NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 9, ISSUE 3, Mar. -2022

THE CONTRIBUTION OF NEUROSCIENCES IN THE SENARIZATION OF LEARNING CONTENT AND EVALUATION STRATEGIES

Mazouak Abderrazzak
Laboratory of Physical Chemistry of Materials, Ben M'sik Faculty of Sciences, Hassan II University of Casablanca, Casablanca,Regional Center for Education and Training Taza., Morocco ,
* mazouakabdo@gmail.com

Rahhali Mohammed
Regional Academy for Education and Training Casablanca-Settat, Morocco ,
med.rehhali@gmail.com

Said Belaaouad
Laboratory of Physical Chemistry of Materials,
Ben M'sik Faculty of Sciences, Hassan II University of Casablanca,
sbelaaouad@yahoo.fr

ABSTRACT
Since their appearance, neurosciences have allowed the definition and understanding of the brain activities that take place before, during and after new learning. And remain solid references for planning educational content on the one hand and improving teaching methods and appropriation strategies on the other. In the same perspective, the appearance of two opposing currents in the interval of neurosciences positioned teachers and educational actors before a dilemma between the supporters of the scientific authority of neurosciences to change certain teaching practices at a time when against opponents who warn against an abusive interpretation of images relating to learning activities. Our article will attempt in the first part to define the place of neurosciences in the educational sector and the learning process and then to explain the contribution of neurosciences on the practices of planning, management and evaluation of learning. without denying the set of limits of this contribution in the contribution of the improvement of the act of teaching-learning.

Keywords: Neurosciences, brain activities, teaching, learning

INTRODUCTION
The intention devoted to today the contribution of neuroscience in the development of teaching content does little that justify the provision of knowledge and explanation of cognitive processes in learning . Starting from a simple explanation based on functional anatomy to arrive at the use of brain imaging, neuroimaging or functional magnetic resonance imaging of the brain. These means make it possible to understand the role of the different parts of the brain during reading, in the construction of knowledge and to determine the origin of certain learning disorders and difficulties.
In this context, the focus of decisions teaching on the neuroscience offers more precision and determination of the different content and scientifically explains the relationship with learning explaining the manifest behaviours and motivations desired sources for the appropriation of knowledge by the brain.
On the other hand, neurosciences, given the different branches of study which assures it, namely: neuropsychology, neuroconstructivism, cognitive neurosciences ... they also play a determining role in the explanation of the nature of the relations between cognition and the brain the social context; and education.

In contrast, the wrong use of neuroscience may influence negatively the teaching and learning methods.
The objective of this paper lies in analyzing in a first time contribution of neuroscience in the process of learning and their relation to the planning and management class. And subsequently to retrace some nuances and the limits of neuroscience on the evaluation and support of learning.

THE BRAIN AND ITS FUNCTIONS

Research on the relationship between neuroscience and learning processes have originated in the early years 80, but for lack of means technology at that time, the research has not advanced much. The discovery of the functions of certain organs of the brain is due either to the effect of chance, or during accidents that have occurred to patients or in an experimental setting on animals or during the autopsy of patients with brain disorders. A few examples illustrate how the discoveries took place:
Phineas Gage (Kean, 2014), the man who has lost the sense of self after a crash in bar of mine that passed through his skull in 1848. Despite his recovery by the surgeon Harlow, the region prefrontal of the brain has been damaged. Gage has become "A lazy, unstable, impatient good-for-nothing, sluggish and drunkard, wandering from circus to fair, unable to take care of himself, until he died penniless." Macmillan cited by (Kean, 2014). This story shows that victims of frontal injuries have difficulty in sentimentality, concentration and planning.
The area of Broca discovered by Paul Broca in 1861 who has studied the brain of a patient who lost the speech after brain injury. According to Broca, this area is the only center of language. This discovery will be developed parCarl Wernicke in 1874, which has discovered a patient able to speak normally, but without understanding the meaning of what he says. This is another area that is responsible for understanding language called: Wernicke area.
Scientific progress made in biochemistry, mathematics, and optics has enabled the in-depth discovery of the functions of certain brain centers . It is thanks to the microscope and to the techniques of fixation of living tissues, that we were able to discover the neurons by the use of the dye for the staining of the nucleus of the Franz Niss cell , and also by the Golgi method, of Camillon Golgi allowing to highlight the tree structure of neurons.
Recent discoveries focusing more on brain imaging have enabled researchers to map and inventory brain connections. There are currently over 200 brain areas in both hemispheres. Studies often focus on the anatomical structure of the cortex (myelin density, the neuronal sheath and the thickness of the cortex), the activity of the regions at the time of the performance of cognitive tasks . The Figure 1 shows the role of different brain regions:

