

## *The role of neuroscience in the learning of a foreign language*

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### **Abstract**

In the literature of recent years much has been written about a deeper knowledge of the brain and its functioning with regard to the processes of learning a foreign language. Glottodidactics, as a science of language education, attentively follows the progress of neuroscience, pointing out the importance this progress has in the process of learning foreign languages. The advancement of progress in neuroscience encourages the drafting of efficient theories and models of language education. The today results in the neurolinguistics field inform on the existence of a network of four main neurofunctional schemes. These neurofunctional schemes during the learning of the mother tongue are specialized in realizing certain language processes. Whereas, the learning of a foreign language causes the creation of neural sub-systems, within each of these neurofunctional schemes. Another second hypothesis is that on the functioning of bi-lingual schemes, that is the interaction of language sub-systems which operate in the bilingual brain. (or multilingual).

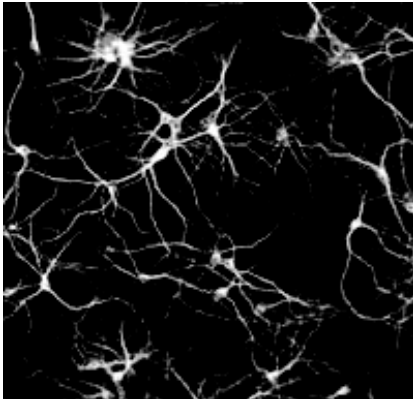
Both the existence of neuro-functional special schemes, but with a constant interaction, and the neurolinguistics hypothesis about their functioning lead to the formulation of some main glottodidactics theories. As a conclusion we can say that the development of language competence comes through the real use of the language. The metalinguistic and pragmatic competences are strategically activated and the affective and emotional dimension of the language learning is of primary importance.

### **Aspects of neuroscience**

Although based in different models both glottodidactics and neuroscience are practical and interdisciplinary disciplines, which in order to solve practical problems address different sectors, so they both are open to cooperate with other sectors in order that this cooperation assists them to achieve their goal. But, on the other hand their epistemological models are different from the structural point of view. Glottodidactics is based on a central model, at the center of which stands an independent discipline, whereas neuroscience is based on a multi polar model, based on the presence of many independent sectors which are linked by the same scientific interest.

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the brain and its functioning with regard to the processes of learning a foreign language. Glottodidactics, as a science of language education, attentively follows the progress of neuroscience, pointing out the importance this progress has in the process of learning foreign languages. The advancement of progress in neuroscience encourages the drafting of efficient theories and models of language education.



The human brain is composed of millions of neurons or neural cells, interrelated among themselves, whose function is to perceive, exchange and continuously elaborate the information, which is perceived in the form of electrical signals and passed through the cells' extensions, the last parts of which (sinapsi) create contact points with other neurons. The network of the connections of neurons might be so powerful that a single neuron can influence the activity of thousands of other neural cells (Fabbro 1996; Agliotti, Fabbro 2006).

The main duty of neurons consists in the coordination of the human activity both in the level of organs' functioning and that of the behavior. In order to accomplish this duty the neurons are organized in groups of cells, called "neuro-functional scheme", which are specialized for a certain function.

This organization, in more complicated neural systems is naturally activated due to the genetic factor: the brain genetically has the tendency to create neural gatherings to encourage some human functions which don't need to be learned, as for example the cry of the baby.

Whereas, in other cases the creation of neuro-functional schemes widely depends on the inputs of the environment and on the actions and interactions of the subject with such inputs. This division between the neural systems genetically defined or by the interaction with the environment is fundamental, as there exist: (Casey, Diamond 2004)

a) *Processes that expect the experience*, which encourage the use of the genetic potential, using the environmental information perceived by everybody (for example the ability to hear linguistic sounds, making the distinction from the noise of the environment);

b) *Processes that depend on the experience*, which use the information of the environment that change according to the learning context and situations (for example the contact with a certain language or the enlargement of knowledge in a bilingual context).

From this point of view the learning of a foreign language is a process which depends on the experience or the opportunities offered by the educational environment.

For the neuro-functional schemes to be created and stabilized it is indispensable the interaction with the environment: only after certain environmental inputs the neural channels may become stable, strengthening the synaptic connections related to the input and avoiding the others. It results that the role of experience is even more important when we analyze the changes in the cerebral organization of the cognitive functions caused by specific environmental inputs; a learning environment rich in direct incentives strongly influences the cerebral development.

Brain, during its maturity takes the shape of a direct and indirect neural connections network, which harmoniously work together for the performance of different functions. At the same time the brain is made of neural groups, named neuro-functional schemes, which participate in the carrying out of certain primary functions.

