The educational intervention between empiricism and neuroscience

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ABSTRACT

This article deals with the scientific side of the pedagogical act, in particular the learning theories claimed through the empirical field. Beyond a pedagogical choice, pedagogues are supposed to approach pedagogical practice appropriately through acts validated by neuropedagogy in order to be able to both scientifically ground the teaching-learning process and direct it straight to the point far from any trial and error caused by uncontrollable variables.

Neuropedagogy reveals to us which are the most suitable pedagogical choices for the desired effects and for the types of students, taking into account all the egocentric and exocentric dimensions of the learners (neurobiological structure and function, temperament)

Keyword : *neuropedagogy the empirical pedagogical act efficiency ,learning*

1. INTRODUCTION

For a long time and no doubt still largely today, conceptions of teaching do not stop interposing in a dynamic and intense way insofar as as soon as we claim the effectiveness of a conception or a method we quickly pass to detect its limits

On the other hand, the pedagogical act is based on several methods which can be adopted depending on the subject taught, the context in which it evolves and the subject to whom it is addressed, the latter constitutes a mystery box, a real biological machine which is needed. to be studying.

In fact, at school among students, we can explore what happens in the brain when they learn or when they make mistakes, neuro-pedagogy makes it possible to test learning that works or does not work. We can even see through the brain when they are learning the effectiveness and efficiency of this or that pedagogy without ideology.

In the same way, it aims to know what is particular for each pupil, we will be able to adjust the pedagogy and improve the teaching practice at school.

However, as empirical as they are, the pedagogical models cannot truly be dissociated from neuroscientific contributions, they are closely linked and interdependent, given that their practice in the field remains the most exhaustive field which makes it possible to confirm or reject their existences.

From there, three questions challenge us:

- To what extent should the pedagogical act take neuro-pedagogy into account.
- Why does the use of neuro-pedagogy remain a necessity if the pedagogical models have claimed their effectiveness?
- How to combine empiricism and neuro-pedagogy to further increase the effectiveness of teaching practice?

Our analysis which follows does not claim to develop exhaustively the different pedagogical models, but to describe and analyze them in the light of the most recent neuro-pedagogical contributions, then we will show that if the

models most often conveyed in teaching practice have received empirical confirmation, most still remain purely speculative

2. PEDAGOGICAL MODELS

2.1 The Transmissive Model:

Old model, spared from any pedagogical engineer, the student is considered as a cranial box which it must fill it without taking into account its neurobiological characteristics. The teacher adopts traditional pedagogical relationships modeled on the relationship that father and child fully. The learner must necessarily follow the pace of learning imposed by the teacher otherwise he is qualified as intellectually unfit. At the same time and despite its empirical nature, the students were available to accumulate the so-called required knowledge in a linear fashion.
However, it should be noted that until some time the transmissive model was very beneficial for the learning of children, in particular for the memorization and stability of learning.

2.2 The behaviorist model:
Resulting from studies carried out in psychology from the years 1913 on conditioning, it was the object of study of the empiricist philosophical tradition. This model is more elaborate than the transmissive model since it is interested in the observable behavior which is conditioned either by a stimulus or by the history of the interactions of the individual with his environment.
This model despite its empiricist aspect, it was claimed scientifically by the fact that at the level of the frontal context the scenes are repeated and recorded through a type of neuron called mirror neuron " Ritzolati : Italian researcher", and since the behaviorism is based essentially on the demonstration and reproduction of a model, mirror neurons proved to be very useful.

Similarly, the learning time of this model is a determining factor in memorization, the shorter it is between learning and repetition, the greater the probability of memorization (1).
Consequently. This model makes it possible both to save learning time and its stability, and at the same time, to develop self-esteem in the learner by the fact that the majority of students can illustrate rehearsals and reassured exercises at the same time. prior that is to say less doubt and less stress generated by stress hormones.
It is for this so-called scientific observation that behaviorism finds its application today in applied behavior analysis or ABA (Appled Behavioral Analyzes).
ABA-type intervention methodologies are used for various mental disorders, in particular people with pervasive developmental disorders (PDD), including autism, etc.
However, behaviorism remains an obstacle to developing other attitudes that have become required, in particular imagination and innovation, since cognitive activity remains frozen by the repetition of the exercise. That on the one hand, on the other hand behaviorism does not develop cognitive inhibition (2), that is to say: it does not help the student to inhibit the automatism learned by the reproduction of knowledge despite the change in the learning situation.

2.3 The constructivist model:

Constructivism appeared thanks to the work of -Piaget-, it concerns learning as a construction of knowledge through initial experiences, in other words: each individual will be able to transform knowledge and experiences already acquired into new knowledge accommodated and more elaborate to the demands of the new learning situation. In this sense “Serre” wrote (3): “the body which crosses, certainly learns a second world. The one towards which he is heading, but he is mainly introduced to a third through which he transits » So we can consider that from a given degree of knowledge, we can acquire another superior to the old.