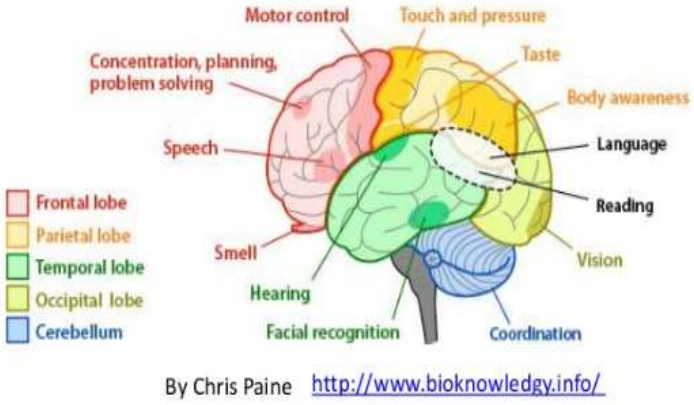

Figure 1: the functions of brain regions

Contribution of Neurosciences

You can now view the activity brain during the execution of a task thanks to the technology evolved from devices such as : the tomography by emitting positrons (PET) imaging and functional magnetic resonance (fMRI) that make more visible brain function. This helps explain the relationship that may exist between moral behavior and brain activity recorded and visualized in the form of images. If we can understand the causes of the difficulties encountered by some students in mathematics, we can propose a suitable pedagogical approach. Much research is based on the comparison of the state of the brain before, during and after the subject's activity, the comparison of the state of the brains for groups of students who have undergone different activities whether they are passive or active. This research shows that:

The brain changes architecture thanks to learning. We are talking about brain plasticity. Indeed, when learning, the brain circuits recycles a number of neurons communicating with each other on through the synapses. For example, learning a new word requires the creation of new connections between neurons that have a relationship with sight (neurons of the visual cortex), sound (neurons of the auditory cortex) or with other data recorded in the brain (associative regions). Repeating each word to learn it strengthens these connections and makes them easier to remember. Brain plasticity is achieved through two processes

The synaptogenesis: this is the process of the formation of synapses. Each neuron develops dendrites which go to other neurons. Contact between these dendrites gives rise to synapses. It is a development and modification of connections. A side of the first synaptogenesis at the beginning of life (learning before the experiment), the second synaptogenesis develops through learning and the effect of the environment (dependent learning experience).

The neurogenesis (neurogenesis): "This is one of the advantages possessed by the brain to be plastic, that is to say to change its structure and its operation is under the effect of the influence hindrances of learning, or under the influence of social contacts". (Sablonnière, 2016). However, according to surveys 50% of the population thinks that intelligence is an innate notion and everything depends on the neurons that an individual has. The notion of cerebral plasticity has proved the opposite, intelligence is determined by other factors, in particular the environment (quality of the social environment and human relationships, diet, physical exercise and sleep, etc.). Depending on the degree of learning are developing neurons so that others disappear as the famous expression "Use it or looseit " (1) used in the jargon neuroscientist.

The 5 Ages of the Brain

The child, before 5 to 6 years old, is very emotional. He reacts to get what he wants by crying. He expresses joy when he is happy. Yet he is unable to control these emotions. This has to do with the development of the brain. Scientists distinguish 5 ages (5 phases) (SABLONNIERE, 2013) of this development :

- 1st age (during pregnancy) from the 28 th day, we observe the formation of the first neurons in the embryo.
- 2nd age (birth to 12 years): the brain is ready for all learning. It is receptive characterized by great flexibility of connections between neurons.
- 3rd age (from 12 to 25 years old): During this period, certain neuronal connections will be suppressed, others will be stabilized according to their usefulness. This is the period of pruning and myelination. In adolescence, "we know that the subcortical zones (center of emotions and sensations) develop first while the prefrontal cortex (so-called upper brain) expands later; which explains that the adolescent has great cognitive ability but shows emotional immaturity (conflicts, anger, sadness, shot of lightning, runaways, excessive behavior) "(Vicarini , 2016).
- 4th age (25 to 65): The brain, especially the prefrontal cortex, reaches maturity around the age of 30 years. Personality is forged and is characterized by mastery of emotions, responsible conduct and planning of

actions. During this period, the more the brain is used, the more we notice the appearance of new connections.

