

Constructivist and Investigative Learning Environments in Distance Teaching

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Abstract

This communication respects to an important theme either in face-to-face teaching or in distance teaching: the *learning environments*.

In a first part it is described the history of the learning environments' research, highlighting the lines at international level in this field.

In a second part of this communication we seek, based on diverse studies (Cunningham, Duffy and Knuth, 1993, Jonassen, 1994, Savery & Duffy, 1995, Jonassen and Tessmer, 1996, Brooks and Brooks, 1993, 1999, etc.) and on the works developed by a group of researchers, including the author of this communication, to define the so called *constructivist and investigative learning environments* and discuss its main general characteristics, with particular emphasis to the cooperative work, multiple representations, pedagogical relationships, metacognition and some others aspects that are underlying to its implementation.

In the third and last part it is highlighted the fundamental importance that these environments have in the online teaching when we intend to have a social presence, a cognitive presence and a teaching presence (Garrison & Anderson, 2003).

Keywords: distance teaching and face-to-face teaching; learning environments; constructivist and investigative learning environments; cooperative work; metacognition

Introduction

The teaching of the *Industrial Society* privileged the relation teacher-student in detriment of the relation *student-student* (Bessa & Fontaine, 2002, p. 22-23). Not many years ago was detached the importance (unquestionable, is a fact) of the binomial teacher-student, but few people spoke about the relation student-student. In the transmission model that invigorated, it was fomented competition and not the cooperation, as if the education was a duel (some teachers used the «*sabatinas*» where two students made questions each other without, at least, the teacher being worried if the student who produced the question knew the answer!).

However, already in all the first half of the last century, some philosophers and educators as John Dewey, Celestin Freinet, Maria Montessori and others had started to contest this kind of practices and to develop the idea that it is important, in the educational field, to foment the cooperation in the search of the knowledge and to develop the sharing of experiences.

In the third decade of the last century some works were produced in the area of psychology that recognized the behavior of a subject as a function of himself and the environment where he is inserted (Lewin, 1936, Murray, 1938, cit. Sebela, 2003, p. 23), but were only in the 1960s that Herbert Walberg and Rudolf Moos, working independently, had launched the bases for the development of the educational research on *learning environments* (Majeed, Fraser & Aldridge, 2002, cit. Sebela, 2003, Fraser, 1986).

Trying to put in concrete form its ideas concerning good learning environments, Herbert Walberg developed an instrument focused on these environments, the Learning Environment Inventory -

LEI, which was used in activities of evaluation of a well known Course of Physics: Harvard Project Physics (Newby & Fisher, 1997, Fraser, 1998, Sebela, 2003). At the same time, Rudolf Moos developed the first one of its scales of social climate, designed to diverse finalities (Moos, 1968, 1974, Moos & Houts, 1968, cit. Fraser, 1998, Sebela, 2003). Later, a surpassing perspective of the two instruments appeared which has influenced the way as the conceptualization, the evaluation and the research of learning environments are processed (Moos, 1979, Walberg, 1979, cit Walker & Fraser, 2004, Fraser & Walberg, 1991; Newby & Fisher, 1997; Fraser, s/d, Sebela, 2003).

The 3rd version of LEI, (LEI-1982), which authors are *B. J. Fraser, G. J. Anderson* and *H. J. Walberg*, for example, was considered an inquiry instrument “*intended to measure student perceptions of 15 dimensions of the social climate of high school classrooms or middle school.*” (Fraser, Anderson & Walberg, 1982). It contained 48 items distributed by 4 scales: relationships; personal development; system maintenance; physical environment. The describers were the 5 common ones: I strongly agree; I agree; without opinion, I disagree; I strongly disagree. This tool was later reviewed, in 1985, in the *Ninth Mental Measurement Yearbook* and, in the meanwhile, many scales for all school levels appeared since the elementary schools (Fraser & O'Brian, 1985, cit. Sebela, 2003) until the university (Fraser & Treagust, 1986, cit. Khine & Chiew, 2001).