Different studies in the neuroscience field have evidenced the existence of a neuro-functional schemes network which during the learning of the mother tongue are activated for carrying out different linguistic aspects. According to the studies (Parais 2004) do exist four neuro-functional schemes interdependent from each-other, but at the same time independent from each other, which independently control:

1. *The linguistic competence*, which has to do with morfosyntax, lexical-sysemantic and phonological elaboration; the competences controlled by this scheme are mainly achieved by the silent memory (Fabbro 2004);
2. *The metalinguistic competence*, which is known as the competence of clear rules of language functioning; this scheme includes encyclopedic notions for the language, consciously learnt (Fabbro 2004);
3. *Pragmatics*, widely localized in the cortex areas, in the right hemisphere (Danesi 1988; 1998) which harmoniously operates with the scheme of the linguistic competence, as it influences choices at each level of the linguistic elaboration;
4. *Dynamic and motivational dynamics (developments)* directed by the limbic system, which constitutes a center for the control and evaluation of inputs, whose positive activation is a kind of indicator for the good functioning of the other neuro-functional schemes.

It is thought that during the learning of a second language within each of these macro-systems are created some neuronal sub-systems, which activate the new linguistic code. The activation speed and the effectiveness of these subsystems depend on many factors, among which we can mention:

**a)** *The age when it is started to learn a second language.* If the learning of a second language starts at a quite early age, the neuro-psychological mechanisms, typical for the elaboration of the mother tongue are activated, which may lead to the acquisition of the linguistic and communicative competences, if not equal, very similar to those of the mother tongue..

**b)** *The exposure towards the language and the possibilities of using that language.* A minimum quantity of positive neural impulses are needed in order to put into function the neural circuit.

During the learning of a foreign language at school one of the greatest difficulties is that rarely being in contact with the language that is being studied and having rare opportunities of communication the pupils need a very big “cerebral energy” in order to activate those subsystems relate to the foreign language. (Paradis, 2004).

**c)** *The emotional comprehension during the learning.* The functioning of neural circuits specific for each language depends also on the emotional state of the pupil, which should have a stimulating, inclusive, relaxing and assuring learning environment. (Morosin, 2006).

**d)** *The correctness of the linguistic input.* The neuro-functional subsystems receive, elaborate and memorize the linguistic input towards which they are exposed.

If for the learning of the mother tongue the pupil has at his disposal a big quantity of linguistic inputs coming from the interaction and communication with native speakers of that language, the learning of the foreign language is based on inputs offered by a teacher which in most cases are not native speakers of the language. This increases the

responsibility of the teacher as a non exact input leads to the learning of non exact behaviors, particularly related to the linguistic neuro-functional system (wrong pronunciation, non exact vocabulary, etc) and the pragmatic system (inability to adapt the linguistic register to the different contexts, social-pragmatic behaviors, unacceptable for the foreign culture).

e) *Intellectual predispositions*; another aspect to be taken into account is the one related to the intelligence level of the pupil and his learning styles. If the pupils can learn a foreign language according to the capacities of their intelligence, the input will pass through the preferential channels and the linguistic memory can be relaxed.

## **Glottodidactics**

The existence of specific neuro-functional schemes, with ongoing interaction, as well as the neuro linguistic hypothesis about their functioning lead to the wording of some major glottodidactic theories.

The linguistic competence develops through the concrete use of the language

This linguistic (and communicative) competence, mainly localized in the areas of silent memory, is usually perceived as the competence of automatic assimilation and use of the language. This happens only in case that the teacher proposes communication situations in which the pupil can use the language in certain contexts in order to favor the initial development of the linguistic competence. In this case it might be necessary to propose a teaching methodology based on the discovery, memorization and recall of the linguistic formulas (for example greeting forms, the key sentences to order in a restaurant, communication forms in a shop, etc.), which only at a second moment, taking into consideration the age of the pupils, will be analyzed in the meta linguistic plan.

In general the linguistic (and communicative) competence mainly includes the development of linguistic competences (know to read a newspaper article, to follow the developments of a movie in a foreign language, to participate in an informal conversation, to write an essay, etc), which can be realized only through practice and the use of the language.

The meta linguistic and the pragmatic competences are strategically activated

When foreign languages are learnt at a certain age, often it results very difficult to reach a high level of linguistic competences, in order to somehow approach the native speakers of that language, unless the person lives for some years in the country where that language is spoken. The reasons for this difficulty are related to the lack of direct access of the foreign language, a process which is slowed down by the phenomena of the unconscious translation from the mother tongue to the foreign language and vice versa. However, the continuous interaction and the compensation among different neuro-functional schemes makes us claim that in the face of a low level of the linguistic competence, the student can reach an efficient level of communication, owing to the compensating function of the metalinguistic and pragmatic competences' schemes.

After such a statement it is necessary that the teacher, especially when dealing with grown up students, leaves a suitable space for reflecting on the language and its use in pragmatic contexts

The affective and emotional dimension of language learning is primary

The neuropsychological theories on emotions and motivation confirm the

importance that a positive and motivating environment has for the pupil in order that the learning of a foreign language can be realized in the most efficient way. In this context we can give some basic didactic suggestions for the establishment of an educative environment with these characteristics.