- 5 th age (of 65 years and over) : With age, the brain ages and concentration skills and cognitive reaction declines.

To keep the brain active and develop its plasticity, neuroscientists recommend learning Standing, a practice sport regularly, a social relationship with others and be active throughout life. This recalls the sentence of Erasmus "Man is not born a man he becomes one" and confirms by Kant "Man is born twice, during his birth then during his apprenticeship".

The Four Pillars of Learning Developed by (dehaene, 2013)

According to him, successful learning is based on four pillars identified by cognitive science which are: attention, active engagement, feedback (feedback) information), and consolidation.

- **Attention:**

Attention is a complex function characterized by the selection of information and its processing. This filtering manifests, itself in relevance and focus on the task or attitude to be accomplished. The test of the invisible gorilla put in place (CHABRIS & Simons, 1999): This test in the form of video (1) where he is asked to watch two teams dressed in black and white by the passing ball. The instruction given to the participants is to count the number of passes made by the team dressed in white. In the course of the execution of the ball, a person disguised in a gorilla flows between the players. When the visualization is complete, participants are asked to announce the number of passes made at the same time, asked if they have seen the black gorilla that passed in the film. The test results show that about 50% of the participants did not see the gorilla. This test shows that when a person is focused on a task, any event that occurs in his environment is not taken into account. During learning, teachers have a decisive role in attracting the attention of learners at each point of learning and making them learn attention. Stanislas Dehaene, referring to the work of Michael Posner, distinguishes three sub-components of attention: alert, orientation and executive control.

- **Active engagement:**

A learner not engaged in learning does not learn or assimilates poorly. Engagement is a thoughtful and conscious attitude mobilizing the learner for a willingness to learn.

- **Feedback:**

This is feedback learning. The learner can make mistakes, imagine false representations. Feedback is critical. It makes it possible to correct errors, channel representations and improve learning. The return of information has a cognitive explanation as shown Dehaene (Stanislas, 2013) "It is currently thought that the cortex is a kind of machine to generate predictions and integrate prediction errors: he launched a prediction, given in feedback of sensory information , and a comparison is made between the two ". Because "the brain thus works by iterations, with cycles that can be broken down into four successive stages: prediction, feedback, correction, new prediction."

- **Consolidate the acquired knowledge**: (transfer from the explicit to the implicit).

It is realized according to Dehaene (Stanislas, 2013) by :

- Automation: transfer from conscious to non-conscious, and freeing up of resources. In fact, in early learning, it will have a strong mobilization of the prefrontal cortex to process information in a conscious way

requires a force of concentration. In gradually to measure as the subject progresses in the learning, achievements automatically learn. This automation transfers knowledge to non-conscious networks, freeing up resources. When a child learns to read, he initially finds it difficult to do so, given the elements to be combined at the level of graphemes and phonemes. Gradually, the child frees himself from this difficulty and from decoding by the phenomenon of automation, and concentrates on other learning such as: the meaning of the text, the reading of a long word … etc.

- Sleep: the role of sleep is decisive in learning. Indeed, when an individual sleeps or takes a nap, the brain begins to function by putting the recorded information in order (classification, tracking, location, memorization, etc.)

Brain Architecture Influence the Appren - Weaving

According to Steve Masson (Masson, 2016), the architecture of learners' brains influences their learning. Knowing how the brain functions of learners can help teachers better understand the biological constraints linked to learning. It is interesting to note a first constraint to learning which depends on the learner's initial brain architecture: since the brain naturally recognizes objects regardless of their orientation, it initially turns out to be difficult for students to distinguish letters. p, q, b and d which are spontaneously processed by the left and right occipito-temporal cortices as a single object presented in different orientations

Brain-Based Learning:

Is an example of learning based on understanding brain activity: Understanding how the brain works is also understanding how we think, how we act, how we learn and how we can solicit our brain without tiring it. It is also looking for effective didactic and educational methods that go with the biological maturity of the brain. The methods of learning based on the functioning of the brain refer to several fields including: psychology, technology and neurology. Many teachers use this form of learning such as: introducing prior knowledge based topics to stabilize and regulate it as the students know already. That which allows building brain connections between neurons. Also, the creation of an environment rich in fun activities or all forms of attraction of the learners' intention (rhymes, stories, songs, etc.) stimulates the brain to learn.