In the 1990s, the constructivist ideas began being incorporated in this field. A new instrument named *Constructivist Learning Environment Survey* – CLES was created, that its authors had presented in 1991, in a communication submitted to the Annual Meeting of the American Educational Research Association, in New Orleans (Taylor & Fraser, 1991). It was designed “to enable teacher-researchers to monitor their development of constructivist approaches to teaching”. As a matter of fact, it evaluated the perceptions of teachers and students on determined dimensions considered important in learning environments, before and after its implementation. These dimensions are the following ones (Sebella, 2003):

- *Personal Relevance* – the extent to which teachers relate science and mathematics to learners' out of school experiences.
- *Uncertainty* – the extent to which opportunities are provided for the learners to experience mathematics and science knowledge as arising from theory dependent inquiry, involving human experience and values
- *Shared Control* – the extent to which learners are invited to share with the teacher's control of the learning environments, including the articulation of their own learning goals, designed and management of their learning activities with the determination and application of assessment criteria.
- *Student Negotiation* – the extent to which opportunities exist for learners to explain and justify to other learners their newly developing ideas and to listen and reflect on the viability of other learners' ideas.
- *Critical Voice* - the extent to which a social climate has been established in which learners feel that it is legitimate and beneficial to question the teacher' s pedagogical plans and methods and to express concerns about any implements to their learning.

The instrument is available in two forms: the *preferred form* that was designed to assess students' perceptions on learning environment that they would ideally like and the *actual form* to assess the students' perceptions after its implementation in a classroom.

Three years later, it was presented a second version of CLES (CLES-1994), just at the same annual meeting (Taylor, Fraser & White, 1994). In this meeting, authors affirmed that this second version was developed “for researchers that are interested in the constructivist reform of high school science and mathematics”. And they said also:

The cognitive focus of the earlier instrument has been broadened by including a concern for the social-cultural forces that shape the rationality of traditional science and mathematics classrooms (*idem*).

This remodeled instrument was designed to evaluate the teachers and pupils' perceptions on some dimensions that its authors consider important in a learning environment. It has 5 scales, each one concerning to one key-aspect, in a total of 40 items. These key-aspects are the following:

- (a) making science and mathematics seem relevant to the world outside of school;
- (b) engaging students in reflective negotiations with each other;
- (c) teachers inviting students to share control of the design, management, and evaluation of their learning;
- (d) students being empowered to express concern about the quality of teaching and learning activities;
- (e) students experiencing the uncertain nature of scientific and mathematical knowledge

Many works have tried to validate this instrument in different areas. For instance, one of them (Cannon, 1997), based on CLES was developed with *College students*, in *Biology*, Chemistry and Physics courses and some conclusions were formulated. Some of them are these:

- Students preferred to be taught along the frameworks consistent with constructivist epistemology.
- The CLES helps College Science teachers to become more consistent with a constructivist epistemology.
- The CLES appears to hold promise for assessing classroom learning environments in College science courses.

Another research was developed by *Mokgoko Sebela* in South Africa for prepare his thesis for the Degree of Docor of Mathematics Education (Sebela, 2003). He submitted *1864 students* of different levels to this last version of CLES and the results were very consistent (high reliability coefficient). Based on this fact, he concluded that researchers and teachers can be confident concerning the use of the modified version of the CLES in the Mathematics in South Africa.

Other instruments had been produced, in particular some inventories with scales that were designed to quantify the presence of some characteristics of learning environments and were used and validated in diverse research in different countries. One of these instruments, for example, the "My Class Inventory" (MCI) was used and validated in Australia with 1565 students of Mathematics (Majeed, Fraser & Aldridge, 2001). Another one, the "College and University Classroom Environment Inventory" (CUCEI) was developed, in 1997, by Fraser, Treagust, Williamson and Tobin to evaluate the perceptions of the psycho-social environment in university lessons (Khine & Chiew, 2001; Crump, 2002). Similar studies with the most varied pupils had been made in many disciplines since the Mathematics to Agriculture, for example, in tertiary education in Singapura (Khine & Chiew, 2001).

