

TEACHER TRAINING PATHS BETWEEN NEUROEDUCATION AND PROFESSIONAL LEARNING COMMUNITY

Giuseppa Compagno, Francesca Pedone¹

University of Palermo (ITALY)

Abstract

This paper starts from the belief that a school capable of feeling and making community is regarded as a privileged context to promote both organizational and relational well-being. Teacher training is possible in the intersection between the concepts of Neuroeducation and learning community. Moreover, the concept of "school-as-a-community" interacts with that of "peer learning", which is configured as a methodology capable of simultaneously promoting the ability of realization of the individual and of the organization.

From a methodological point of view, this work documents a research project carried out with a group of 69 teachers of the first cycle of education. Moving from the problems and questions arising around their conception of school as a learning organization and their perception of the teaching relationship in neuroeducational terms, the project has been articulated into two phases. In the first one, we coped with the analysis, reflection, problematization and confrontation on the teaching profession, on the deep significance of the teaching acts and on any possible discrepancy between what is planned and what is actually achieved in practice. In the second phase, we tutored and mentored teachers in the study of the dynamics of the educational relationship in terms learning strategies, neuro-behaviors and paying particular attention to those cognitive-somatic markers implemented in teaching/learning practice.

The work highlights those aspects connected to the processes of cooperative learning among teachers, considered as systematic processes of review and revision of the practices put in place by a professional community, as well as some elements of Neuroeducation which are functional to a wider knowledge of the tools and strategies available to teachers for the implementation of their teaching relationships.

Keywords: learning organization, Neuroeducation, learning community, teacher training, neurocognition.

1 THEORETICAL HINTS

The theoretical lines of the present paper show how the idea of school as a community provides the perfect context where the growth and change of the individual and the organization occur. Actually, school is, at the same time, an educational community and a learning community; it is a space of synergy between learning organization and "neuroeducational" relationships.

1.1 School as a learning organization

A school community is set up as a group of people featuring different ages, roles, expectations, needs, background. Community members share common goals, values, ways of being and acting: such a ideological grouping forms the unique identity of the community. Then communities act starting from the basic ideological and the synergy comes up exactly from this shared opinions [1]. The community concept looks at the school as a dynamic totality of people living the educational process in a basically cooperative way, so that everyone, feeling himself respected and appreciated, is helped to better interact with others and to live at the school as an organic reality and able to interact productively with global reality.

A school as community has to develop a common understanding, or a shared philosophy, about student learning and outcomes that should be achieved. This common understanding appears as the "school compass", providing them with a strong sense of identity and continuity in times of changes [2].

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In the last twenty years, the term "school as a learning community" has spread in the educational literature, referring to a concept of school as a learning organization [3], which is a set of people that, feeling connected each other in their daily acting, develops a creative thinking and learns how to learn together. The school as a learning community promotes and enhances learning as a process of continuous dialogue, active and collaborative between all the actors that interact within it (teachers, students, executive, families, technical and administrative staff), to improve the quality of learning and life in the school. The school as a learning organization can be considered as an organization whose members reach ideas, accept the responsibility to develop and maintain the organization, works together, understands and tolerates the each other diversity.

The school as a learning community is set up as a complex system, and the complexity is given by the multiplicity of levels of interaction and targets to be achieved, by the heterogeneity of the actors in it, by the challenges it faces.

According to some researchers, the conditions that can lead the life of a school as a learning community are identified in the mission, vision, moral values and goals [4]. First factor, the mission, is the peculiar life reason for the organization and shows the deep and ultimate reason for which an institution exists and performs certain actions. The vision is, the other hand, the clear picture of what the school wants to be and become. It is a project or an operating path based on specific criteria that allows to chart the route of the school organization and to give meaning to the actions of each person working within the school itself. In order for the vision to be practicable, it must be articulated in concrete cases, made explicit and forwarded in a transparent way. In this way, each member of the school community will be able to join the values that vision implies, to identify their roles in the organization, to provide a significant contribution to the building up of the community. The common vision connects and directs the effort, the involvement and commitment of everyone. If the mission implies that schools understand the purpose of their being and the vision implies that they know which direction to follow, the moral values constitute an attempt to clarify the collective efforts, and the actualization of shared ideals. The moral values denote what will drive the behavior and choices of community members and show how each person can contribute to the initiative of improvement. The fourth factor, the goals, identifies what everyone should aim in the short term. The goals indicate the steps to be taken to achieve the established purposes and help, at the same time, both the orientation to results of the learning community, both the individual and collective responsibility for achieving these results.