Diagnosis and explanation of "4D ": dyslexia, dyscalculia, dyspraxia and dementia:

Thanks to neurosciences, we can today diagnose and propose remedies for dyslexia, dyscalculia, dyspraxia and dementia.

-Dyslexia is a neurological disorder affecting 8-10% of children. According to the WHO (1) , “dyslexia is a specific reading disorder. It is also about a persistent disorder of the acquisition of the written language characterized by great difficulties in the acquisition and in the automation of the mechanisms necessary for the mastery of the written word (reading, writing, spelling…) ” . It is due to a disorder of the auditory cortex or the visual cortex.

-Dyscalculia : According to the WHO definition, dyscalculia is a “specific, significant, lasting disorder in the processing of numbers, apart from a sensory or psychiatric cause upstream, in an intelligent child.”. Children affected by this disorder little known, have the difficulties to recognize the figures, understand their value, to make calculations accurate.

-Dyspraxia is due to a motor disorder. Children with dyspraxia are clumsy. They have difficulty writing well (dysgraphia), eating properly, walking without falling. Their motor skills are disturbed. This disorder brain, present in about 5 to 7 % of children from 5 to 11 years is due to the anomalies of perception visual -spatiale where the brain is unable to plan, coordinate and execute the gesture normally. As if the act performed is being done for the first time.

-Dementia: The WHO dementia "is a syndrome, usually chronic or progressive, in which we observed an alteration of the function cognitive (ability to perform mental operations), greater than that which is could expect normal aging. It affects memory, thinking, orientation, the understanding, the calculation, learning capacity, language and judgment. " Alzheimer's disease is a form of dementia that affects generally the persons aged (60 to 80%), which occurs after a stroke brain.

Learning Strategies and Neurosciences

Learning styles (Pashler et al., 2008): We recognize that each learner has a unique learning style. It can be auditory, visual, or kinesseic depending on the nature of the development of the sensory organs (sight, hearing, movement). The teacher is asked to manage the learning taking into account these styles pedagogically and didactically. An auditory-style learner tends to learn better in a verbal situation, a visual-style learner tends to learn better with images, a video ... With the development of neurosciences, the notion of learning style has no scientific validity. This neuromythe is explained by (Chamberland, 2013) who says "It is very widespread, and even often presented as proven. There is a whole learning style industry that sells tests, books, kits and training for teachers to help them tailor their teaching to the styles of their learners. Yet a growing number of researchers and of researchers call seriously into question the value of science for studies that support this hypothesis. " (Chamberland, 2013). Chamberland refers to the work of researchers (Coffield et al., 2004; Pashler et al., 2008) who have shown that the research carried out has generally not shown that there is a gain in matching teaching style and the learning style, at least for the styles put to the test.

a.The right brain and the left brain or theory of two brains :

The most widespread idea in teaching is the existence of a relationship between the learning capacities of the pupils and the functioning of the hemispheres: The hemisphere The left deals with numbers, language, logical sequences and mathematics while the right hemisphere is responsible for handling the representation of space and emotions (Geschwind & Galaburda , 1985). Some authors have even argued that the mathematics gifted students have developed left hemisphere and vice versa for gifted students in art and literature. This neuromythe, which is widely conveyed in the school environment "has never been validated by rigorous experimental data (Bishop & Wahlsten , 1997). It was essentially observations from experiments performed in the rat and that the extrapolation to humans is more than doubtful as soon as one approaches the field of cognitive functions "(Vidal, 2002). According to Goswami (2006) cited by (Masson, Lafortune , & Brault Foisy, Misfiez -vous des neuroMythes , 2013), "this neuromythe would probably result from a bad interpretation of the results of studies in neuroscience, which would not take into account the fact that the cerebral hemispheres are interconnected and rarely work in isolation. True, there are certain tasks, such as recognizing a face or reading, for which one hemisphere is dominant in most people. However, the OECD (2002) reminds us that most tasks require the work of both hemispheres in parallel. "

