ARTÍCULOS DE REVISIÓN

Virtual communities of collaborative learning for higher education

Comunidades virtuales de aprendizaje colaborativo para la educación superior

Gilda E. Sotomayor[12a]

[1]Universidad de Salamanca, Salamanca, España.
[2]Academia de la Magistratura, Lima, Perú.

[a]Educator and researcher of the Ph.D. Program with mention in Training Processes in Virtual Spaces at Universidad de Salamanca. Specialist Professor of the Second Specialization Program of the School of Education at Universidad Nacional Mayor de San Marcos. Coordinator at PROFA (Aspirant Training Program) of the Academia de la Magistratura.

Correspondencia

Email: gisoga@usal.es

Summary

This article aims to outline and project three new learning scenarios for Higher Education that, after the emergence of ICT and communication through the Network-lnternet, have appeared under the generic name of virtual communities. To that end, we start from a previous conceptual analysis on collaborative learning, cooperative learning and related concepts taking place in these communities and serving as a basis for sorting them into three types in particular: communities of educational work, professional practice and scientific knowledge. Virtual communities where the activities undertaken and skills acquired are set as important parts of our personal learning development, which are necessary to build the knowledge society.

Key words: Collaborative learning, cooperative learning, knowledge, social construction of knowledge, virtual communities, learning, knowledge society.

Resumen

El presente artículo tiene como objetivo esbozar y proyectar tres nuevos escenarios de aprendizaje para la Educación Superior que, tras la irrupción de las TIC y la comunicación a través de la Red-lnternet, han surgido con el nombre genérico de comunidades virtuales. Para ello, se parte de un análisis previo de carácter conceptual sobre el aprendizaje colaborativo, aprendizaje cooperativo y otros conceptos afines que tienen lugar en estas comunidades y que sirven de base para clasificarlas de forma específica en tres tipos: comunidades de tarea educativa, práctica profesional y conocimiento científico. Comunidades virtuales en donde las actividades a realizar y las competencias a adquirir se plantean como piezas importantes de nuestras trayectorias personales de aprendizaje, necesarias para construir la sociedad del conocimiento.

Palabras clave: Aprendizaje colaborativo, aprendizaje cooperativo, conocimiento, construcción social de conocimiento, comunidades virtuales, aprendizaje, sociedad del conocimiento.

There is no doubt that search and implementation of curricular adaptations and innovations in the educational system consider the Internet Network as the new environment where the dynamic and important process of creation, management and dissemination of knowledge will be displayed. This new environment structured in a network, where different communication flows come together, would be expanding research and knowledge distribution opportunities as well as coordination among people and more participatory experiences; all this would be offering an opportunity for collaborative learning (Suarez & Gros, 2013).

In effect, it seems that the collaborative is considered now as a key characteristic of online learning and dominant use in educative technology (Garrison, 2006; Harasim, Hiltz, Turoff & Teles, 2000; Kirschner, 2002; Dillenbourg, 2003; Badia & García, 2006). In fact, the popularity these methodologies have gained in the context of virtual education reflects in the last Horizon Report 2014 data, which indicate as one of the trends in high education technology, the increase of online collaborative learning and collaborative environments. Hence the impulse and proliferation of the educational practices focused on team work and network-connected have acquired for construction of knowledge.

These practices would become the invincible formula to achieve the maximum excellence in online education given the academic, social and psychological benefits it provides, which are extensively documented in the field literature, see Garrison, Anderson and Archer (2001); Molinari (2004); Roberts (2005); Haythornthwaite (2006); Guitert, Romeu and Pérez-Mateo (2007); Brindley, Walti and Blaschke (2009). However, the balance of the results in online collaborative learning studies is not very flattering. The relevant conclusion obtained from many experiences in this type of formal education has to do with complexity and difficulties involved in guiding the students' speech from the initial to the more advanced phases of construction of knowledge: students often share ideas and compare information, but is less frequent that they debate ideas, concepts or statements, or negotiate on meaning, and even less frequent that they collaborate in building new ideas (Onrubia, Colomina & Engel, 2009).

This problem has been attributed to methodological and technological matters related to planning, which importance has been very well analyzed in the study by Hernandez, Gonzalez and Muñoz (2004). However, a good part of these methodological and technological problems found has to do with basic conceptual issues and, especially, with the existence of different ways to construe concepts like *Cooperative Learning, Collaborative Learning, Knowledge and Construction of Knowledge*. Thus, we consider it would be a problem related to the lack of conceptual clarity in the terms of our current pedagogical discourse, and related to the concept of Virtual Communities that we will address below.

In light of these considerations, at the beginning we are going to try to make this conceptual set out so that we can state our position and justify the concepts we adopt and the meanings to define those concepts. We believe the lack of conceptual clarity is leading to a methodological error, since the concepts allow understanding reality and talking about it, this is why they are guidelines for action; so that, if the concepts are neither clear nor different, the practice becomes chaotic. Thus, to the extent that we define our concepts, laying on the table the argument related to the problems inherent to collaborative learning and social construction of knowledge in the virtual learning communities, we would make progress in an analysis that allows a better understanding of the underlying phenomenon of the lack of connection between theory and practice. We know that, in practical terms, educational action demands operative concepts. Below we will try to delimit these concepts, providing definitions that make them operational and that serve for articulating methodological frameworks for the three types of virtual communities we suggest for higher education.

Cooperative Learning and Cooperative Learning.

The terms *cooperation* and *collaboration* are often used interchangeably within the academic jargon; however, in specialized literature we find an important number of studies analyzing their differences from different perspectives (Bruffee, 1995; Roschelle & Teasley, 1995; Koschmann, 1996; Dillenbourg, 1999; Panitz, 2001). Based on the selection of some of these differences, we will characterize what we understand by cooperative and collaborative learning. We will use this distinction as a starting point to further outline a classification of the three learning virtual communities,

which we conceive as basic cells of knowledge society.