This model requires the active participation of learners. They are the ones who seek answers, particularly declarative and procedural, thanks to the guidance and support of the teacher. Indeed , this model aims to empower, empower the learner with the aim of developing, training, and the development of the student.

Constructivism is very beneficial for brain maturity because it develops learning activities Thanks to problem-solving situations and projects, this type of situation leads the child to develop the activity of the lope- prefrontal part of the brain, places of reflection, reasoning, creativity and imagination, it is in a way education and training for this part of the brain deemed to be the center of decision-making.

In addition, constructivism makes learning more elaborate and multidimensional, first it solicits verbalization which allows the student to identify the mechanisms that will subsequently influence procedural knowledge insofar as they allow the pupil to become aware of what he has just done, as well as the identification of the difficulties to be overcome.

This model thus passes through the acceptance of the error as an essential phase for learning, it considers it not as a bad answer in relation to an expected result, but as a consequence of a bad interpretation of the act to be achieve or an inappropriate mobilization of the means implemented, in this sense building knowledge cannot be done immediately, it must always go through the total and progressive elimination of errors thanks to the modification of the recommended learning strategies.

And thanks to this, the student also develops what is called metacognition, that is to say, it is the knowledge that the individual has of his own way of learning, In fact, independently of the age of the learner, we know that the cognitive resources solicited vary both according to the moment of learning, and to the strategies that the subject deploys to learn, we can find types of student who develop optimal and thoughtful distributions of resources attention, they can switch from a selective mode of attention for relevant knowledge to a less consistent mode of attention for so-called less relevant knowledge.

However, and compared to neuro-pedagogy, constructivism is not always a good model for learning, it can be a constraint for memorization and learning activities, although at school students come from from different socio-economic and socio-cultural backgrounds that directly influence their representations and their previous know-how, it will therefore be aberrant to build knowledge with similar construction conditions.

In addition, the difference in maturity among the students makes the task of the teacher complicated, insofar as the same learning situation can be experienced differently by the subjects depending on their degree of maturity. Indeed, a large part of them do not manage to put a certain proportion between the cognitive resources available and the demands of the learning situation with which they are confronted "very easy or very easy" from there, the link between perceived difficulties and investment will certainly cause different attitudes "mistakes, cheating, high quality of effort...", As a result: stress with generation of cortisol hormone considered a real brain poison and brake on maturity and which directly influences the hippocampus until its volume decreases. (4).

2.4 The socio-constructivist model:

Like the constructivist model, the socioconstructivist concerns the construction of knowledge through experimentation and discovery, it also develops the idea that construction goes beyond the personal framework to decline in the social framework, in other words: that each individual is not alone in the world, he is surrounded by other people who have a direct and permanent influence on him.

According to this model, learning takes place by the students by exchanging their perceptions, their ways of seeing things to reach a consensus, therefore, each of the two interlocutors refines their conceptions and develops their thoughts.

Socio-constructivism gives much more importance to communication , whether verbal or non-verbal, of which each student will be able to clarify the thoughts and negotiate the meaning of the words spoken to clarify and defend his words, from there, the brain develops two types of maturity: a first psychosocial through empathy and acceptance of others, and a second, intellectual through the sharing of knowledge.

Thus, it is important to clearly understand that the mechanism of memorization and learning through social interaction is explained by the fact that each hemisphere of the brain plays a determining role, in other words: for

each word received by the left hemisphere, it will be contextualize by the right hemisphere to have meaning which facilitates anchoring and memorization.

Nevertheless, and among the neurological repercussions of constructivism is that young adolescents are sensitive to the judgments of others, and stress will therefore be higher among them, whose effect of hormonal fluxes will be significant, suddenly: the risk of dropping out of class or exhibiting deviant behavior.

3. USE NEURO-PEDAGOGY TO BETTER BASE EDUCATIONAL CHOICES

In teaching learning, pedagogical models are fully usable. Admittedly, they require Their implementation according to several parameters:

Firstly, the absence of a methodological mastery of the models or the fear of not achieving the desired learning, teachers remain fixed for a single model which seems to them the most accessible and which guarantees more learning dictated by the system.

Second , teachers favor pedagogical models to save time, for example: recommending the transmissive model makes it possible to get straight to the point.

From there, we can see that to optimize the teaching act, several parameters must be taken into consideration.

3.1 better know the brain to teach better:

A- the brain

The brain is individualized At first glance, all brains look alike, but neurologists find that, like fingerprints, they are all different both in terms of physiology and electrical signature (5).

Besides, individuality is not only explained by genetics. In fact, 60% of the differences between individuals can be explained by genetic factors, the remaining 40% are related to environmental factors….