The school as a community of learning people is shown, ultimately, as an organization whose implied culture that defines it is learning. The school as a learning organization is a community where the main condition for membership is that a person is always willing to learn, regardless of the role it plays within the educational institution. The school is an organization in which learning and, therefore, knowledge is closely connected with the practice. For this reason it can also be defined as a community of practice, emphasizing the fact that these communities bring out the social nature of learning. Wenger [5] defined the community of professional practice as a group of people who share a concern, a set of problems, a passion about a fundamental element of their profession. People in this group deepen their knowledge and their skills in accordance with a continuous interaction.

Communities of practices have been described by Jonassen, Peck and Wilson [6] as working groups whose members (characterized by professional affinities) learn the same participation in the community in which they bring their professional experiences. Inside community of practice, members share both the needs both skills which each person; this generates the sharing of stories and representations, the search for solutions and the design of common developments. According to Wenger [7] communities of practice imply the existence of a mutual agreement between the members, who feel bound by a common identity and a trust relationship, who maintain relations and work together in ways that are always different, for the maintenance of the community; the community of practices also implies the establishment of a joint venture, which is a shared responsibility of the problems and prospects and the negotiation of activities among members; the community of practices implies, finally, the presence of a shared repertoire made of artifacts, tools, routines, stories, language, actions, beliefs and moral values representing the historical memory of the community. Other features distinguishing the professional communities learning (or communities of practice) are: the vision and shared moral values; the shared responsibility of learning by pupils; collaboration oriented to learning; plans of individual and collective learning; self-reflection about professional trend; the ability on opening and creating of networks and partnerships; inclusive opening to all members; respect and mutual support [8].

In school context, communities of practices aim to connect people in network to allow the learning needs of all those who move within the school community to come out. In this way, communities of practice can become a place of collaboration, sharing and exchange of knowledge, experience and procedures, of reframing problems and targeted information.

According to a transformative conception, learning of the student teachers can be intended as "the process associated with the use of a previous interpretation, to build a new or revised interpretation of the meaning of a own experience as a guide for future action" [9]. The compass of professional development, points towards greater collegiality, collaboration and research continues as part of the schools where teachers and leaders are both researchers and learning people, in which teamwork and shared goals have to prevail, and in which the value of the individual and of the collective is recognized as essential for organizational learning. The professional learning communities have the potential to be the main catalyst in the transformation of the teaching-learning process, because teachers, as members of a learning community, can experience learning as their students do. Research shows that teachers thoughtful, willing to question their strategies and improve themselves, have better results in promoting learning [10].

1.2 Neuroeducation for the implementation of the teaching relationship

The school is not only a learning environment in which to acquire basic knowledge, but is a real agency of socialization in which young people and adults share their interests, learn more and more about themselves and each other. Teacher relationship, which is a key pillar of this school, creates different levels of interaction, both symmetric and asymmetrical and activates the development of communication skills and relationship skills. Nowadays, teaching is increasingly complex and challenging, requiring teachers skills being immediately spendable in heterogeneous classes, characterized not only by the number of pupils, but also by the plurality of needs, cultures, values. Teachers are asked to be expert in coping with this new panorama and in selecting adequate approaches as well as dialogue and mediation.

In order to improve teaching and to encourage the process of student learning, teachers need to acquire effective teaching strategies. Neuroeducation meets that need since it is able to combine the neurobiological principles of Cognitive Neuroscience with educational implications in the educational process. In recent years, one of the activities that our brain has been addressed is the research on how the brain itself works. In particular, a special interest is devoted to how our brains enable us to think in education and this is the task of the Educational Neuroscience [11] which presents the convergence of three areas:

- Psychology that studies the mental processes that underlie cognition and behavior;
- Teaching that deals with education in its different components (communication, evaluation, relationship with the student, classroom management, methods and techniques);
- Neurosciences that study the brain in terms of its evolution, its structure and its functions [12].

