

The potentials of bodily experience in the construction of knowledge: “bodily-dynamic concept maps” as teaching-learning proposal for “*meaningful learning*”

MAURIZIO SIBILIO¹, PAOLA AIELLO²

¹Full Professor in Didactics and Special Pedagogy at the Department of Human, Philosophical and Educational Sciences and Responsible of Handicap Laboratory at the University of Salerno – ITALY.

²Assistant Professor in Didactics and Special Pedagogy at the Department of Human, Philosophical and Educational Sciences of the University of Salerno – ITALY

Published online: Septembere 21, 2012

(Accepted for publication September 10 2012)

DOI:10.7752/jpes.2012.03043; <http://dx.doi.org/10.7752/jpes.2012.03043>

Abstract

The success of the constructivist paradigm has proved particularly effective in providing an interpretation of the functioning of the teaching-learning relationship based on the raising of the subject's active role in the mechanisms of knowledge. In the constructivist perspective, the action is one of the basis of the construction of knowledge: the meanings ascribed to the events and the objects depend largely on the personal experience that involves *thoughts, feelings* and *actions* (Novak, 1998). From these theoretical assumptions is possible to suggest in the didactic field the use of teaching and learning techniques that use of the potentials of the action for the construction of meaning (Novak, 1998) and for a "meaningful learning" (Ausubel, 1978). With this purpose it has been proposed a teaching approach to be experimented in formal educational settings whose basic idea is to provide "dynamic concept maps" that, like concept maps, that are traditionally and iconographically represented, make clear the relations between the concepts that make propositions through the action.

Key words: didactics, motor activities , meaningful learning, concept maps.

Introduction

The research on cognitive mechanisms has increasingly supported an interaction among different scientific traditions. Furthermore, in the last decades, they have also helped the scientific community develop a multidisciplinary and interdisciplinary study on the role of teaching, highlighting its multidimensional aspects, including those related to the function of the body and the movement in the teaching-learning processes. The complexity of the study has included philosophical discussions about the distinction between *Geist* and *Natur* (Dilthey, 1883) in the heuristic statute of the didactics, even with regard to the bodily and motor dimension in the teaching and learning processes. In fact, the body and its motor potentials have not only an educational function for the whole person but they also provide important empirical data for a research aimed at identifying educational theories and practices which can support the teaching-learning processes.

On the epistemological level, the interaction between natural sciences and human sciences allows the use of two different categories: “*understanding*” and “*explanation*”. The “*understanding*” focuses on the potentials of the body and the human actions involved in the learning and teaching mechanisms. The “*explanation*” focuses on the observation and the description of the empirical data of the educational event involving the body and the movement.

Hence, it has been useful to establish interdisciplinary relationships that have led to a confluence in the educational research of data emerging from theoretical and experimental research in the psychological, philosophical, pedagogical and neurobiological domains. This scientific contributions have been particularly useful, and sometimes necessary, to investigate how the body and the movement can help the cognitive mechanisms in the teaching and learning processes. The theories developed about this study have produced teaching methods and techniques which, in turn, have been inspired by specific cultural, philosophical and epistemological paradigms , which have provided different interpretations on the possible relationships among body, movement and the mechanisms of knowledge. With this aim, the success of the constructivist paradigm has proved particularly effective in providing an interpretation of the functioning of the teaching-learning relationship based on the raising of the subject's active role in the mechanisms of knowledge. According to the

constructivist view, learning is indeed the function of how the person constructs the meaning from his own experience, and his most radical version "*develops a theory of knowledge in which knowledge does not reflect an "objective" ontological reality, but exclusively an ordering and organization of a world constituted by our experience*" (von Glasersfeld, 1988). Within the constructivist paradigm, in fact, "*the teaching is conceived as the time when teacher and students cooperate to produce a meaning*" (Tizzi, 1990). It implies a constant construction and reconstruction of their mental schemes using the experiences in progress (Bertrand, 1998). In this sense, constructivism rejects the "metaphysical realism". Its consequences in the educational and teaching field are reflected in the development of training programs that can foster a communicative interaction leading to a construction of shared meanings. Hence it is against a concept of teaching meant as a transfer of absolute knowledge. In the constructivist perspective, experience is the basis of the construction of knowledge: the meanings ascribed to the events and the objects depend largely on the personal experience that involves *thoughts, feelings and actions* (Novak, 1998).

The communicative interaction achieved through the active participation encourages the sharing of experiences necessary to the acquisition of meanings that can be marked in order to share, compare and modify them (Novak, 1998). According to Joseph Novak, the body and the action play a central role in the processes of knowledge. He conceived the action not as a passive event but as a conscious, intentional and emotionally charged event that "*at least in the mind of the actor, has a precise meaning*" (Novak, 1998).