To begin, we must indicate that cooperative learning and collaborative learning are similar methodological approaches, since both of them consist of working with groups of students. However, basically, they show characteristics that differentiate one from the other, since both of them were originally planned to educate people of different age, education level, experience and teamwork ability. Below are highlighted the differences that have been placed in a chart which will be further explained in detail.

CRITERIA / TYPES	LEARNING COLLABORATIVE	LEARNING COOPERATIVE
ROOT, ORIGIN John Myers (1991)	European continent (Anglo-Saxon tradition)	American continent (USA)
AUTHORITY / CONTROL Panitz (2001)	Students and Professor	Professor
ACTIVITY / TASK Dillenbourg (1999)	Shared (synchronously coordinated among everybody)	Distributed (divided in specific parts for each one)
CONTENT Brufee (1995)	Non-fundamental or non-basic knowledge, less structured Debatable	Fundamental or basic knowledge, less structured. Agreed
APPROACH Díaz y Morales (2008)	Sociocultural (communicative exchanges, type of interaction, joint activity)	Cognitive (participatory, motivational, reward, technical interdependence structures of group work)

Computer Supported Collaborative Learning (CSCL).

In light of the differences exposed in the chart above, we may conclude that *cooperative learning* and *collaborative* learning are two parallel approaches or trends with different origins and traditions. However, the important role exercised by ICT introduction into the educational scope has led many psychological studies and contributions of educative and computer technologists (see Romero, 2008; Romeu, 2011; Guitert & Perez-Mateo, 2013) to finally replace, mistakenly, the term cooperative and praise collaboration since it shows the maximum level of joint work. Hence there is a trend towards the use of the term *collaboration* which, when it takes place in the virtual environment emerges as a renewed concept called

Computer Supported Collaborative Learning (CSCL). This concept is known as Computer Supported Collaborative Learning (CSCL) and it arises initially as a branch of Computer Supported Collaborative Work (CSCW) in labor contexts of team work, being considered nowadays as an independent area and an emerging paradigm for educational technology and a popular instructional approach, especially in higher education.

As it has been said in the beginning, it is recognized that ICT and virtual environments offer innovative opportunities to support collaboration, communication and knowledge production, increasing the possibility to learn and work in teams (Harasim et.al.,2000). However, CSCL is a very complex process that does not take place automatically. In fact, according to Andriessen, Baker and Suthers, 2003; Fischer, Bruhn, Gräsel & Mandl, 2002; Kischner, 2003; Marcelo & Perera, 2007; Coll, Bustos & Engel, 2011; Gao, 2011, in practice, the CSCL is applied with little success within the formal educational system. These studies highlight the big difficulties found in its development due to the insufficient achievement in terms of learning quality and, especially, regarding communication problems among the participants. In effect, experiences like those emerging from CSCL environments have been somehow frustrating, as it has been proved by the several studies compiled by Andriessen et al. (2003) describing how difficult it is to establish dialogue and to generate quality social interactions, based on reflection and based reasoning. In fact, as observed by Peñalosa, García and Espinosa (2011):

> When the content of interactions in these contexts has been analyzed, it has been often concluded that, given the contributions of other members of the groups, categories denoting reconceptualization and modification of individual positions are not established. Instead, repetition of ideas expressed by classmates, paraphrase of fragments from bibliographical material or what has been classified as "serial monologues", which imply expressing ideas unrelated to what the classmates propose are presented(p. 4).

Therefore, difficulties of collaborative work and joint production of knowledge indicate that students do not get used to this type of learning. Moreover, what we confirm is the need of coerce them to collaborate,

since it does not happen spontaneously, as stated by Kirschner (2008), as a consequence they usually feel frustrated or disoriented. One of the keys to understand this GAP or limitation has to do with the complexity of the learning approach in collaborative environments, which is based on the Socratic method of creative dialogue. In effect, this model seeks to provide spaces where discussion among students take place, at the time of exploring certain type of concepts we are interested in explaining or problematic situations we want to solve, so that they can create knowledge on the basis of others' ideas and own ideas. In other words, the matter is to face the challenge of building group knowledge collaboratively from the contribution of each one in information, experiences, knowledge that will be discussed in group and shared, giving rise to a shared knowledge that must be available to everybody once it is organized, classified, structured and ready for reuse.

All this approach seems to meet an adult context of professional development and/or scientific research, rather than a young people context of formal learning. Hence we consider a mistake, on the part of the professor, to adopt this type of learning model without considering that an approach with these characteristics must be analyzed taking into consideration the individuals who are going to use it and the work contexts in which it will be applied, since a model is not usable only for what it is or for the value we give to it, and it represents the contexts in which it will be applied. In this regard, the educational context of school basic education is not the same as the university higher education and, within this context, the initial level is not the same as the most advanced level. This being the case, it is important to assess two variables to take into consideration in order to carry out collaborative experiences: pedagogical regarding the nature and technological methodological design of the learning context, and psychological concerning the profile of the individual participant.

The pedagogical variable of collaborative environment nature and design will be explained later in detail, when we address the item related to the "communities of educational work" that work with the collaborative model. So far we will say that, in this regard, conditions are required to be defined and set out to make possible the active participation and productive interaction of the students, and the inquiry and collaboration mechanisms are activated. To that effect, it is necessary to have the supports, resources

and scaffolding required to promote these performances which do not occur spontaneously among young students.

Regarding the psychological variable, i.e., the profile of the individuals who will participate in the experience and those to whom this model is aimed at, it must be taken into consideration the fact that the structure, since it is quite open, demands from them a certain degree of responsibility, maturity and creativity. Conditions that are found in students from higher courses or very well trained, who have a minimum level of autonomy in their own learning, provided by their ethical responsibility, emotional maturity and certain cognitive development. This is because, for the construction of a knowledge agreed and validated by the group, reasoning and questioning will be jeopardized, becoming necessary some interpreting and negotiation of pre-existing meanings to reach new ones. Hence nobody cannot participate in anything from nothing, from the lack of criterion and lack of knowledge; therefore, it is required that the participants begin with some cognitive base to guide their behavior, getting involved with others' points of view, and enriching the own ones.

