized, etc.).

(b). The Learner Role

Regarding the role of the learner, the Emotional Approach maintains the same position as in the previous point on the role of the teacher: it will be essential to attend to their personal and individual characteristics and avoid excessive strangeness or stressful situations. However, learning will be more effective if the learner assumes an active and protagonist role based on the following functions:

1. Take responsibility for their learning.
2. Actively participate in the negotiations raised (which may be about meanings, procedures, topics, content, etc.).
3. Engage in tasks and interact openly with peers and the teacher, taking risks and not being afraid for mistakes.
4. Adopt a positive attitude towards the target language, culture, and learning process.

V. THEORETICAL CONTRIBUTION

The Emotional Approach proposed here draws directly from widely accepted approaches such as the Communicative Approach or the Natural Approach. However, it offers an eclectic and novel vision of language and its teaching and learning from an interdisciplinary perspective, bringing together Neuroscience, Didactics, and Linguistics.

This work provides a new methodological approach to second language teaching. The most remarkable aspect of this study is the inclusion of the neurodidactic perspective, traditionally ignored in linguistic research on SLA (Heller, 2018). The Emotional Approach adapts these advances in Neuroscience to the field of SLA and language teaching and offers a theoretical framework that will bridge the gap between these advances and the teaching practice. At its core, it provides new insights into the importance of emotion in second language acquisition, placing it at the centre of the learning process (Makiabadi et al., 2019). At the same time, it is closely related to other approaches, such as the Communicative Approach or the Natural Approach, whose postulates align with the Emotional Approach's main principle. Moreover, by focusing the learning process on emotions, the theoretical model presented here allows us to approach the learning process from a holistic perspective, centred on the learner's natural interests.

The theoretical principles of the Emotional Approach concerning language and its acquisition process are intimately linked to the functioning of learning at the neural level. The Emotional Approach understands that if language is a set of neural networks, teaching should promote the generation and efficacy of these networks (Di Gesù et al., 2014). In this process, certain pleasant emotions act as an enhancer, while other stressful or demotivating emotions will block cognitive processes and impede learning. Clearly, this is the most novel and significant aspect of the Emotional Approach and it contributes with a theoretical framework to build the links between Neuroscience, Didactics and Linguistics.

VI. PRACTICAL CONTRIBUTION

From a practical perspective, the Emotional Approach proposes a dramatic change in the teaching practices implemented in the second language classroom. In addition to promoting social-emotional interaction, it proposes a shift in teaching focus, which should now be on generating and maintaining an optimal emotional state among students. Adequate feedback and emotional management in the classroom (both the teacher's own emotions and the learners' emotions) constitute for the Emotional Approach the main learning strategy.

Teachers implementing the Emotional Approach should pay attention to all the stimuli involved in the teaching-learning experience. This includes aspects such as the environment (classroom layout, scheduling, ventilation, acoustics, etc.), interpersonal relationships (among learners and between them and the teacher), the learner's inner world and sociocultural background, and the learning strategies themselves, which include resources, types of activities and tasks, etc. Although the teachers will have more control over this last point, they should pay attention to all the mentioned above types of stimuli, since they will also influence the generation of students' emotions. Learners' sociocultural environment merits particular attention. Within their possibilities, teachers should be aware of learners' sociocultural peculiarities and learning habits since proposing learning interventions too different from their habits or expectations may provoke an excess of estrangement that may trigger undesired emotions.

This has implications for the competencies required by teachers. To adequately apply the Emotional Approach, teachers must have an excellent capacity for observation, listening and empathy. They must have a critical spirit that allows them to constantly re-evaluate their teaching performance and undertake the necessary changes and readjustments to maintain the optimal emotional state. In this sense, they must also have high competence in emotional management.

VII. FUTURE RESEARCHES

This study opens multiple lines of research in different directions. Future research may develop specific teaching-learning methods based on the Emotional Approach. This will put into practice the postulates validated here theoretically, allowing the development of research that may verify their validity also empirically. In addition, the Emotional Approach lays the foundations that allow designing concrete materials and strategies in which the theoretical principles may be adapted to different learning realities and contexts. To summarize, it opens innumerable possibilities for teachers and researchers to elaborate and evaluate their own second language teaching-learning proposals in accordance with the brain functioning.

It is common to find teaching proposals that focus on communication or content, offering learners a large amount of real and meaningful input from the beginning, and encouraging communicative interaction. However, it is worth questioning whether the topics and tasks awaken interest and curiosity, whether the work is based on dopaminizing tasks, whether the DAS Circuit is activated and, in short, whether an emotional state conducive to learning is favoured. In this regard, it is essential to highlight that the Emotional Approach invites to reflect on the adequacy of the different current methods and approaches regarding the functioning of linguistic acquisition processes at a neural level and offers the necessary tools to carry out this important assessment.

VIII. CONCLUSIONS, LIMITATIONS AND IMPLICATIONS

With the Emotional Approach as a result of the theoretical analysis developed in this study, the proposed objectives have been met. In the first place, it has been found that emotion is the factor with a more significant impact on the learning process. Thus, it has been concluded that pleasant emotions favour attention, memory, motivation and, in short, learning and language acquisition. On the contrary, unpleasant emotions such as anxiety, stress or boredom block cognitive processes impeding learning. Secondly, a theoretical model for the teaching-learning of second languages has been designed to transfer the advances of Neuroscience to the teaching practice. The main didactic and linguistic principles of the Emotional Approach, supported by the solid interdisciplinary review of the different theories analysed, will contribute to developing more efficient and satisfactory teaching methods and proposals for language teaching and learning.

This research has to be considered within its limitations, since the theoretical model elaborated has been supported exclusively from an interdisciplinary theoretical perspective.

In conclusion, although further research in this field is needed, the Emotional Approach brings Neurodidactics closer to the teaching practice, provides a solid theoretical model that will allow teaching and learning languages according to the brain's functioning, and invites teachers and linguists to reflect on the suitability of the methods that are currently implemented.

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