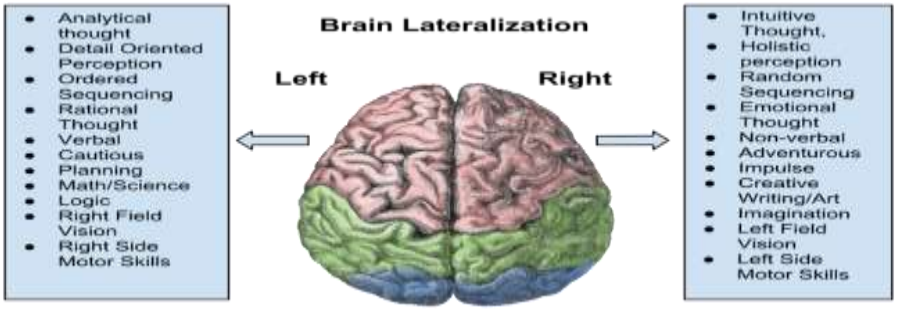

Figure 2: The right brain and the left brain

b. Brain Gym :

Created by Paul and Gail Dennison at the beginning of years 70, Brain Gym (6) or the gym of the brain is a set of physical exercises aimed at developing, relaxation and arousal of the brain. The neuromythe of Brain Gym is that it is believed that performing certain specific exercises develops an area of the brain to stimulate and awaken the brain. This facilitates and improves learning. This specific gymnastics called ECAP of 4 steps which are: energy, bright, active, positive) and a good hydration. Recent studies show that the brain gym is invalidated by scientists (Pasquinelli , 2012). However , the Brain Gym is a recommended exercise for the maintenance of health. Just as neuroscience affirms its importance for the activation of brain regions linked to attention and concentration.

Neurosciences and Content Management

Although that the contribution of science is rich and diverse teaching practices adapt to the context of the classroom environment. In the same lesson, the teacher's styles change without disregarding which current the teacher is enrolled in. Depending on the reaction of the learners, the teacher changes his attitude. Its teaching can be behaviorist, constructivist, socio- constructivist, or even neuroconstructivite … Sometimes, the good practices developed by certain teachers are linked to the contextualization of learning rather than to scientific logic. However, a teacher ignoring the contribution of learning sciences find difficulty in the conduct and interpretation of uncollected abnormalities during in the management of learning.

Cognitive neuroscience comes into the classroom in different forms. They provide educational solutions for teachers based on knowledge about how the brain learns and attempts to assess their efficiency using scientific protocols. Teachers are invited to use these neuroscientific tools by applying protocols as much as possible and by helping researchers to develop solutions.

a. From a content planning perspective

The memory, the understanding, the focus and analysis functions are axes fundamental to the implementation of learning content in this flaps neuroscience are levers :

- Set learning objectives
- Model and categorize levels of cognition
- Set up objects and sectors for the appropriation of knowledge
- Trace educational paths associated with organizations and appropriation instructions
- Choose and select tools and teaching aids

b. From a content management point of view

The use of precise Neuroscience that the student is different in abilities, interests, and motivations ... Therefore, to learn the content in the same class requires adaptation and differentiation strategies of teaching

- Students do not progress in the same way and do not learn at the same time.
- Students do not use the same techniques to solve problems.
- Each learner has a unique repertoire of behaviors.
- The students do not have the same profile of interest and the same motivations to achieve the same goals.

This reality exposes the teacher to differentiated practices (differentiated pedagogy and differentiated styles) Jean-Luc Berthier, Les cogni'classes . Olivier Houdé , The Montessori brain school, Freinet and Piaget in cognitive science.

CONCLUSION

The quality of a brain lies in its activity and its richness in connection. What neuroscientists are trying to demonstrate in a complex and complicated scientific field. The majority of studies in neuroscience, is based on the neuroimaging noninvasive , trying to bring scientific explanations of the relationship between brain activity and learning. However, this relentlessness can lead to abuses that could have negative consequences on political and educational decisions with the intention of improving the quality of education. (Bruer , 1993) who was one of the first to advocate a teaching based on neurosciences (“ Brain-basededucation ”) is also now one of the most critical of this notion. Yet the brain research continues without cease until the achievement of the truth awaited on the functioning of the nervous system.