This factor of the participant´s profile has a direct relation with the nature of context or group to which it belongs to participate as a member. With this we refer to the different groups and/or virtual learning communities and to the interaction and transactions established within them, according to the profile of the members comprising it. For that reason, we deem necessary to take a look at this type of communities, whether they are natural or artificial. This aspect has been less considered and only with the arrival of collaborative learning theories the groups have been rethought, although almost always they were artificially created groups for learning purposes. Let us see, below, which of these communities we referred.

Virtual Learning Communities.

In general, communities, regardless from being virtual or not, have a specific way to use their force and their social and collective nature to address interaction as a regulatory principle of their existence. This is because a community is a set of human interactions and behaviors that have a purpose and expectations among its members. Interaction, i.e., communication to share experiences, equipment activities, sensitivities and life STYLES, leads

us to state that learning is inherent to it. In effect, from a communicative conception, Kaplún (1992) states that "there is learning when communicating because to be educated is getting involved and participating in a process of multiple communicative interactions" (p. 37). In this regard, any community when it communicates something is a learning community, which is thought as a result of a community or social situation rather than a merely individual or personal matter.

Also, from an educative conception (sociocultural), learning in community is the basic type of human education. For Rogoff (2003) human development should be understood as a process where individuals develop to the extent that they actively participate in cultural communities and take intellectual tools and skills of the cultural community they belong. Thus, diverse social interactions turn individuals into trainees who, little by little, learn how to handle these tools and systems until they have a good command of them and use them effectively in the context in which the activities of the social group are defined and executed. As it may be concluded, not only all the community learns but, also, this learning is the basic type of education or human development.

Well, all communities being learning communities, however, bibliography specialized in education uses the name "learning community", which has extended in recent years with various meanings and typologies. A very good functional classification of learning communities, either formal or informal, is the one proposed by Riel and Polin (2004), who distinguishes between communities focused on carrying out an activity or work, in the improvement of a practice and in the production of knowledge. The first is a group of people united to carry out a work, work on a common issue or problem and get a product. Generally, there is a project of work well determined regarding its characteristics and production stages. On the other hand, practice-oriented communities are those described in Wenger's work, i.e., a large group of people sharing interests in common, generally consists of professionals from various scopes whose objective is to improve knowledge on its own professional practice. Finally, learning communities based on construction of knowledge are similar to those above and develop in a professional-research field with the specific purpose of searching knowledge advance of a subject or field of research. These types of communities show

different levels of involvement of their members and, hence, they need different help and monitoring systems (Gros, Garcia & Lara).

Thus, on the basis of this classification, although interpreting it and putting it into context from our perspective, taking into consideration the differentiating features between cooperative and collaborative learning, we suggest these three types of community for higher education that we call specifically: educational work, professional practice and scientific knowledge, which we consider as the basic cells of Knowledge Society. Let us see each of them.

Community of Educational Work (school/academic).

These learning communities are proposed in the scope of formal education (schools and universities) for both educational levels; both in the level of basic education "school work communities" and in the level of higher education "academic work communities". They are aimed to study a common subject or problem related to a discipline to obtain a collective knowledge product**.** Here the activity to be performed is aimed at students discovering truths that, although new for them, are known for the teacher. In this plane, objectively, they do not build or produce new knowledge, since at school and even at the university work is done with known problems solved with strategies and methods established by the professor, since they are contexts of intentional learning where, thanks to the support and help of others (expert professor and peers), the process of modification, enrichment and diversification of knowledge schemes defining school learning can be triggered.

Hence, at an epistemological level, students do not build new knowledge, because it is already given and exists as objective knowledge, as a product of science and technology advance. In this plane, those who build knowledge are scientists and intellectuals who make culture advance in all the dimensions it implies. This is why we do not share the idea that "in the educational work we must achieve not only learning what is already known but the ability to create new knowledge" (Gros, 2013 p. 171), because, as we said above, the creation of new knowledge is not incumbent to the student but to people trained to do so. On the other hand, it does not mean that subjectively in the psychological plane or level, as a psychophysical operation, when making the activity or work, knowledge is built in his head and processed giving rise

to a real and new knowledge entity for him. This is what constructivism refers to when it defines learning as a process of construction and restructuring of mental schemes.

In effect, Vigotskian constructivist explanations, at a psychological level, help us understanding what is happening inside the subject when he is learning. Learning would be for this approach to incorporate new information to the previous mental schemes, which are modified and rework in the light of new information of social and cultural origin. Thus, what the subject does when learning is reorganizing and reworking information coming from outside (inter-psychological), integrating it to the knowledge and previous experiences he has, in order to properly relate them in his mind (intra-psychological) to give meaning to a new knowledge for him.

Well, for students to generate out of their minds the collective artifacts or products of knowledge with which they internally achieve a learning like that outlined by constructivism, it is fundamental the role played by the activity to be performed; with this we refer to the "educational work". So, the design of this work is one of the critical points in this type of communities, for which it is important to know how is determined, whether it is relevant or not for the students. This requirement for relevance and authenticity in the works has meant to try methodological options focused on discovery learning, based on problems, aimed at projects or case methodology. Although there are some differences among them, in all these active methods what we intend is to "learn doing" collectively, and that these communities become communities of research, exploration, approach to problems from the own experience. The idea is that the student faces manageable challenging problems; manageable not as much in the sense that he can solve them or resolve them alone, but face them thanks to the combination of his own possibilities and the support and instruments he receives from the professor.