Another series of research related with constructivist learning environments was basically directed for a different line. More than to try to know the perceptions of the students, this line intends to search the effect of these environments on their results (McRobbie & Fraser, 1993). Besides to theorize about the classroom environments that we think are propitious to better attitudes and achievements of the students, this research line looks for to validate the constructivist ideas about learning environments with experiences in classroom, complemented many times with inquiries to the teachers and pupils involved in the research. More precisely, this research is trying to validate, as universally as possible, certain ideas, some of which already with more than 20 years, as, for instance, the following ones:

- the essential idea that good environments in the classroom can improve the learning;

- that the results of the students improve in the classrooms in which environments have similar characteristics to those that students prefer.

In a research line that results of the investment that we have made in the constructivist epistemology of sciences and in the educational psychology, we have been trying to theorize about good constructivist learning environments and also to submit our ideas to the experimentation in classrooms. We are then integrated in the second of the kinds of research we referred. So far, we are in a phase where the theoretical investment is already significant, but the experimentation is still precarious.

Constructivist and Investigative Learning Environments

The theoretical basis of these environments seats, on one hand, in all the research developed and centered in learning environments and, on the other hand, in a series of theories of important psychologists, who had worried about the importance of the social factors in the personal and idiosyncratic process of learning of each student. Thus, for example, Vygotsky shown that the social interaction plays a basic role in the cognition: all the superior cognitive functions result of the relation between individuals and social environments and are culturally mediated. A more advanced level of development of a pupil is reached if he is submitted to cooperation between pairs or to the support of an adult, to explore the potentialities of the "*zone of proximal development*". In turn, Bruner (2000) developed four basic ideas about the pupil who is involved in an efficient learning: the idea of *action*, that is to question, to select information and to become involved in guided heuristic processes for a purpose; the *reflection*, that is to reflect on the proper thought and the proper accomplishment; the *collaboration*, that is to look for the dialogue and the speech with the others; and, finally, the *culture*, the enrolment in a cultural world as a pattern of life and the thought about the reality.

The learning of the pupils must be directed by these four ideas and be participative, collaborative, pro-active and pointed to the community. Joseph Novak and Bob Gowin (1999) shown the importance of the "negotiation" of meanings between teachers and pupils on the basis of the curricular materials and the use of metacognition and metaknowledge instruments that facilitate the extraction of meanings of materials, many times conceptually opaque for the students (one of the reasons why Gowin created the Vee diagrams and Novak created the concept maps). More recently, the idea of 'situated learning' appeared, having been developed by Jean Lave and Etienne Wenger (Lave & Wenger, 1991), linked to the idea of 'community of practice'. The idea of situate learning is anchored in the basic principle that knowledge and context are indissociable and that learning requires social interaction and collaboration. There is not, according to Lave and Wenger learning without context, learning occurs in a context of practices and with the reflection about theses shared by the people who are involved on them.

Another fundamental line of research very important to constructivist learning environments is the one that had whose focus is the so called 'cooperative learning', that will be treated in another section.

At last, a series of different theories were complemented and is in this complementarily and in the ways they are related they must be thought and they become useful for the fundament of good learning environments propitious to the collaboration and even to the most demanding cooperation.

With to the creation of sophisticated technologies and easy computational tools to use, it is possible nowadays to create good constructivist learning environments also in distance education, breaking with the traditional isolation that involved the old students of this modality of education. It is now possible to socialize the environment where the e-learning is processed, with technologies that enrich the communication on-line, allowing to videoconferences, chats, forums, multimedia presentations, metacognitive tools that are propitious to the negotiation and sharing of meanings, for example those ones of cognitive mapping and concept mapping, and that facilitate not only a formative but also a summative assessment, and so on. The accessibility and usability of the learning environment interfaces on-line has grown enormously. Today, for example, it is possible communicate throw chats where is not necessary to read what was written by our interlocutor as we listen to a digitalized voice saying what he wrote. This is just what occurs, for example, in the Odissea1 platform created by a researcher of the Open University of Lisbon. To add to everything this, we make use today of a series of didactic computational resources that can add much value to the e-learning, but our reference about that is in another section of this paper. For now, we go to try to characterize constructivist and investigative learning environments.

What is a constructivist and investigative learning environment?