The constructivist view interprets the relationship between action and knowledge in terms of co-construction, as the world comes out together with the action and the thought and it does not pre-exist to this relationship, suggesting that "*every action is knowledge and all knowledge is action*" (Maturana, Varela, 1992). In this perspective, learning cannot be meant as a mirror of the reality but as a result of construction of meanings in which action and experience have a central role.

Background and Theory of Concepts Maps

In the educational and didactic field, the research on how meanings come from the experience has led to test teaching-learning models and techniques, representative of knowledge and in favour of its acquisition. At the beginning, it had to recognize the presence of a pre-existing knowledge and "naive theories" already acquired by the learning subject during his/her early experiences and then build a new knowledge significantly connected to them. In fact, at the beginning of every learning experience, each student has its own cognitive matrix which is subjected to evolution and made of its own internal representations, concepts, principles, rules, procedures, plans of action and intellectual abilities, each one with its own significance, fixed by the extension and the importance of networks of relationships internal to the subject. According to the principle of assimilation by David Ausubel (1978), a prerequisite for *meaningful learning* is that the new material to learn is related to the learner's existing knowledge, creating a network of relationships that make easy to remember and use the new knowledge.

In the seventies, in the course of a research program made at Cornell University, according to Ausubel's thought, Joseph Novak (Novak & Musonda, 1991) proposed the use of concept maps as tools to create and use knowledge. He also described the strategies to use them in many scientific works. Novak, in particular, proposed an educational theory, which explains why *rote learning* is ineffective for long-term storage and for putting into practice the knowledge learned and why, instead, meaningful learning is more suitable to the development of creative thinking (Novak, 1998). In the first case, it is a *learning* that takes place when the learner memorizes the new information without connecting them to the previous ones; in the second case, it refers to the learning that occurs when the learner chooses to relate new information to those he has already possesses.

In clarifying his thought, without ignoring the main role of the action, Novak focuses on how a person involved in a training program acquires his/her knowledge and how he/she mentally and visually represents it in a net of interconnected conceptual nodes. The use of concept maps, proposed by Novak in collaboration with Gowin, aims at showing the connections between the meanings that are attributed to the concepts, representing a constantly open and integrated knowledge. Novak and Gowin (1984), referring to Ausubel's thought, identify a subject's ability to recognize, according to his own and sometimes exclusive methods, the regularities in nature and therefore the concepts. They are the set of "features" that are in common not only with the observed objects and events, but also with the actions, gestures and mimic activities directly performed by the subject or observed in the others. The regularities which, at the light of experience, prove themselves reliable or they do not (von Glasersfeld, 1988), represent the basis to give meanings that cannot be limited to a process based only on the visual or auditory canals, but that looks as a personal and more complex sensory-perceptual synthesis of information and cognitive structures of the subject. The world of experiences is also a test-bed of our ideas, holding a plurality of channels which help the acknowledgement of the regularity in the events and objects.

Constructing Concepts Maps by using Body and Action

Starting from these theoretical assumptions, many scholars have developed teaching-learning strategies aimed at fostering a "*meaningful learning*" (Jonassen, 1991). This theoretical research is part of these studies and it aims at investigating the potentials of the body and action in facilitating the acquisition of concepts. With this purpose it has been proposed a teaching method to be experimented in formal educational settings. Its basic idea is to provide "dynamic concept maps" that, like concept maps that are traditionally and iconographically represented, make clear the relations between the concepts that make propositions through the action.

Specifically, it has been supposed a theoretical support to the teaching activity, in a laboratory form, which can achieve a way to do and to act and which helps to test alternative experiences to a teaching method based on words and images in order to link the concepts and then to compare them with other criteria of the educational training activity.

The bodily-kinesthetic mapping, that is meant to carry out, is not, except in some specific cases, a replacement of the iconographic structure of the concept maps, but it is their derivation. It has complementary functions and it is conceived as an alternative methodological path supported by the teacher and aimed at using the body and the action in the production of new concepts.

In this perspective, gestures and motor actions represent "*body-kinesthetic labels*" (Novak, 1998), that, like words, may be constants perceived in the events or in the objects, or evidences, symbols and representations of events and objects, "whose combination in simple units encourages the construction of meaning" (Novak, 1998). In this theorized teaching approach, a proposition includes many "*motor labels*" linked to each other and able to express a meaning.

Therefore, the didactic-motor construction of a proposition requires the learner the attribution of a meaning to each label as well as to the relation between different motor labels. Actually, it is this attribution of meaning to the links that are produced, which gives meaning to proposition, that is a sort of expressive and figurative circuit, where each sentence is functionally linked to the others.