Hence the active methods indicated cannot be basically restricted to "pure discovery" since the student when learning from his own experience, does not necessarily find and learn the rules or general principles of the solution of the problem faced. Thus, there is failure in selecting the relevant information and, with it, the quality of the contact with the material to learn is affected. For that reason, it is better to talk about "guided discovery",

as advised by Meyer (2004), where the student receives a problem and the professor guides closely to achieve its possible solution. Therefore, a consideration to take into account is that in this type of work communities, characteristic of formal education, design must be provided and the activity must be tracked so that it has sense. To that effect, the professor will guide using methodologies of work well defined concerning its characteristics and production stages, that finally lead to obtaining the knowledge product or artifact built by the students. Here, they are in charge of ideas to a greater or lesser extent, they become aware of the goals, but the global and media responsibility for broadening the knowledge boundaries are not in their hands, but in the professor's. He is who keeps complete control and is basically who organizes the groups, monitors the process at each stage, makes the questions at the time he provides the students basic information to the extent that he searches and collects materials (text, audio or digital video) of interest for the group, uses cooperative structures (simple and complex) to make the interaction easy and he requests results or specific knowledge products (a report, presentation, etc.) which must be worked at taking into consideration the evaluation criteria that had been previously fixed.

As it may be deducted, here the role of the teacher is very important to the extent that he leads the group with leadership, to ensure the students make their work within the frame of a foundational knowledge, i.e., knowledge which responses are known and unique, since they are concepts existing in a given time of science, that are usually required more and more in time. As we see in this type of communities, they are based on cooperative learning, being them necessary not only for the school task but also for the academic task, especially at those initial levels of higher education, especially dedicated to a certain type of common knowledge shared as in the case of experimental science where the response is given by consensus of the discipline to which the professor belongs. In Kuhnian *terms*, this is what defines the paradigmatic condition of these disciplines, which would have acknowledged scientific achievements that play the role of model problems and problem solution.

In fact, the school scopes (primary and high school) are the ones that are more suitable for the cooperative methodology. Group goals, mutual support: all of this does not change the authority of the professor, who must provide a foundational education according to this education stage. This

education establishes foundations - hence the name of basic education - and univocal concepts to interpret the world, while the foundational knowledge supposed the existence of an objective reality from which we form ideas, notions and concepts describing it. Here, the work of the professor is to try the student makes these ideas his own and use them to understand the world that surrounds him and behave in life.

What happens in collaborative learning communities is different, which purpose is different. They adapt better to the university environment (advanced level) where the student coexists with the knowledge in a more free way than that in basic education. Here the emphasis is on learning by means of dialogue and academic debate which changes the professor's authority as the only source of knowledge to that arising from groups of peers. The professor who works with this learning means and trusts in the self-government capacity of the university student, as well as his commitment to participate in group works where dialog, negotiation, agreements and disagreements make an essential part of his new education. In this regard, the subjects or contents to be addressed must be debatable, related to non-foundational knowledge, like the one related to, e.g., human realities from social sciences, where there is neither a single answer nor a single method to achieve it, or there is no an objective reality from which we can state adequate concepts for it and invariants in time, and they are not absolute. This is a field where knowledge parameters are constantly changing since they show an amazing number of open disagreements drawn on the legitimately scientific problems and methods. Hence the existence of a diversity of schools and sub-schools competing and showing wide disagreements on fundamental questions (Andersen, 2001).

This is why the communities using the collaborative learning as a methodology are more complex, since conversation, dialogue is a source of knowledge. Regardless of the achievement of a consensus or not, the possibility of dialog that contributes that different positions appear is already an achievement. As González and Díaz (2005) hold:

> We try to generate dialog, to clarify the possible agreements that the members of the group would be willing to achieve, or even illustrate the divergences that would prevent consensus. Because controversy

and conflict contribute to learning. The fact that a student sees his own points of view questioned and learns how to question the others', make him understand better the weakness and strength of his arguments; he learns, also, respects different ways of thinking and reach agreements (p. 35).

To achieve this kind of behavior it is necessary to take into consideration the previous knowledge and ideas that already exist in the cognitive structure of the students, because learning as a mental constructive activity cannot take place in the emptiness, starting from nothing. The possibility of learning necessarily goes through the possibility from coming into contact with previous ideas or knowledge that the students have built on certain subjects or concepts in the different areas, differing both in content and nature. For instance, some are more conceptual, more procedural, more descriptive or more explanatory. Hence, this basis of previous knowledge provides students with certain maturity and cognitive autonomy to be in charge of their own learning. Because here they will make decisions on how to organize and search strategies to solve a problem, assessing if they have enough and relevant information, or if they have to look for themselves in other sources. Not only answering to the initial questions made by the professor, but suggesting essential questions that really aim at a true academic discussion and not to the repetition of obtained information.

Being the group the one assuming the responsibility for working collectively to fulfill the objective, the teacher is no longer a strict controller of the activity and acts as a guide in the conversation, which becomes the most powerful tool to create and share knowledge, where the moderating and revitalizing function of interaction in debates, turns the professor into a sort of "dialogue craftsman". For this reason, as indicated by Collison, Elbaum, Haavind and Tinker (2000) online moderation is an art with general principles and strategies that can be learned. In this regard, the proper education of the professor as a moderator is essential if we intend to achieve, with certain assurance, success in the knowledge creation processes. In fact, the problem of the obstacles students have to face to have a critic discussion, at the same time shows a gap in the professors' education, who are not prepared to moderate these spaces, therefore they need to be educated. Thus, Salmon (2000) suggests an extensive variety of functions and skills the professor

should develop to moderate online dialogues, such as: give instructions on how to use the system and build an environment of trust among the students which stimulates them to participate; stimulate the contributions confirming, rejecting, repeating and reformulating the students' inputs; highlight the relevance of certain aspects of knowledge and their nature shared with the participants, reduce his interventions and importance. Finally, formulate the conclusions and summarize the different points addressed throughout the process.

Also, the extensive relation of functions and tasks to be develop by the moderator in virtual environments, leads to the acquisition and development of a whole series of knowledge and competences, basic and essential, administrative and technical, and others more complex related to pedagogical and social aspects, which implies that he is also a collaborative learning environment designer, well planned in a rigorous and in advanced way. For García (2013), the design of these environments may affect the nature of online discussions, since it influences what participants can see and do. Thus, by means of a proper design, it is possible to promote a characteristic or specific attribute in online discussions.