A constructivist and investigative learning environment is, in agreement with the label, a learning environment that seats in constructivist and investigative ideas. But as the two adjective "constructivist" and "investigative" are far of being clear and consensual, it is necessary to clarify what they mean. Let us start with the constructivism. This word has many meanings. Thus, the question of what means this word does not have one only answer. The constructivism was object of confused and incoherent interpretations and there are diverse qualifiers to characterize it, such as contextual, dialectic, empirical, methodological, moderate, piagetian, after-epistemological, pragmatic, radical, realistic, social, socio-historical (Matthews, 1992, p. 34; 1994), empiricist, rationalist and pragmatic (Bickhard, 1998, p. 104-108), cognitive, epistemic and metaphysical (Grandy, 1998, p. 114), etc. But there is an essential idea that is shared by all «flavors» of constructivism: the knowledge of the world is a human construction and, as all the human constructions is fallible. The ideas constructed by the individuals and by communities of individuals are evolving along the time implying that the idea of knowledge-fact was substituted by the idea of knowledge-process. Beginning of this same base, the constructivists later are divided in two great groups: the *radical constructivists* that do not believe in the representational character of the knowledge and that based the knowledge value in an immanent validity that respects to the coherence and viability of the constructed ideas; and the *trivial constructivists* that believe in the representational character of the knowledge and that extend its value to a transcendent validity, based on a correspondence and an increasing approximation between the produced ideas and real "objects" they respect to¹.

¹ This clear distinction of these two great kinds of constructivism was established by Ernest von Glasersfeld, an assumed radical constructivist.

After the study we made about diverse forms of constructivism and many bibliographical consultations on this subject, we seated in a trivial form of constructivism, the one that Novak (1990, 1993) designated by *human constructivism*. Underlying it, there is a surpassing epistemology of the great antitheses concerning scientific knowledge and that appeared in the long history of the philosophical thinking about this knowledge, the antitheses realism-idealism, empiricism-rationalism and skepticism-dogmatism, that I consider well translated in the underlying ideas to the so-called 'Vee of Knowledge', epistemological Vee or also 'heuristic Vee, of Bob Gowin. *Human constructivism* is also based on the psychological ideas of Joseph Novak, ideas that are, at the same time, heuristic, cognitive and humanist. It recoiled some essential ideas of other forms of constructivism, particularly of the cognitive, social and cultural constructivisms, for example: the importance of previous cognitive structure of who constructs the knowledge, of the cognition and the metacognition, a cognition that depends on intellectual, affective, volitional factors, etc.; the importance of a culture, basically of a humanist culture with a transdimensional vision of the human being; and the relevance given to the social factors, signs and artifacts, as fomenters and not as inhibitors of a progressive science.

The human constructivism is based on great *principles* (Novak, 1990, 1993; Gowin, 1990; Mintzes e Wandersee, 2000, p. 58-65). The first one of them is that human beings are creators of meanings. As a matter of fact, the production of scientific knowledge is, trully speaking, the production of new meanings about the objects of scientific research. And an empowering learning is the one that conduct to new meanings about the subject that are being learned. This is the reason why this kind of constructivism is related with the so-called *meaningful learning* (Novak, 1990, p. 6; Mintzes & Wandersee, 2000, p. 57-65; Marín Martínez, 2003, p. 44, Moreira e Buchweitz, 1993), a «substantive» learning where is the «stuffing» of the concept and not only the «skin» that is assimilated by students. As is affirmed by *Mintzes and Wandersee* (2000, p. 58), the *human constructivism*

Offers the heuristic and vatic power of a psychological model of human learning, together with the analytical and explicative potential involved in a philosophical and unique perspective about concept change.

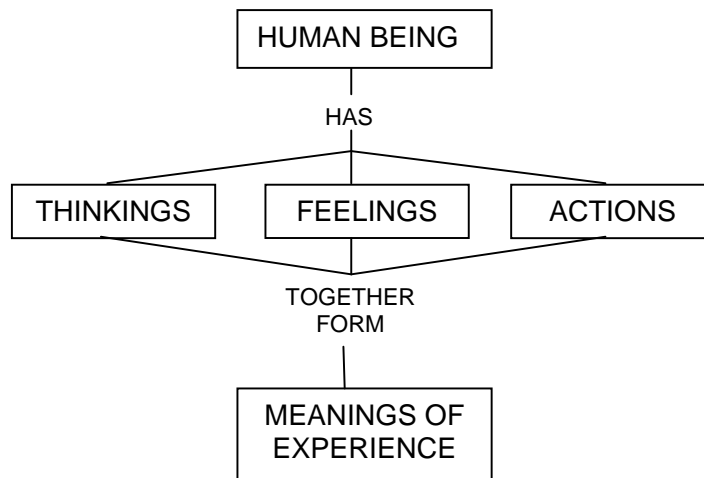
This constructivism is, according to Joseph Novak,

a vision of the creation of meanings that comprehends either a theory of learning or an epistemology of knowledge (Mintzes & Wandersee, 2000, p. 58).