REFERENCES

1) Aksoy, M. E., (2010). Attitudes of prospective teachers towards the teaching profession. Journal of Social Sciences Research, 2, 197-212.
2) Başbay, M., Ünver, G. & Bümen, N. T. (2009). Attitudes of secondary education non-thesis master's students towards the teaching profession: A longitudinal study. Educational Management in Theory and Practice, 15 (59), 345-366.
3) Cloud, I. (2009). Evaluation of teacher candidates' attitudes towards teaching profession (example of Dicle and Fırat University). Journal of Dicle University Ziya Gökalp Education Faculty, 14, 13-24.
4) Bulut, H. & Dogar, C. (2006). Examination of pre-service teachers' attitudes towards the teaching profession. Journal of Erzincan Education Faculty, 8 (1), 13-27.
5) Celep, C. (2010). Teaching as a profession. In C. Celep (Ed.), Introduction to educational science (pp. 45-74). (3rd Edition). Ankara: Memoir Publishing.
6) Capa, Y. & Çil, N. (2000). Examination of teacher candidates' attitudes towards the teaching profession in terms of different variables. Hacettepe University Faculty of Education Journal, 18, 69-73.
7) Capri, B. & Celikkaleli, O. (2008). Examination of teacher candidates' attitudes towards teaching and professional efficacy beliefs according to gender, program and faculties. Journal of İnönü University Faculty of Education, 9 (15), 33-53.
8) Celik, K. (2010). Teaching as a profession. In A. Tanrıöğen & R. Sarpkaya (Eds.), Introduction to educational science (p.235-265). (2nd Edition). Ankara: Memoir Publishing.
9) Demircioglu, E. & Ozdemir, M. (2014). Examination of the attitudes of science and literature faculty students towards the teaching profession according to various variables. Journal of Mersin University Faculty of Education, 10 (3), 110-122.
10) Demirel, M. & Akkoyunlu, B. (2010). Self-efficacy beliefs and attitudes of prospective teachers towards the teaching profession. International Teacher Training Policies and Problems Symposium II, 16-18 May, Hacettepe University, Beytepe-ANKARA.
11) Eraslan, L. & Cakici, D. (2011). Attitudes of pedagogical formation program students towards teaching profession, Kastamonu Journal of Education, 19 (2), 427-438.
12) Shirtless, M. N., Oral, B. & Bulut, İ. (2006). Non-thesis master's application in training qualified teachers for secondary education. In the Proceedings of the Restructuring Symposium in Secondary Education, 20-22 December 2004 (pp. 545-551), Ankara: Ministry of Education Board of Education.
13) Gül, İ., Minister, S. & Ünal, A. (2014). Problems encountered in pedagogical formation practice (Ondokuz Mayıs University example). 9th National Education Management Congress, 8-10 May, Siirt.
14) Helvacı, M. A. (2007). Characteristics of the teaching profession. N. Saylan (Ed.), in Introduction to educational science (pp. 313-332). Ankara: Memoir Publishing.

15) Keser, H., Bayir, S. & Numanoglu, G. (2009). Attitudes of teacher candidates towards the teaching profession. International 5th Balkan Education and Science Congress, 1-3 October 2009, Edirne.
16) Okçu, V. & Celik, H. C. (2009). The effect of teacher candidates' views on KPSS on their attitudes towards the teaching profession. I. International Turkey Educational Research Congress, 1-3 May 2009, Çanakkale.
17) Saracaloğlu, A. S., Bozkurt, N., Serin, O. & Serin, U. (2004). Factors affecting pre-service teachers' attitudes towards the profession. Journal of Contemporary Education, 311, 16-27.
18) Seferoglu, S. S. (2004). Teacher competencies and professional development. Science and Education in the Light of Reason, 58, 40-45.
19) Simsek, H. (2005). Attitudes towards the teaching profession of students who continue their secondary education non-thesis master's program. Yüzüncü Yıl University Journal of Electronic Education Faculty, 2(1), http://efdergi.yyu.edu.tr, retrieved on 07/10/2010.
20) Üstüner, M. (2006), The validity and reliability study of the attitude scale towards the teaching profession, Educational Management in Theory and Practice, 45, 109-127.
21) Yildirim, I. & Vural, Ö. F. (2014). The problem of teacher training and pedagogical formation in Turkey. Journal of Teacher Education and Educators, 3 (1), 73-90.
22) Council of Higher Education, (YÖK). (2010). Letter dated 28.01.2010 and numbered 03317.
23) Yuksel, S. (2004). The effect of the non-thesis master's program on students' attitudes towards the teaching profession. Uludag University Journal of Education Faculty, 17(2), 355-379.