Moreover, some regions especially in the frontal context are 80% under the genetic influence (6).

Around age 8, the different areas of the brain structure in order to fulfill their respective roles. This organization is dependent on the learning achieved which will ensure that the neural network will be more or less developed, after the brain begins a slow maturation, the work is done from the back of the brain to the front.

B- effects of hormonal system on learning

A Hormone is a chemical substance, it has a communication function in order to regulate the action of one or more Hormones produced by the hypothalamus and the pituitary gland, its role is very important in learning:

- Serotonin and dopamine: are involved in the production of states of well-being and positive moods depending on whether the learning situation is pleasant or not (7).
- Noradrenaline: has a role in attention, emotions, sleep, dreaming and learning and its reduction affects the acquisition of knowledge and new associations. So it will be necessary to put the student in a climate of pleasure, enthusiasm and joy to love the place and the people of the school.
- Adrenaline: it is a physical and mental stimulant, high levels lead to lack of attention, anxiety, hence some teachers' enthusiastic empathy attitude can lower adrenaline and increase serotonin and dopamine especially in situations of doubt where the student cannot concentrate and control these emotions, case of problem situations.
- Cortisol: it is a regulator of circadian cycles, it reaches a peak between 6 and 8 a.m., it reduces and influences memory, hence the need for a less consistent educational approach in the case of a directive method that requires less intellectual effort of the student and a laborious commitment of the teacher.

3.2 take into consideration the types and rhythms of student learning :

Although students' brains and temperaments are different, so are their learning styles and paces. Indeed, pupils are likely to be auditory visual or kinesthetic, they can also be 'sequential' or 'concurrent' and in each case they are 'verbal' or 'verbal noun'.

As a result, the variation and alternation of pedagogical approaches become a necessity according to the rhythms and typologies of the students, we can even use in a single class with the same lesson two to three pedagogical models: constructive for so-called gifted students and behaviorist for children in difficulty given the attention deficit which does not allow them to solve problems of the proposed situations.

3.3 training issues:

Declarative and procedural knowledge are organized and interdependent means to succeed in concretizing issues spread over "short, medium and long term" time. In this sense, conceptual knowledge tends much more towards the memorization of concepts which it must require from the behaviorist model, while procedural knowledge must be done through construction via problem situations and projects in order to improve awareness. and how to do it.

3.4 the nature of the subjects taught:

It must be admitted that certain so-called instrumental subjects which rely on analytical and reasoning skills must be taught differently from other memorization subjects. To integrate words in dictation, a primary school pupil must memorize the sound and shape of the letters, while in mathematics he must be able to integrate the way to solve addition operations (the fingers , the small sticks...). Thus, soliciting a debate of ideas for matters of a reflective nature, such as philosophy, will be more beneficial .

3.5 seek the optimal offset:

According to "Vygotsky" (8): it is the gap between what the subject can achieve alone and what he can do with the help of others. Indeed, achieving a desired progress is explained by a passage from one level to another more superior. Since the latter is not always reassured if the learning situation requires solutions that largely exceed the subject's intellectual resources. Thus, repeating a situation at its maximum complexity in the case of behaviorism does not lead to any progress and causes more and the same errors. So reducing and varying the situations that carry some notions of previous experiences, case of constructivism can guarantee both success and investment.

4. CONCLUSION

It must be admitted that the educational act requires thoughtful development based on neuroscientific contributions for several reasons: first, to increase the school success rate for all students by the fact that each student finds a pedagogy that suits his or her own nature, its own pace of learning and its own expectations, then, to be sheltered from any risky pedagogical choice which generates not only failure, but certainly real psychological traumas affecting self-esteem and self-confidence which can subsequently lead to school and even social violence.
Today, the strategic vision (2015-2030) (9) has given importance in the first places to equal opportunity and the quality of education in order to guarantee more chances of success for students, however, this ambition does not can materialize only from a well-established pedagogical engineering . Indeed, varying pedagogical models according to student typologies at appropriate times can both reduce the school failure rate and ensure inter-student equity.
Finally, the function of teachers is becoming more and more complicated given the dynamic evolution of scientific contributions which call into question many empirical convictions, of which it will be necessary to update some teaching practices through training (continuous and initial) by integrating theoretical supports. in neuro-pedagogy.

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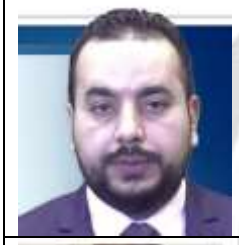	Mohammed Rehhali .Associate teacher of secondary education qualifying in natural sciences, Pedagogical inspector of secondary education qualifying in life and earth sciences, Doctoral student in science didactics and educational engineering Hassan II University of Casablanca (UH2C), Morocco,
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