The establishment of a motivating environment

The first step for the establishment of a motivating environment in the classroom is to know the needs, aspirations and the wishes of the pupils in order that we arrange the language learning process not only according to the didactic requirements, but also according to the motivating and emotionally positive requirements. Usually an environment is motivating when learning is a pleasure. In order to prove this we should verify whether balance exists among the following factors:

**a)** *Confidence/ challenge.* The pupils accept to be included in a didactic activity if they feel they are able to do it, that is to say if they feel they are able to accomplish their duty and this requires that:

- The activities are reasonable and in compliance with the pupils' knowledge;
- The relation between the teacher and the pupil be based on reciprocal confidence, in order that the pupil doesn't feel himself continuously assessed or judged because of the mistakes he might make;
- The proposed teaching situations guarantee psycho-social confidence to the pupil, especially if we deal with teenagers or adults, as they fear the judgement of their friends.

*Innovation:*

**b)** According to the emotive evaluation model of the input, the innovation factor realizes the attraction of pupils attention; we can realize innovation by changing some teaching aspects, as for example:

- Type of classroom activities, using different teaching techniques which, though they have to reach the same curricular objective, propose different working methods in the classroom;
- The start of the activity input, which in general results motivating. The teacher can use and play with the type of the resource he can use to start the activity (promotion, video, internet research, newspaper articles, etc.);
- The receptive channels included in the activity. The same technique can be proposed again orally/in a written form, individual work/team work, etc.

However, too much innovation can disorient some pupils, particularly if they are children. It can also disorient those pupils who wish to have almost the same teaching scheme with the same didactic activities.

**c)** *Objective/ subjective needs.* According to the emotive evaluation theory, the pupil evaluates the input according to his own needs. The pupils, based on this principle evaluates the input positively or negatively and as a result removes it from the work memory by sending it to the cerebral learning centers or blocks it until the respective memory track eventually loses. (Boncinelli 2000, Anolli, Legrenzi 2003).

The gap between the objective and subjective needs can be overcome only if:

- are evaluated the interests of those pupils (sport, favorite movies and books,

games, cultural and artistic interests, etc.) who might be the key to the success with other pupils in order to increase in them the pleasure of learning a foreign language, by convincing them that the language they are studying might be a means to cultivate their interests;

- A cooperation climate between the teacher and the pupil is created, in order that either of the educative process actors be active part in the establishment and realization of this course.

Considering the above we can list some methodological principles for the teaching of a foreign language, which respects the neurobiological mechanisms. The teacher of a foreign language should create a learning environment “rich” in some views, which we are going to analyze as follows.

### **Emotional resource**

We have already mentioned and highlighted the role of emotional inclusion in the learning of the foreign language, which leads to the decrease of the activation threshold of the areas included in the linguistic processing.

In order to realize this teachers organize activities that are:

a. Pleasant. The linguistic and communicative competence of the pupils can be developed through the ludic methodology, by organizing the teaching activities in the form of games. This methodology is effective even with teenagers and adults but taking care that they don't seem as children's activities and without interest.

b. Comprehensive. The learning of a foreign language should respond to the needs and interests of the pupils; so the teacher should carefully choose materials and activities that encourage the pupils' interest; for example, teenagers in general like music, movies, internet, television, sport. If the foreign language teaching activity is organized based in these fields, then the pupils would perceive the foreign language as a necessary means to fulfill their interests.

c. Confident. The teaching activities that will be organized in the classroom should be confident in the psycho-social plan and the pupils can apply their capacities without risking to be blamed in front of the teacher or their friends.

### **Linguistic resource**

In the process of the foreign language learning at school, the teacher plays an important role as he is the main resource of the linguistic inputs (although currently not the only one). This is why this input should be:

1. *Precise*. In the linguistic and sociolinguistic plan to avoid the cultivation of incorrect behaviors of the pupils. Nowadays the teacher can provide assisting materials, such as magazines, video and audio materials, promotional materials, newspapers, etc.);
2. *Realistic*. The teacher can offer a linguistic and cultural model as close as possible to the everyday reality.

### **Cognitive resource**

The pupils' intellectual predispositions seriously affect the language learning as every pupil has different preferences in the way of learning the language, which should be reflected by the teacher. The presence in the classroom of different cognitive styles pushes

the teacher to use rich activities related to:

- The way of class management: individual work, work in pairs and team work;
- Groups creation which could homogenously or heterogenously be structured, not only on the linguistic level but also on the cognitive profile;
- Distribution of duties within the groups in such a way as to assess the individual predispositions of every pupil;
- The didactic material, in order to stimulate as many sensitive channels as possible the teacher should alternate in a balanced way the oral texts with the written ones and also introduce realities or authentic objects to be seen, heard or used;
- The kind of activities, by not privileging only the linguistic and logical-mathematical intelligence;
- The degree of structuring activities, by altering didactic moments much more guided by the teacher in activities with a high degree of freedom and independence for the pupil.

As a conclusion we can say that the development of the linguistic competence happens through the concrete use of the language, the metalinguistic and the pragmatic competences are strategically activated and the affective and emotional dimension of the language learning is principal.

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