It is useful to consider that, according to the theory that inspired the concept maps, the attribution of meaning to a concept increases in relation to the propositions that are built and connected to it. In this sense, the construction of a concept through the didactic approach of the dynamic maps responds to the need to identify different meanings by using propositions made of "*intentional action*" that, due to their nature, can expand the attribution of meaning to concepts that are sometimes already part of one's own personal knowledge.

The attribution of meaning to a learning experience can take place in various ways, including the one that involves the use of intentional actions which calls for the recognition of constants within motor experiences which naturally, or by analogy, express specific meanings.

Therefore, this didactic-methodological approach proposes a learning-teaching action that takes into account the above said theoretical framework and which can be considered a different teaching method, broadly consistent with the technique of the concept maps and using the action to evoke symbols and representations related to events and objects.

To support this theory, many contemporary scholars recognize the potentials of the motor experience as a way for the construction of concepts, asserting the existence of an *embodiment* of human knowledge, that shows itself in the cognitive processes till the more abstract reasoning and which depends and uses "*low level*" concrete structures, such as the sensory-motor system (Lakoff & Johnson, 1999). This view suggests the didactic use of the action for the construction of knowledge.

Hence, the approach that we intend to suggest, supported by a clear rationale, responds to the need to promote teaching methodologies that are able, through multi-sensorial experiences, to "*...evaluate the characteristics of the perceptual materials and find regularities, common and uncommon features, that allow to build concepts*" (Novak, 1998) and to represent them through the action.

So, the educational use of the dynamic maps wants to be a method of teaching and learning which gathers some of the principles that underlie the construction of concept maps, recovering the didactic usability of the concept maps, motivated by the simplicity that summarizes the individual learning process, and giving strength to the links that give meaning to various concepts. Through the teaching use of the dynamic maps, which requires the development of "motor labels" of the concepts, the logical structures and the perceived constants, together with the definition of propositions corresponding to actions, gestures and mime-gestural forms, it is possible to contribute to the definition of "*bodily-dynamic conceptual itineraries*" that facilitate a possible construction of multi-dimensional meanings.

On a methodological level, the teaching development of the concept maps, as shown by Novak and Gowin (1984), indicatively follows the following stages:

- a) to clarify the role of concepts and the relationship among different concepts;

- b) to identify written materials or verbal concepts and the links among different concepts;
- c) to display a map using the concepts and the links between concepts referring to written or oral materials.

This technique naturally gives a key role to the visual memory, both in relation to the attribution of meaning and to the reminiscent ability of memory traces. The proposed approach uses other sensory channels, mainly using the movement to represent and then give meanings

The "bodily-dynamic maps", similar to the concept maps, are a "good way to help teachers to organize knowledge for teaching and a good way for students to discover the key concepts and principles in lectures, readings or other teaching materials"(Novak,1998).

The teacher, when proposing this teaching methodology, plays a crucial role in the construction of knowledge, and he teaches in compliance with a teaching method that is guided by the principles of constructivism. He is part of the group, he shares his personal experiences with the others, giving up any claim to centrality to fit in the communication network that takes place during the teaching-learning experience.

Organization of the didactical proposal

On the methodological and organizational level, this educational approach requires the subject to which it is primarily addressed, to "choose to learn by attempting to incorporate new meanings into their prior knowledge"(Novak,1998). It also demands the teacher to take into account the prior knowledge which has to be related with the new ones and to provide a significant material that can be related to what already own. On a technical descriptive level, the organization of the educational proposals inspired by this theoretical approach can be developed according to the following steps:

1. The teacher analyzes the characteristics of the chosen topic with the students, referring to the specific domain of knowledge, trying to distinguish events and objects.
2. The teacher analyzes with the group of his /her students the regularities that are present in the subject of study in terms of perceived constants that can be translated into concepts, logical structures, connections between words related to the specific domain of knowledge.
3. The teacher asks the class to test a motor reproduction or interpretation of each event and each object within the subject matter.
4. The teacher asks the students to test a motor interpretation of the concepts and propositions connected to them, representing the perceived regularities and the links that make the logical structures in a dynamic-bodily way. In this phase of experimentation, as in the previous one, the proposed didactic approach necessarily calls for a guided discovery learning aimed at identifying individual actions, gestures and miming activities representing motor labels.
5. Every student, after the motor interpretation, constructs individual "motor labels" of the concepts, the logical structures, or the links and perceived regularities, defining propositions corresponding to actions, gestures and miming-gestural forms that represent in symbolic form or in real form different meanings. In this first phase of motor labelling the general concepts contained in the study and then the specific ones can be represented.
6. Each student builds through "conceptual body-dynamic routes", the script and the setting of his own path that, similarly to the concept mapping, represents one possible representation of concepts and sentences. In this way the routes are real "dynamic concept maps" and represent a methodological tool that helps an active and participatory construction of knowledge that can be recalled directly or which can evoke additional concepts through associative mechanisms achievable through a symbolic and emotional use of the body and the movement.
7. Each student performs and interprets his own dynamic-bodily conceptual route at the presence of the class and it will express in an individual "story" of the motor labels assigned to concepts and propositions.
8. The class group as a whole prepares a specific and shared bodily significant learning path that is like a "flexible script" of a dynamic map in which the script is represented by motor actions, which from time to time represent one or even more meanings through the action performed (Sibilio, 2010).