In general, a good design that a collaborative environment should offer, e.g., support for coordination, communication, negotiation and interactivity among the members of the group (Zurita & Nussbaum, 2004), for which it must have a set of technological tools to favor the attainment of these processes; in other words, technological support for discussion and joint knowledge production. Moreover, these spaces must be accompanied by a script system supporting the different stages of learning, i.e., systems of instructions that systematize the ways the members of the groups should interact and collaborate with the purpose of jointly solving the problem. Below, let us see first the question of the technological support and then we will address more extensively the question of the scripts.

Technological Support.

Regarding technological support, we may mention the free use platforms in the scope of the so-called Learning Management System, better known as LMS such as Moodle, as well as other specific tools of the current web 2.0 (wikis, blogs, etc.) and finally some specific programs to support

collaborative learning, designed for collective knowledge construction, such as several platforms in the field of CSCL.

LMS – Moodle.

Most of the LMS commonly used by educative institutions does not provide the computational tools necessary to support collaborative interactions. So far, most of these platforms allow information exchange and discussion, but they are not made to promote the process of knowledge construction (Gros 2008). This is the case of general platforms like Moodle which, in addition to its attributes as an Open Source system, it offers limited options to edit contributions and to include multimedia elements, as well as to connect with resources outside the platform. It does not offer specific provisions to support processes of collaborative knowledge construction either, it shows little flexibility when evaluating the contributions, and the knowledge generated is little exportable and reusable. Moreover, the structure in threads of conversation of its Forum is not enough to connect and have a discussion, since it not always makes easy the connection display and relationships among individual contributions (García, 2013).

Social Web.

These social software tools and applications include a wide range of technologies: blogs, forums, social networks, wikis, social markers, chats, wikis, etc., that are constantly renovated and through which you can share and exchange contents, jointly create, tag, comment, remix, value them, etc. However, such tools have deficiencies in their role of facilitator of processes directly implied in the collaboration, while they have not been created with a training objective. The problem of the use of these generic applications is that they do not incorporate specific tools facilitating the scaffolding, follow-up and evaluation process to help students and professors to improve tasks and management systems of contributions, to accelerate the effective follow-up of the interactive and discourse production processes or the evaluation of involvements and knowledge that is generated so that it can be reused. As stated by a García (2013) "the specially open and decentralized structure of these tools makes its use difficult in learning situations that are more limited to some specific parameters" (p.156).

Construction of Knowledge Environment.

They are programs or tools in the CSCL field, design of which, according to Lipponen and Lallimo (2004) must be explicitly based on some learning theory or pedagogic model. They are not general tools that can be used in many ways, that is, they are significantly different from LMS as Moodle or web 2.0 tools. In fact, this type of technology is very specific and as stated by Gros (2008), its use only makes sense for professors who are really convinced of the pedagogic approach to be used, on the contrary, it is almost impossible to use it.

Within these programs we can mention the ones appearing on the list proposed by Jiménez, Llitjós and Puigcerver (2007) such as: CALM, CAROUSEL, EVA, FirstClass, ELON-Systems, GRACILE, MOLE; POLARIS, SpaceALIVE! , TOP. On his side, Gros (2008) highlights three programs, namely: KNOWLEDGE FORUM justified on twelve principles of learning of the theory of knowledge construction of Bereiter and Scardamalia; BASIC SUPPORT FOR COLLABORATIVE LEARNING (BSCL, even though the correct term is SYNERGEIA since BSCL is only a part of the environment) developed from the contributions of the group cognition theory of Stahl and FLEXIBLE LEARNING ENVIRONMENT (FLE3) designed from the theory of activity of Engeström. All these programs, which are not of free distribution, incorporate a series of tools which allows the knowledge construction. This is the case of BSCL of Synergeia and FLE3, which are more oriented to joint creation of products while Knowledge Forum is focused on the process of inquiry and discussion of form. In this sense, implicit pedagogical methodologies are not exactly the same. For the Knowledge Forum the most important is: constant questioning, questions and ideas, while the methodology of BSCL (Synergeia) and FLE3 also assumes an inquiry process focused on creating a product with a beginning and a clearer and more specific end in comparison to the methodology of Knowledge Forum.

However, a significant problem in CSCL is that free collaboration does not necessarily produce knowledge. For this reason in certain circumstances collaboration must be guided so that it increases the possibility to reach educational benefits. An increasingly applied solution to manage complexity inherent to the collaborative learning process structuring consists of specifying the so-called "CSCL scripts".

Scripts.

The so-called scripts, from a more cognitive tradition and scaffoldings to a more constructive tradition, consist of a tool for support of collaborative work the objective of which is to specify how students must interact among them to have successful interactions. It addresses ways of support to students and professors in order to improve homework and contribution management systems. Kirschner and Erkens (2013) conceive them as "guides supported by technology telling the professors when to intervene, by focusing students and professors on cognitive and meta-cognitive aspects of the homework" (p. 5)

As we can see, the main point of scripts is supporting and guiding in order to ensure collaborative learning (working together, bringing about discursive and argumentative processes, coordinating activities, etc.). In other words, it deals with activity programs giving guidelines to students and establishing a commitment between them and the professors, as well as organizing work in some aspects such as: group size, formation and dynamics of interactions, sources of distribution of contents, control of activities, product valuation system, etc. (Hernández et. al., 2014).

According to Gros et. al (2009) there is a need to advance in developing these scripts which contribute with pedagogical functionalities for scaffoldings of processes, evaluation, follow-up and reuse of generated contents. This proposal is based on three fundamental elements: contributions (categorization, labeling to make reading, writing and articulation of ideas easier), follow-up (evaluation systems of contributions, notes) and product (viewing, packaging of the content).

Likewise, we can count on works of Laférrière (2005) which allow establishing correlations between the use of scaffoldings and the progressive argumentative process. Regarding the foregoing, we can mention the proposal to work and offer scaffoldings or scripts with support promoting abilities to develop arguments and dialectic counter-arguments relevant in tasks for solving non-structured complex problems. As stated by Peñalosa et.al. (2011) "teaching by inquiry without causing argumentation implied an incomplete scheme. Argumentation is an essential form to think about a subject; promote argumentation in science and humanities by fostering

the solid acquisition of concepts" (p.9). Then, it is necessary to give an orientation so that students become proficient in arguing, that is, so that they can show contents, based on premises complying with the criteria of acceptability, relevance and sufficiency.