Neuroeducation represents the crossroads between the desire to create an interdisciplinary field of intervention and codification of a neuro-oriented research area [13]. Neuroeducation may help teachers develop better teaching strategies. Thanks to the knowledge of the neurobiology of learning, teachers may easily understand when and how some transformations and reactions in the students' brain occur, which may be useful to the structuring of new tools and teaching strategies for all. The reorganization of the educational practice, according to interpretative schemes that use neurobiological research of learning, may allow a reformulation of the study of students' activities in order to optimize their cognition, metacognition and school success.

In the last twenty years, Neurosciences have made remarkable progress in the knowledge of the human brain. The information we derive from Neurology, Psychology and Neurolinguistics, allow us to share the neurological processes underlying the functioning of the brain. The further step is that of being able to select and use different strategies in the teaching/learning relationship in order to recognize and appreciate individual differences and, thus supporting the development of talents and styles of each and every learner.

Teachers trained in a Neuroeducation perspective soon discover that learning, from the viewpoint of the brain, occurs through a stimulation of neurons which process the information and transmit them through the axons, in the form of electrochemical stimulation (synapses), to other neurons. Learning consists, then, in a series of physical stimuli which are selected by the thalamus and sent to specific

areas of the brain; the more neurons are stimulated the more dendrites and connections are created and favor brain plasticity. It follows that the biological potential of the connections must be supported and developed within a learning environment which is the proper space able to consolidate the existing connections and to create new ones.

This all implies that the teaching/learning relationship may be implemented by a new operational awareness that teachers need to acquire. Tasks or learning activities, for example, are most engaging to the mind if they call into question the various sensory modalities creating stimuli for diverse incoming information. A further aspect is the adaptation of students' prior knowledge when new information is forfeited, since the latter are integrated into existing neuronal networks. Hence the importance of enhancing also the experiential knowledge of the students, in order to activate those neural circuits and to facilitate the subsequent reorganization of knowledge. Last but not least, it is important to take into account the ways in which people learn according to a variety of cognitive and emotional styles that substantiate and personalize every teaching relationship [14].

2 THE RESEARCH DESIGN & ACTION

Our thoughts turn to an in-service training, within the logic of lifelong learning, aimed at providing multifaceted learning experiences, to facilitate the construction of minds opened to constant exploration and education; a training program aimed at training of cultured people, oriented to the moral values of the person, able to master the symbols of culture in a personal and creative way.

2.1 Teacher's training

Peer learning is often referred to as a privileged teaching strategy for an idea of school as that described above, i.e. a community of people working and learning, sharing progressively its knowledge, rules, behaviors, moral values, and setting out specific methods of communication and networks of relationships.

This paper summarizes the training course started with 58 junior high school's teachers and 11 primary school's teachers of a Comprehensive School in the city of Palermo, in order to create in the school a learning professional community.

By the course of research-training undertaken with the 69 teachers the goal was to set up an inclusive working group, animated by a shared vision of learning, able to support and share the commitment and work of each one of its members. By a specific training, this group of teachers has been induced to question its own work, in order to search and learn together new and more appropriate approaches for the enhancement of learning of all pupils.

The course began by involving teachers and the manager, driving them to the understanding of all the matters to be developed within their school. By administration of the questionnaire 1 of the Index for Inclusion [15], it was demonstrated that the group of teachers had several critical issues in the area A1 "Creating inclusive cultures: Building community".

For this reason, it was established to start together with the teachers' group and their manager a collaborative learning process aimed to simultaneous growth of individuals and to school organization. Collaborative learning has assumed a shared focus, a shared responsibility to learn and an orderly approach to achieve the focused goals. This assumption requested teachers to abandon the role of experts and to adopt a collaborative approach that recognizes the moral values, knowledge and skills of all the members of the community group. The collaborative learning process involving community members, teachers and manager, in a cycle of exploration, experimentation and reflection.

The path of research-training was characterized by two different phases of 15 hours each, for a total duration of 30 hours.