This theory they refer to is the *theory of meaningful learning* and the epistemology that underlies it is, at the same time, *cognitive, constructivist and humanist*.

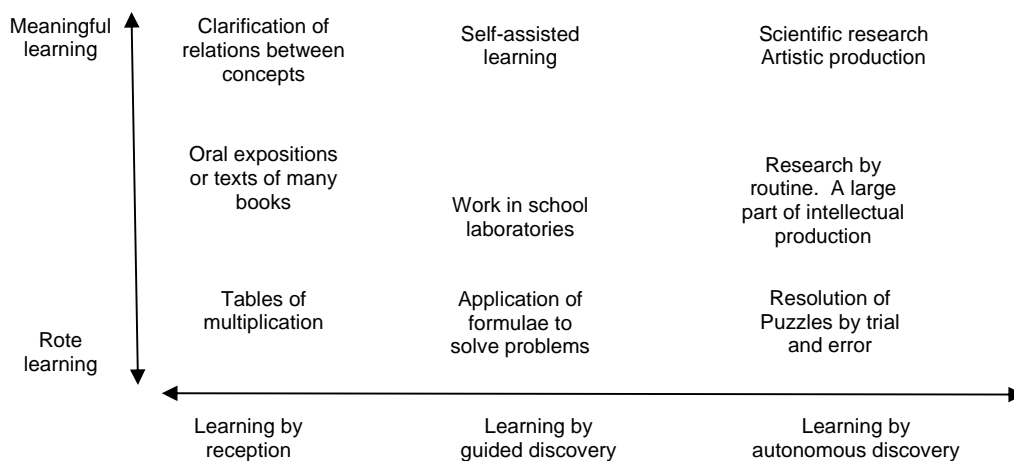
Another principle is that the education must have as an objective the construction of shared meanings as succeeds with the scientific production. Therefore this form of constructivism gives to much importance to the sharing and negotiation of ideas in good environments that are propitious to this sharing and negotiation.

Another principle is related to the transdimensional character of the human being in what concerns to its cognition. This principle is defended since many years ago and the cognitive psychology and the modern sciences and technologies of the cognition have come to confirm. Therefore, this constructivism defends that the meanings concerning the experience human are modified through the interaction between thinking, feelings and actions.



The meanings of experiences are the results of thinkings, feelings and actions (Novak, 2000, p. 10)

Another much singular idea of this meaningful learning theory and the human constructivism, whose original author was the educational psychologist David Ausubel, is that learning can be more or less meaningful or mechanics (literal), independently of being acquired by reception or discovery and that the scientific research and the artistic creation are original and highly creative forms of production of new meanings, that must serve as a reference for who wants to learn meaningfully.



Two dimensions of learning (adapted from Ausubel, Novak e Hanesian, 1980, p. 21, Novak e Gowin, 1999, p. 24 and Novak, 2000, p. 28).

Now, let us to characterize what means the qualifier "investigative" given to the constructivist environment. With this adjective we intend to say that these kind of environments will have to be propitious to the research, to the familiarization of the students with the scientific processes, to an education for inquiry or research (Gil Pérez et al., 1999, Furió, 2001, Cachapuz, Praia & Jorge, 2002, p. 171-191). Depending on the context where it elapses, this education must be active, based on more or less open problematic situations, as much as possible related with the current world and the day-by-day social problems, where the pupils, working collaboratively or cooperatively, go defining their personal objectives along the process of learning. The teacher must have in account the students' conceptions and the context where they work and will have to provide interesting and motivating activities to them, challenging them, but without being inaccessible to their capacities.