As we can see, preparation of instructive books or scripts introduced in environments of learning are purported to direct and limit ambiguities to which students are exposed because it is inappropriate at first to leave the student in an empty place by thinking that he and his peers may achieve the entrusted task by themselves. For this reason, it is necessary the professor's follow-up and orientation and a scripting system to be adopted and internalized by students progressively to increasingly get rid of this, since the idea is that at the end, the scaffold is removed, as stated by Bruner (1988), so that the student can act independently with no support or professor's help.

Lastly, we should agree on the fact that the transit in "educational communities" has to be performed progressively, in the sense that it is necessary to learn in a continuum that moves from cooperation to collaboration, that is, from a very controlled, highly structured and professor-focused system, like in "school community" to a system where the professor and students share authority and control of learning, inherent to "academic community".

Professional Practice Community.

These communities correspond to the idea of practice community, defined by Wenger, Mc Dermott and Snyder (2002) as "a group of people who share an interest, a set of problems, or a passion for some subject, and deepen their knowledge and experience in the area through a constant interaction strengthening their relations." According to Barab and Duffy (2000), this type of communities constitute the way suitable for learning authentically, that is, those learnings that are conducted and validated inside a real community and not only like simulations or problems posed within an educational institution, which cannot reach the degree of "reality" the real practice communities have. Therefore, this type of communities are feasible from the workplace, within the field of continuous training that seeks to improve in the technical part, in knowledge about the professional practice itself, in order to make the professional performance higher. These communities allow to develop a specialized knowledge based on the shared reflection on the practical

experiences of their members, who can exchange, communicate and analyze their knowledge with other people, including their abilities and skills, which grow as a result of the interaction between them.

Now, as Cerda & López (2006) state:

In order for this shared learning situation to take place, it is important that those people participating in the dialogue and reflection recognize the other one as legitimate to learn from him/her, as he/she is his/her profession peer. The other person, although he/she has different knowledge, experiences and expectations, contributes to reflection since diversity precisely allows to be open to new viewpoints, questions and reflections. This is why the presence of highly qualified professionals, with skills to work with adults, strengthens the transformation processes, since it makes easier for the group to be open to diversity of experiences and knowledge and allows the dialogue to be established so that it allows the involved individuals to reformulate the meaning given by each one to his/her practice, fostering like this the ability to keep on learning. This opening attitude allows to truly analyze the "Why?" and "What for?" of the professional practice, as well as to build confidence to search for and try joint action alternatives. Therefore, the dialogues cannot deal exclusively with successful experiences; all experiences deserve to be shared and analyzed among the participants, since it is possible to learn from all of them, as long as they happen in similar contexts and tackle common problems (p. 4-5).

Hence the collaboration, more than artificial, is real and unforced, whereas the dialogue is set in such a way that it allows the involved individuals to reformulate the meaning given by each one to his/her practice, think about what is done, why and how it is done, share and systematize what its members think, and publish and disseminate the new knowledge so that it has a social impact on the professional field and does not remain just with them. This professional, specific and differentiated know-how is autonomous as, largely, it originates and is built in situations of professional practices and practical knowledge, which are different from the daily academic situations in many aspects.

It is a fact that no one learns out of a community of people with the

same profession. No one learns to be a lawyer, doctor, scientific researcher, or banking professional out of a community of lawyers, doctors, or banking professionals. Therefore, it is necessary to be part of learning environments where it is possible to be in contact with professionals with more experience in a particular field, instead of separating people that receive training from daily practice and giving them only notions from such practice (Vásquez, 2011). Consequently, we consider that the Community of Practice (CoP) is a perfect means not only for professionals in any field who seek professional development, updating, continuous training and innovation, but also for students during the university professional training. Here the university students, as trainees, may learn work methods and a scale of values on which the professional ethics is based from the professional experience, personal knowledge or experience of other expert people. Thus, it is guaranteed, from the beginning, that contact with the company dynamics would be simpler and transition from the academic culture to the work culture would be easier.

The student of some professional career could be an observer in one of these communities acting as "legitimate peripheral participant" –according to the Lave and Wenger terminology– so that his/her learning results from a progress in his/her participation development to a more comprehensive role in the community. Here, learning has a change in his/her identity as a result, which goes from trainee to expert as, from periphery, he/she reaches different levels of participation. Even though it is true that students as peripheral members hardly ever participate, they often observe experiences and what the others do within the community, benefiting from shared events (behaviors, procedures, routines, contents, etc.) that are part of the practice and are expressed in terms of a typical special narration of the community. The trainee gradually incorporates that set of terms (language), learning ways of speaking in relation to the typical community work, every time the meaning is constructed on verbal exchanges during the practice, that is, during the activity. The trainee may gain specific abilities, skills and capacities in this exercise.

Based on the foregoing, the CoP should be part of the university's training strategies, which should deal with informal training processes that support, record and facilitate learning and participation experiences of this kind. For that purpose, it must be taken into account that these communities emerge

from pre-existing working networks and develop, depending on the new joined members and the evolution of the addressed subjects. Therefore, their lives will depend on the subject validity and interest and on the importance of contents generated, for which they must be cleverly managed and moderated. This last issue is about the good use of a knowledge management technology and methodology, since, in fact, such communities are Knowledge Creation and Management networks (KCM-Network), in this case, knowledge from the professional experience itself, which is built in daily practice and makes sense for those who have generated and used it. According to Fernández (2001), the key words here are "pertinence and belonging": Generation and management of information and knowledge pertinent in a context defined by affinity among participants, due to its belonging to that area of information and knowledge.