The script, starting from general concepts about the subject matter, will be gradually and progressively supplemented by shared motor labels that will increase the meaning of the dynamic map for the entire class group. Similarly to the structure of a script, each student will have the opportunity to interpret a part of the route by proposing his/her own motor labels, modifying or integrating them following the suggestions of other students and functionally including them as "stations" of an expressive-motor circuit. In every station, each student is then called to interpret his own motor label and to represent concepts and propositions, endowing them with the suggestions of the class group.

Conclusions

The constructivist paradigm allows the study of didactics starting from its own interpretation of the function of teaching, that can be considered as a professional skill aimed at *giving meaning* to the teaching experience proposed by the teacher to the learner. Knowledge is so the result of a subjective experience, that during the same teaching proposal, can induce each student to give a different meaning, which depends on both the prior knowledge and on how each person gives meaning to his/her own experience. In fact, in this perspective, every teaching action, before being prepared and implemented, should take into account that the past knowledge of each student may have, from case to case, different meanings. The construction of new meanings requires in fact to analyze the characteristics of each student to plan teaching-learning interventions aimed at recognizing the “starting” conditions "on which to anchor the construction of a teaching-learning path and to define the most suitable methods and techniques. Within the school world, it is very often not considered the meaning of the motor experience, potentially effective in the construction of knowledge, so limiting its usability in teaching. According to a constructivist approach to the teaching-learning relationship, the didactical methodology should be able to foster the construction of meanings, according to the different ways each person uses his/her own *cognitive device* to give labels to objects and events. In this perspective, the didactic value of the concept maps is its attempt to integrate the subjective representation of the meanings with a collective construction of labels able to widen the horizon of the concept, considering a possible shared cognitive action.

Of course, Novak and Gowin’s technique of the concept maps is a teaching method that reflects the complexity of our cognitive functioning, but using written and oral forms of communication, it cannot understand all the meaningful possible paths inspired by the constructive approach. The symbolic value of the body and movement, its expressive strength, its evocative and reminiscent ability, lead to consider the bodily dimension of the teaching as a path to experiment teaching methods to come along with the use of concept maps. The method of dynamic maps, making use of the natural attractiveness of the individual and group motor experience, can be considered as a methodological attempt to create learning experiences that could potentially take on a meaning in an original form for the subject, because the action is often able to solicit cognitive mechanisms capable of constructing and reconstructing objects and events, anchoring them to the various symbolic, mimic analogic, expressive forms of the movement.

References

- Ausubel, D. (1968). *Educational psychology: A cognitive view*. New York: Holt, Rinehart, and Winston.
- Bertrand, Y. (1998). *Théories contemporaines de l'éducation*. Montreal: Éditions Nouvelles.
- Dilthey, W. (1922). *Einleitung in die Geisteswissenschaften Versuch einer Grundlegung für das Studium der Gesellschaft und der Geschichte*, Leipzig: B. G. Teubner.
- Jonassen, D. “Objetivism versus constructivism: Do we need a new philosophical paradigm”. In *Journal of Educational Technology Research and Development*, 39(3) (1991): 5-14.
- Lakoff, G. and Johnson, Mark T. (1999). *Philosophy In The Flesh: the Embodied Mind and its Challenge to Western Thought*. New York: Basic Books.
- Maturana, Humberto R. and Varela, Francisco J. (1980). *Autopoiesis and Cognition. The Realization of the Living*. Dordrecht: Reidel.
- Novak, Joseph D. (1998). *Learning, creating, and using Knowledge: Concept maps as facilitative tools in schools and corporations*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Novak, Joseph D. and Gowin, D. Bob. (1984). *Learning how to learn*. New York and Cambridge: Cambridge University Press.
- Sibilio, M.(eds) (2010). *Ricerche corporeamente in ambiente educativo*. Lecce: Pensa.
- Tizzi, Edoardo W. (1990). *Didattica. Itinerari bibliografici per la scuola materna elementare e media*, Genova: Sagep, 1990.
- von Glasersfeld, E. (1981). *An Introduction to Radical Constructivism*. Originally published in P. Watzlawick (Ed.), *Die Erfundene Wirklichkeit*, Munich: Piper,. Author's translation in P. Watzlawick (Ed.), *The Invented Reality*, New York: Norton, 1984.