The domain of the scientific contents is considered very important, but no more faced as an end in itself, but as a way to think and to reflect about the proper thinking, the science, the current technological world and the society. And if the so-called *substantive knowledge*, based on the understanding of the concepts, principles, theories and laws of science, is important, the *procedural knowledge* is also very important, because it is related with the scientific processes, as, for instance, the gathering and treatment of the information, the experimentation, the interpretation of results and the formularization of value and knowledge claims. Finally, we cannot forget the importance of the *epistemological knowledge* concerning to the nature of science and its relation with the society, the knowledge in action applied to the day-by-day world, the power of *communicating* science, the most varied *attitudes* and *values* that also are fundamental and must be developed in students, etc. Intrinsically, what we intend with this perspective is that the pupil acquires the most empowering varied cognitive-procedural, affective and social abilities, that respect the human and social values, at last, that goes changing its meanings in order to give more and more and better and better contributions for a better world.

In constructivist and investigative environments the students work together and support each other "as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities" (Wilson, 1996). These activities must enclose experiences under multiple perspectives, to provide realistic and excellent contexts, to stimulate the contribution of the students and the assuming of responsibilities for their processes of learning, must also provide multiple forms of representation of the involved situations in the learning and to imply the students be conscientious of the proper process of knowledge construction, through reflexive and metacognitive activities (Cunningham, Duffy and Knuth, 1993). These environments, being important for current education, acquire as much or bigger importance in the context of e-learning, particularly when we design lessons and choose the tools of learning, using the modern technologies. It was also thinking about distance teaching that Savery and Duffy (1995) establish four principles that will have to be emphasized:

- (i) The learning is an active and involving process.
- (ii) The learning is a process of knowledge construction.
- (iii) The learners will have to «function» in a metacognitive level.
- (iv) The learning will have to involve "social negotiation".

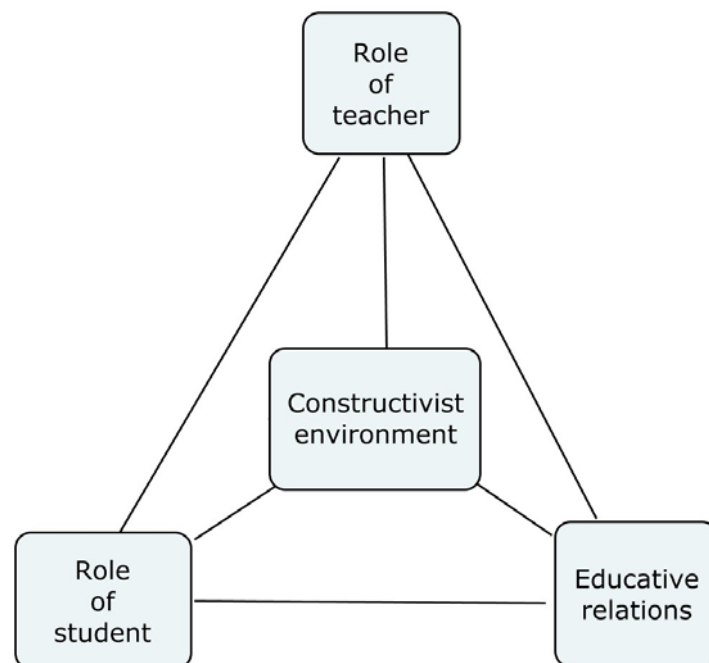
Clarifying the third principle, these authors affirm that the learning must not only be focused in capacities of thinking and in arriving at "the certain" answers, as it occurred in the traditional

activities of routine. The students will have to prepare their proper strategies trying to go ahead to the resolutions of problems and to become more and more autonomous based on the capacity of reflection. Concerning the fourth principle, the students will have to be capable to think about their thinking, beliefs, perceptions and knowledge in contribution with the colleagues.

In turn, Wilson (1996) tried to categorize the constructivist learning environments and made reference to these three types: learning microworlds in computer, open and virtual environments, and other learning environments based on real or virtual classrooms.

To fundament in a more objective way these constructivist learning environments of learning on the classroom, real or virtual, we go to detach three aspects:

- the teacher role;
- the pupil role;
- the educative relationships that must be established.