In this regard, it should be noted that there is a literature and line of work that have systematized a whole knowledge management methodology in this type of areas. It is based on the Wenger's initial works (1998 and 2002) on practice communities and on those works later conducted together with White and Smith (2009) adapted to digital environments. Such authors define some possible approaches that help to evidence quickly both typical activities and tools that may be used to focus intervention on a community of this kind. In addition, there is the Collison et al.'s work (2000) on effective strategies for discussion moderators in this kind of environments. In Spain, for example, these collaborations have been collected and systematized by the research team working with Dr. Joaquín Gairín from the Autonomous University of Barcelona (UAB, by its Spanish initials), in order to articulate a proposal for creation and experimentation of a KCM-Network model, which has been implemented in professional practice communities of different organizational contexts (public, educational and business administration). It is worth mentioning that, namely, the Accelera Project has a KCM-Network model in the education field, which considers the group reflection and debate as a basis of the proposal organized, in the first stages of groups, based on questions aimed at looking for language harmony, subject identification, reality diagnosis, intervention, record and dissemination of what has been learnt. The group reflection is conducted by the knowledge manager who, in addition to technical skills, must show organizational and social skills.

Finally, it should be pointed out that the Compartim Program is one of the best experiences in Spain on knowledge shared in practice communities, within the public administration area. This Program is an initiative directed towards all professional groups making up the Department of Justice of the Regional Government of Catalonia (*Generalitat de Catalunya*) through the Center for Legal Studies and Specialized Training (*Centre d'Estudis Jurídics i Formació Especialitzada*-CEJFE), and it is technologically resolved with the *e-Catalunya* platform that is open to other Government's departments and even to external workers related to such administration. Said collaborative work and knowledge management Program has been implemented in 2005 and, after several years of implementation, has created a network of different communities, which objective is to generate and share knowledge that has been shown in manuals, protocols, intervention guidelines, etc.

Scientific Knowledge Community

Barriga (2007) indicates, "Science is the human activity on which we theorize to understand the world and, based on this, we change it by means of effective technologies enhancing man's life." (p. 47). It is also a group company where consensus building, through debate, dispute and controversies, becomes a very important matter. Therefore, it is necessary to check the scientific community concept in order to understand the scientific practice, since contemporary science originates from scientific communities, which usually share paradigms. Kuhn reminds us that the origins of these communities date back to the beginning of modern sciences, where the need to exchange information, compare ideas and remotely collaborate was a very important practice as it is today.

In effect, as Renaud (2009) states, although it is true that Internet opened new communication perspectives, the act of collaborating remotely is actually nothing new for the scientific community since, as well as the first scientists, researchers nowadays use information and communication technologies to favor exchanges, participate in discussions and make joint collaborations. However, the new virtual space, without geography or distance, makes exchanges be immediate, ensuring real-time observation products and data exchange and communication, allowing likewise new experimentation structures that only may be remotely controlled, as is the case of programs carried out in the Geneva's CERN particle accelerator

and space telescopes as the Hubble. Consequently, thanks to the Network, research teams may work with members connected by institutional bonds who are in geographically remote places, forming virtual scientific research communities. This is why these new scientific communities highly promoted by the Information and Communications Technologies (ICT), constitute the more advanced use of the Network we can currently make.

This kind of virtual laboratories or "collaboratories" will be very well organized and network managed electronic workspaces to generate and disseminate knowledge from a social construction process, where the teamwork result has a value higher than that of the sum of individual works of each member. The real collaborative work of scientific research is based on that, from which the interconnected intelligence or networked intelligence mentioned by De Kerckhove emerges. It is an intelligence far superior to the one provided individually by each member, which is called by Lévy as collective intelligence. As Fernández (2005) describes, it is about:

> Mature or complex virtual communities, also denominated as intelligent networks because their content: is related to the achievement of specific objectives (project intelligence); does not only lie in what some of their members know, but in the collective generation and management of knowledge interesting for the community (collaborative work intelligence); depends on the network approach to other networks to exchange information and knowledge, whether they are in the same organization or not (network interactive intelligence) (p. 124).

Through social interaction and participation in the community collaborative work, it is planned to produce scientific knowledge (laws, theories, hypotheses, models and rules) that is used to manipulate and change reality. Academic filters or quality assessments are required for such purpose, since the scientific companies must have community controls reducing the margin of charlatanism because theoretical and technological knowledge, that is, theoretical science (know how to describe, explain, predict) and technological science (know how to manipulate, control) will be generated in them. It is currently believed that science is, simultaneously, knowing (scientific theories) and participating (technology), as there is not technology without theory. Technology is based on theory provided that it

gives information about ways of behavior of that reality sector expecting to change; the term "technoscience" comes from it.

However, it has been considered that the type of format or virtual display setting for such communities would be, according to the REBUIN report (2001), the called social web (2.0) or participatory web that is characterized by the use of open technologies and especially by the possible work done in a telematic, collaborative and altruistic way. It has even been discussed on a science 2.0 that would be the application of social web technologies to the scientific process, as long as the three items shared in the context of this science are: research, resources and results. Research is shared through researcher's social networks to disseminate documents, interests, professional profiles and, in general, support to research processes. On the other hand, resources being shared are eminently of a bibliographic nature: bibliographic references, web favorites or citation indexes. Finally, results are openly shared, through publications in academic journals with public access, blogs and wikis.

In this regard, it is worth mentioning that, even though it is true that social web technologies are making the scientific community workflow easier, they have, as we have seen, serious limitations to spread the mere information exchange or simple sharing among users. Therefore, they do not ensure enough collaboration to support the knowledge construction process, which is typical of the research teamwork. Consequently, this technological factor should be taken into account given the nature of these communities, which implementation must consider that their structure and organization require not only the competition of ICTs, but also trained workforce in particular. As well as the CoP, a group of people must be in charge of the control, supervision, organization and dynamics of their implementation to keep their objectives. Hence the need to know how to manage them.