2.1.1 *Building the identity of the learning community*

In the first phase the identity of the learning community was defined, i.e. it was highlighted the conceptual framework supporting the school community in the discovery and identification of its own identity - who we are and who we want to become. To hear the voice of the protagonists, to know their expectations, their needs and their way they perceive the problem, a flexible technique for collecting qualitative data allowing exploration of the issue was chosen: the focus group. By focus group and related specific activities, three different dimensions have been examined: the school education quality, the excellence in professional, the school as a learning organization. The activities of this

phase, properly designed and conducted, are aimed to the activation of the reflection and of the dialogue on the history of the group, its purpose and its core values, about the current situation and future expectations.

First step in the building of the group identity has been performed with an activity leading teachers to build and play the history of their community. Following the meeting of the focus group on the issues under consideration and discussion, the teachers and the manager were invited to build the "historical map" of the institute according to the methodology identified by Bailey [16]. The whole group was engaged in deepening the history of the institution referred to the previous decade, in reference to the categories of school quality, excellence in professional field and school as a learning organization. This activity allowed the group to reflect and represent visually in a chronological dimension, important events in the life of their community. Also through this activity it was possible to create a common base of information about the past. At the end, the group came up with following questions: "what does the past teach us?", "Are we interpreting the same event in different ways?", "are emerging any recurring patterns or trends?", "which are the specific strengths and weaknesses of our community?". Dealing with these issues within the group enabled teachers to build a shared meaning and a common background of knowledge.

The focus group questions, placed to identify the core values and purpose of the school institution, aimed to find a common ground between the different points of view, i.e. giving value to different perspectives and finding the items that the different perspectives have in common. Questions such as: "What's the deeper purpose that motivates you to devote your time and your energies to this work every day?", "What could happen if our school and our service would cease to exist?", "Which moral values do we think will be still valid for our community in 100 years?", "would we lose a significant part of our school identity if this moral values should be missed?", led teachers to examine both the discrepancies and the convergence that have emerged between values and action. The analysis of current practices from the point of view of the core values of the school, provides a suggested direction to align the school community with its system of core values.

The assessment of the current situation provides a hint to consider the current state of affairs in relation to how we would like them to be. The questions that led the teachers on exploring the status quo are: "What are we doing?", "Are our practices allowing us to achieve what we want?". These questions are followed by those that aimed to creating a shared vision, i.e. the future of the school community. The questions raised were: "What do we want to create?", "How will we be aware about when we have achieved our vision?".

The collective conversation about the history of the school community, about the moral values, about the goals, about the present reality and future vision, helped on creating a shared identity and was useful as plan to form meaningful relationships inside the school. The conclusions reached by the works developed on these issues, have led teachers to catch in a synchronic and diachronic way the three dimensions. Reflection and activities on quality, designed to promote the identity of the working group, led teachers to identify and develop the indicators of educational quality. Teachers defined the quality of the school not such as a state but such as a process to be shared and negotiated with those who work in the school at all the levels, that is related to a careful analysis of the context and its specificities, that must be able to generate in all the players in the system a constant work of self-reflection on the educational and teaching practice and on the whole training offer. The reflection on excellence in professional field requires an interactive process of reflection and self-assessment. The ability of each on controlling and managing the personal improvement is a key element for achieving excellence. These initial considerations then led the group to consider how the reflexivity that characterizes today the teaching profession involves the transition from tacit knowledge, implicit in the action, a critical knowledge, as result of reflection and sharing of practices and daily school problems.

2.1.2 Learning as community

In the second phase the real process of collaborative learning was realized. Teachers designed a rubric for self-assessment of teaching effectiveness. The tool selected was the rubric, because it allows teachers to become more aware of their own educational practice, so that they are encouraged to change attitudes, communication styles, educational and teaching methodologies, to review their valuable role as educators, inside an effective teaching-learning process. A self-assessment system can play an important role in the professional development of teachers [17]; this tool can be configured as a framework for reference, as a map, useful to lead the teacher in the complexity of his profession [18].