Beginning by the **teacher** and following the ideas of Brooks & Brooks (1997,1999), he will have to know and to have in account, permanently, the points of view of the pupils, their ideas and conceptions, to provide adequate activities to defy the assumptions of the students, to place problems whose relevance is recognized by them, to conceive the strategies on the basis of ample and inclusive initial concepts and to assess the learning of the students in the context of the day-by-day education and in a perspective as “formatrice” (in French) as possible².

² A very elaborated kind of formative assessment completely integrated in the teaching-learning process proposed by a group of researchers of the “Academie d’ Aix-Marseille”, having as finality to be as pro-active as possible and not retro-active (as the traditional formative assessment), contributing to open and facilitate the path of students, foreseeing their own difficulties in each subject.

The **student** has to have active engagement in its learning and in the learning of colleagues, he must be opened and inquirer in permanent search of knowledge, be intentional in what concerns to the search of answers to the challenges that are placed to him, to know dialogize with colleagues and teacher, reflexive, to think about what he made and amplifying, in order to enlarge his learning to the world outside the school.

Finally, teacher and students must try to establish good and strong pedagogical relationships, based on good interpersonal relations, being essential that:

- could be established a climate of cooperation instead of a rivalry climate and aggressiveness;
- symmetrical interactions, in both directions, instead of complementary interactions, in one only direction;
- and the maximum attention to the representations and to the representations of the representations (typical example: what he thinks about what I think about him).

Cooperation as a support of constructivist learning environments

One of the basic characteristics of constructivist learning environments is that they will have to foment the collaboration, even the cooperation, in the work groups. The collaboration implies that the students interchange ideas, they help each other, but they do not have a positive interdependence in the group until the point of all of them to assume a group spirit and each member be responsible for the largest success of all. In the cooperation, this spirit has to exist and has some teachers defending that in the final and individual assessment of each student must be as a criteria to final score the more or less success of the remaining members of the group. There is already a long tradition of research in the area of the so-called 'cooperative learning', or better, the learning in cooperation, as the learning is a personal and idiosyncratic process that cannot be shared, but can be greatly influenced for the learning in cooperation. The investigators that had been more well known as defending and promoting the learning in cooperation are the brothers David and Roger Johnson, of the University of Minnesota, Robert Slavin, of the University John Hopkins, Spencer Kagan, of the University of California, Elisabeth Cohen, of the University of Stanford and Shlomo Sharan, of the University of Tel-Aviv (Freitas & Freitas, 2003). These and other investigators (Humphreys, Johnson & Johnson, 1982; Sherman & Thomas, 1986; Johnson & Ahlgren, 1976; Tjosvold, Marine & Johnson, 1977; Wodarsky et al, 1980, cit. Abu & Flowers, 1997) has developed diverse studies that test the effectiveness of this methodology of learning.

The cooperative learning, according to Roger Johnson and David Johnson, director of the Center for the Cooperative Learning of the University of Minnesota (Johnson & Johnson, 2005), is

“a relationship in a group of students that requires positive interdependence (a sense of sink or swim together), individual accountability (each of us has to contribute and learn), interpersonal skills (communication, trust, leadership, decision making, and conflict resolution), face-to-face interaction, and processing (reflecting on how well the team is functioning and how to function even better)”.

The main characteristics of a group of students learning cooperatively are then:

- a positive interdependence, which leads to a sensation of success or joint failure;
- a direction of common responsibility, that each one has to know and for which has to contribute;
- definitive interpersonal capacities related with the cooperative work demands, such as communication, confidence, leadership, taken of decisions and conflict resolution and a constructive, reflexive and self-evaluative interaction, that contributes effectively for the improvement of the learning of all.

Many educational psychologists have detached the importance to socialize education and to foment the cooperation. It is the case, for example, of Bruner (2000), when he defends

(...) the construction of school cultures that operate as mutual communities of pupils, involved jointly in the resolution of problems, all contributing for the process of mutual education (...) In such school cultures, to be innately good in something implies, among others things, to help the others to be better in that (p. 115).