A management proposal was suggested for the Fractal Network, a knowledge network registered within the scope of Science, Technology and Society (STS), which was created and made in 2012 by the *Laboratorio de Redes Sociales de Innovación* (Laboratory of Social Networks for Innovation) (lab_RSI) based in Barcelona. Luis Ángel Fernández, director of the Laboratory, describes it as a structure composed, at least, of four areas: Debate,

Collaborations, Services and Summaries. Three crowns are implemented by these four areas. The first crown: knowledge and information generation. The second crown: context creation, and the third crown: knowledge factory. Their implementation must guarantee production, evaluation and use of scientific products, a work methodology (including the possibility to moderate), an organized virtual space (covering from the distribution list to highly organized virtual environments with virtual community help services (consultants, additional web-obtained materials, bibliographic references, links to other ones, search engines of materials generated by the community, etc.)), and transparent files with different degrees of organization.

There is no doubt that scientific communities, as information processing and knowledge construction spaces, constitute an essential resource to encourage the region countries to competitive economies based on knowledge. They are a key factor in the development strategy since, from the high-level knowledge generated, effective measures to implement leading innovations may be adopted. As a matter of fact, the development of Spanish academic and scientific virtual communities of users (VCU) from RedIRIS (Computer Resources Interconnection Network) that connects regional networks of all autonomous communities and the main research centers in Spain to the rest of international education networks, especially the Portuguese and French research and education networks –FCCN and RENATER, respectively– to the European research network GÉANT, has been promoted with that final purpose.

Communities and groups of RedCLARA (Latin American Cooperation of Advanced Networks), composed of 15 Latin American countries, stand out in Latin America. This network fosters the development of collaborative activities regarding advanced network technology, as well as education, science, innovation and research. Thanks to this network, researchers from Latin American countries, members of CLARA, may talk among them and produce useful knowledge for the society. In CLARA, Peru is represented by the RAAP (Peruvian Academic Network), which is made up of several public and private universities and some research centers and institutes in order to share information as well as research and education projects among them.

Therefore, it is necessary to support these networks and their collaborative environments in which it is possible to interact with others, regardless of distances and geographical barriers, in order to guide strategically the scientific production growth. For that reason, the current challenge is to create and strengthen, from these Networks, real knowledge and scientific research communities that work together based on an interdisciplinary approach in order to improve the partial visions of the complex reality we live in provided by different disciplines. Hence the interdisciplinary approach in this type of communities is a strategy to include, in the scientific work, teams of experts in diversified fields and not to disregard the depth, richness and explanatory power of specialized knowledge. According to Piscoya (2004):

> The interdisciplinary research has nothing to do -hardly nothing- with people that know everything, but with highly specialized people with flexibility and capacity to work as a team, since the interdisciplinary research is a way to organize the specialists' scientific work at its highest levels and not at the school learning level (p. 62).

Today, the interdisciplinary studies are in the so-called environmental sciences, and are very useful as they provide a total view of some complex problems related to environmental subjects such as climate change mitigation, food security, renewable energy development, environmental protection, etc., managing to present effective solutions. This type of communities should be part of a model to be promoted due to the importance and quality of their contents. Hence the research activities would have to take advantage of the potential of universities and research centers (RC) in order to form academic groups from different institutions who are interested in Network knowledge development, dissemination and collective discussion.

The advanced university students may start to participate in a peripheral way in such communities, as done in the professional practice communities. This way, the young student would have a propaedeutic approach in those areas of his/her interest, as well as the opportunity to join some team from the different study projects, in order to collaborate on tasks that give him/her real early and intensive research experiences. Only one learns by researching, preferably with people that know to do it. As Jover (2003) states: "Science is a tradition, a culture with its own values, rituals, and evaluation criteria.

By immersing themselves in that tradition, young people learn to distinguish the best strategies for a given research and the tactical resources they must promote constantly" (no number).

It is about encouraging students to acquire knowledge, critical thinking skills and values necessary for the very exhaustive scientific and ethical research. Scientific work concepts and specific ways to make, produce and share knowledge through scientific work tools, dialogue practice, development of written communication skills, participatory concept appropriation, research procedures, information gathering methods and tools, computer programs for analysis and representation of results in diverse formats, etc., must be also acquired.

As we may see, all this represents a way of enculturation implying a "participatory appropriation" process (Rogoff, 1995), by which young students change their understanding and responsibility through their own participation in these communities. Thus, they learn to give significance to knowledge and research skills being developed, as well as to be responsible for complying with specific tasks being gradually required in the real research dynamics. All this must favor their efficient performance as a future scientific researcher.

Final Reflection

There is no doubt that, in a changing and unstable world ruled by explosive information flows, it is no longer possible to live only on knowledge acquired while studying in an educational institute. The possibilities to gain access to information provided by the Network are huge, given its more varied sources and its more open and faster access, which is giving rise to a more distributed knowledge generation.

Although it is true that young people have access to contents through Internet in an easy and simple manner, we have to evaluate if they are valid and appropriate since information available in it, due to its large amount, is usually dispersed, repetitive and unreliable. That is the reason why it is important to know how to filter it, for which the mediator role of the currently called "content curators" (teachers, expert professionals, specialist researchers, etc.) is still important. This is why we not only need to have

network access to use or add information, promoting like this information overload, but we mainly need to be well informed and guided by these curators within collective and distributed knowledge management, production and validation systems. These systems are the virtual communities, which should become the new education agents and settings allowing us to learn in a constant way.

As we have seen, the value of these communities lies in the possibility of knowledge management and/or production being carried out in a collaborative manner within the Network-Internet global context, which makes learning not limit itself to a particular local space or to a fixed temporary period of our life cycle. The "e-learning and networked learning" will be the result of our participation in these different settings in which people explore throughout our lives. The importance of what Coll (2013) denominates as "personal learning development" as means of access to knowledge is involved here.

Therefore, we conclude that, if we wish to build all together the authentic Knowledge Society, our personal development must make the most of benefits, opportunities and resources to be learnt given by the different virtual learning communities in which we have to explore. This Society will be built on the ability to create, deal with and disseminate information and knowledge. It is a difficult challenge but not impossible to achieve if we include such processes in these new virtual spaces known as the "basic cells of knowledge society".

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