In a cooperative attitude, teachers have been asked to indicate the features defining the effectiveness of teaching. The first step to achieve this goal was to identify and define main dimensions to which the examined competence can be related. Teachers have answered individually, writing, the following question: "What are, in my opinion, the features that better define an effective teacher?". Then, they compared their lists, two by two; in groups of 4 they have further compared their lists of torque to reach a group list. At the end of discussion, groups have compared their work in a panel discussion and have reached a final single list. The dimensions identified and shared by the whole group of teachers are as follows: organization and classroom management; Disciplinary competence; Teaching skills; Design expertise; evaluation competence ; Ability to inclusion; Relational qualities. At this point the enlarged group has been divided into as many groups as the dimensions identified. Each of the seven sub-groups has proceeded with the identification of the criteria for each dimension previously defined and identified. Inside each of 7 subgroups, in a first time every member was asked to answer individually to the following question: "What are, in my opinion, the aspects that better measure the size ...?". As for the previous phase, process proceeded with the comparison in pairs and then in groups of 4 have further compared their listings of torque to reach a group list. In the third phase of construction of the rubric, teachers were engaged in the definition of the indicators, following the same method of work of the two previous stages. In the fourth and final operational phase with teachers, the indicators on a scale of 4 levels have been listed: expert, professional, apprentice, beginner. At the end of the process the 7 groups got together and shared and socialized what done in small groups. Question promoting socialization process have been: "What has developed, created and learned our group?", "How have we made it?", "What are the effects of our work?", "What is the next step we might take? ".

Along the whole process that led to the creation of the rubric, the elements that characterize the process of collaborative learning were kept in mind [1]. The group has worked in order to create a shared meaning of the subject and of specific terms; once reach an acceptable level of shared meaning has been reached, then the topic of research has been further defined. Teachers were frequently stressed with large questions to stimulate the discussion-exploration process. At the end of rubric implementation, teachers had a chance to reflect both individually, in order to investigate more deeply about themselves and their own actions, both in groups, in order to analyze the different points of view and collect ideas that will guide their future actions . The group reflection was supported by a climate characterized by the willingness to accept other people's thoughts and by freedom of expression.

The process of building the rubric allowed to focus the features related to teachers' self-evaluation, as a systematic process of review and revision of the practices realized by a professional community. This process has grown up as a moment of analysis, reflection, problematization and discussion, about their own professionalism, the meaning of the their own actions and the possible discrepancies between what was planned and what is actually achieved in practice. The reflexivity triggered by the process of building the rubric, caused the change from a tacit knowledge, implicit in the action, to a critical knowledge, as result of reflection and sharing of practices and problems at school. Learning from their own work and from the exchange of professional experience, provided to every teacher the opportunity to create a virtuous circle between theory and practice, starting from reflection, discussion and professional relationship.

2.1.3 The Neuroeducation activity

The third phase of the research involved the use of some strategies aimed at strengthening educational neuro-cognitive skills of pupils, attention, memory and the emotional-motivational factor. It has often been made explicit reference to the close relationship between learning and cognitive styles in neuroscientific terms and it has also been clarified how the mechanisms of memory and attention strongly cooperate to the strengthening of synapses respecting the specificity of each student's brain.

To this end, this part of the project action has been articulated into three steps and teachers were asked to alternate working individually, in pairs or group. Part of the time was devoted to listening and sharing their professional experiences with a survey of the critical aspects referred to their relationship with the students. There clearly came out the need for a deeper knowledge of the pupils and overall, beyond labels or surface impressions.

The first step focused providing teachers with basic hints for a Neuroeducation methodology. Continuous reference was made to the neuroscientific research and its recent contamination with science education. It was, therefore, proposed to teachers a triad of key constructs of Neuroeducation: brain plasticity, the theory of mirror neurons and the somatic marker. The teachers have rethought the

process of teaching/learning now considered as a support to the capacity of neural circuits to vary the structure and function in response to stimuli both during development and in adult life. It was found that the learning mind involves changes in the connections between neurons (synapses increase or reduction) and teaching directly affects the functioning of the brain, changing the degree of connectivity. There followed the consideration of mirror neurons thanks to some dynamic workshops in which teachers were asked to split into pairs and place one facing the other, to simulate movements, facial expressions, verbalization of partners. There emerged a capital concept on mirror neurons: the definition of "mirror" is exactly meant to refer to this ability of mimesis and reproduction of the action perceived. Mirror neurons are divided into categories, depending on the actions they are appointed to do. This neural diversification allows to create even a "vocabulary of actions", i.e. a pattern of motor experiences stored in the archive-F5 of the brain and used by neurons [19]. In order to activate mirror neurons vision is unnecessary: mirror neurons may be activated just even viewing. This aspect induced teachers to consider how mirroring actions are at the basis of the teaching process for which I teach and I talk about things I know, but I have not seen and for which I request a cognitive return in absentia [13]. Ultimately, teachers were asked to share in small groups ways of psycho-physiological reaction in cases of fear, anxiety, stress and other strong emotions. In other words, they elaborated the concept of 'somatic marker' which is a sort of alarm signal or even a special type of feeling (intuition, sixth sense, etc.) generated from secondary emotions and expressed through a bodily reaction. The focus then shifted on the pupils and teachers had the chance to re-think their students' reactions facing a demanding task, an interrogation or a final assessment test.