It is natural that, as affirm Gail & Carter (2000, p. 233), a great part of the popularity of the learning in cooperation is related with the social perspective of education. All the teacher who wants to promote the learning in cooperation must have in account that this is "much more of that simply to place the pupils to work in a group" (Bessa & Fontaine, 2002, p. 57). The idea of that the cooperative work is much more of that the vulgar work of group also was detached by other educators, as for example Johnson & Johnson (1994) and Novak (2000). It is necessary to have in account the specific necessities of organization and motivation of the groups, as well as a set of principles and rules that are essential so that the learning occurs. Novak alerts for the fact of being necessary to follow the recommendations of the brothers David and Richard Johnson and of their co-author Qin, in the sense

of structuralize the work group, in order that each pupil has a clearly and defined role to play, making sure that all the members of the group of learning participate actively (Johnson, Johnson & Qin, 1995, cit, Novak, 2000).

Groups in cooperative work	Groups in traditional work
Positive Interdependence	There is not interdependence or there is a negative interdependence
Individual responsibility	There is not individual responsibility
Demand of the heterogeneity	Demand of the homogeneity
Shared leadership	Without shared leadership
Shared mutual responsibility	There is not shared mutual responsibility
Preoccupation with the learning of the other group members	Lack of preoccupation with the learning of the other group members
Emphasis on the activity and also in the sustainability	Emphasis on the activity
Direct teaching of social skills	It is assumed the existence of social skills
The teacher observes and mediate	The teacher ignores the function of the group
The group monitors its activity	The group doesn't monitor its activity

Social presence, cognitive presence and teaching presence in distance learning

Two of the well-known investigators in distance education, more specifically in e-learning, are D. R. Garrison and T. Andersen. They consider that good distance learning demands that three types of presences need be guaranteed: social, cognitive and teaching presence. As we go to see, the establishment of a constructivist learning environment such as the one we have characterized in this work, proportionate such presences.

Let us start with the *social presence* (Garrison y Andersen, 2005, p. 75-83). This is the form of the students that participate in a learning community could be emotionally and socially with each other. This seems difficult to occur in the distance teaching, that is developed of a predominantly asynchronous form, but if the students will be distributed by work groups, and with the aid of the teacher they create a good constructivist and investigative learning environment, it is guaranteed a truly affective communication between them, an opened and loyal communication, the cohesion and spirit of group and consequently, the social presence.

Let us pass to the *cognitive presence* (Garrison y Andersen, 2005, p. 84-94). It is related with the capacity that the students have "to construct meanings by means of the continuous reflection in a 'community of investigation' (idem, p. 50). The cognitive presence implies, according to those investigators, the reflective, critical thinking, the desire to inquire, of wanting to know, involved in communities of "practical investigation". It is demanded that there is a "broaking effect" of this investigation, the recognition of a problem and a discussion, the "exploration" of materials and exchanges of informations, the sprouting of ideas and some intuition, the "integration" of the students contributions with the search of the solutions for the problem and the "resolution", that is the phase of evidence and defense of the reached solutions. However all these conditions occur naturally if had been created a true constructivist and investigative learning environment in the groups of students involved in e-learning.

Finally, the third presence, the *teaching presence* (idem, p. 95-105). It has to see with the conception of the environment, of the orientation and facilitation of the cognitive and social processes, in order to get educative results and value (idem, p. 51). It respects to the conception and the organization of the process of teaching, to promote and animate the discussions, to give explicit orientations to the students, to give the support (feedback or feedforward) to a good exploration of the problems, to the development of capacities and abilities in them, to the overcoming of diiculties in the problem solving, the discussion of the solutions and the process of resolution adopted, etc. Also this could be proportionate in an e-learning process where the professor appears as the moderator and facilitator of the students' learning, what involves the necessity of creating the kind of environment we discuss in this work.

Conclusion

Either in face-to-face teaching or in distance teaching, the environment where the students work is very important. A good teaching strategy does not imply necessarily good global results, cause between teaching and learning there is not a strict causal relation.

All the investments made in the fields of constructivism, cognition, metacognition, learning in cooperation and learning environments and all the experience recoiled in the face-to-face teaching must be profited to the distance learning.

When the teacher and students involved in an e-learning group create a constructivist learning environment in a virtual classroom, they guarantee the three presences that Garrison y Andersen consider fundamental to have good e-learning and they are in conditions to get better results from the work.

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