The second step was dedicated to the analysis of some models proposed by the Neuroeducation research on cognitive styles and intellectual styles. Reference was made, among others, to the models of Hermann [20] and Kolb [21] almost all focused on the distribution of the brain hemispheres and/or quadrants and on the brain functional lateralization and localization. Finally, we emphasized the theory of Multiple Intelligences [22] and its marketability in education. Teachers were given a test on multiple intelligences able to detect their intellectual predominance. The test was experiential, therefore, teachers were exposed to visual input, linguistic, musical, kinesthetic (etc.). After completing clinical conversation of clarification of the test results, teachers were guided to the consideration of the positive transferability of this kind of experiential tests to their students, although with the appropriate changes due to age, class, school.

During the third step teachers were proposed a short form of Brain Gym exercises with some psychomotor activities for the reinforcement of laterality [23] which required a larger space and individual work and in pairs.

These exercises are based on the idea that simple physical exercise helps blood flow to the brain and improves the learning process by making sure the brain stays alert. Brain Gym can be used both in the classroom and at home, on a daily basis.

The studies on Brain gym attest that the movement increases the electrical activity of the hippocampus and, consequently, it improves learning and memory formation; improving the activity of neurons, the exercise increases the brain's ability to receive proprioceptive information.

Teachers have been able to touch to what extent Brain Gym represents a teaching technique able to activate attention processes and mnemonic once since it consolidates the transition from short term memory to long term memory.

The work-based Brain Gym activity was a challenge for teachers who had to break the mold of a traditional training to dive into a transformative dimension of teacher training.

The Brain Gym exercises designed to help the brain function better during the learning process. They can be considered part of the overall theory of Multiple Intelligences by H. Gardner [22].

With this premise, teachers were finally guided and supported in a Neuroeducation micro-planning activity based on the Theory of Multiple Intelligences and teachers were monitored and facilitated in the construction of complex multi-cognitive tasks. Teachers were divided into groups which should feign the class councils and, above all, they were asked to imagine a class target audience of which to draw a descriptive profile including cognitive styles and intellectual peculiarities. The teachers then tried to formulate disciplinary objectives and aims in a Neuroeducation perspective, making reference to the areas of the brain to be implemented and the intelligence to be solicited by the task. The working groups have carried out the pre-analysis of pedagogical materials and then started the construction of complex tasks.

Overall, the third phase of work on the neuro-teaching methodologies, has promoted in teachers a pedagogical-diagnostics competence as to the development of cognitive mapping, of the target class substantiated by the recognition of any learning disorder or functional difficulty. Moreover, Teachers developed a neuro-methodological competence in structuring neuro-oriented and methodologically integrated teaching paths based on cognitive and intellectual factors as well as on the dialogic exchange with the students and on a more meaningful interaction with them.

3 CONCLUSIONS

The school may become a learning community if it assumes responsibility for professional development and engages in effective learning for both pupils and teachers.

Moreover, the school must offer as a privileged place not only for the development of the neuro-cognitive dimension, but also emotional, affective, relational and of any significant learning experience. Peer learning, as well as Neuroeducation activities, can promote the process of change in this direction, as they tend to create an educational environment highly responsible, conscious and cooperative. The concept of community is structured in a shared philosophy, in networks of relationships and synergy. To use a neuroscientific metaphor, community works as a configuration of human synapses. It is a living context and of great scope for the organization - the context in which the people, not the tasks are in the foreground. The concept of community provides a new starting point when you want to create a culture being supportive to the growth of educators.

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