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ICT in Collaborative Learning in the Classroom of Elementary and Secondary Education
Las TIC en el aprendizaje colaborativo en el aula de Primaria y Secundaria

Abstract

Digital technologies offer new opportunities for learning in an increasingly connected society, in which learning to work with others and collaborate has become an extremely important skill. This article presents the results of a research study into the conceptions and practices of working teachers regarding collaborative learning methodologies mediated by information and communication technologies (ICT) in Elementary and Secondary Education schools. We analyze data concerning ICT contributions to collaborative work processes in the classroom, from the point of view of teachers at schools accredited with a high level of ICT by the Regional Government of Castile and Leon. We furthermore take into account the limitations of these tools, as well as teachers' conceptions of collaborative learning strategies. The methodology is based on the content analysis of interviews of teachers from a representative sample of schools. The results indicate that teachers think that ICT have great potential for enhancing collaborative activities among students and for developing highly relevant generic skills, although they are also aware of the difficulties that both students and teachers face in educational practice.

Resumen

Las tecnologías digitales ofrecen nuevas oportunidades para el aprendizaje en una sociedad cada vez más conectada, en la cual aprender a trabajar con otros y colaborar se convierte en una competencia trascendental. El texto presenta resultados de una investigación sobre concepciones y prácticas del profesorado en ejercicio acerca de las metodologías de aprendizaje colaborativo mediadas por las tecnologías de la información y la comunicación (TIC), en centros de enseñanza de Educación Primaria y Secundaria. En el artículo se analizan los datos referidos a las aportaciones de las TIC para llevar a cabo procesos de trabajo colaborativo en el aula, desde el punto de vista de los docentes de los centros acreditados con alto nivel TIC por la Junta de Castilla y León. También se expondrán las limitaciones que imponen estas herramientas, así como las concepciones docentes sobre las estrategias de aprendizaje colaborativo. La metodología se basa en el análisis de contenido de entrevistas realizadas a equipos docentes de una muestra representativa de centros educativos. Los resultados apuntan que en estos centros los docentes atribuyen a las TIC una alta potencialidad para enriquecer las actividades de trabajo colaborativo entre los estudiantes y conseguir el desarrollo de competencias transversales de gran relevancia, aunque son conscientes de las dificultades a las que tanto alumnos como profesores se enfrentan en la práctica educativa.

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1. Introduction

Digital technology arrived in Spanish educational centres through various programmes for introducing ICT in the classroom, with one of the newest and most relevant programmes being the national Escuela (School) 2.0 developed in Castilla and León under the name Red XXI. Funding for technology has brought computers and smartboards to a large number of classrooms in elementary and secondary schools. Now is a good time to determine the changes this new technology has brought about in teaching methods, and the results in terms of student learning. To this end, the GITE-USAL research group at the University of Salamanca is carrying out research on collaborative learning strategies based on ICT use at those schools that boast a high level of technology in the region of Castilla and León (research financed by the Ministry of Education, "Aprendizaje colaborativo a través de las TIC en el contexto de la Escuela 2.0"; EDU2011-28071).

Several decades ago, Piaget stated that «the principle goal of education is to create men who are capable of doing new things, not simply of repeating what other generations have done - men who are creative, inventive and discoverers» (1981). Developing metacognitive, creative, and communicative skills is still an educational goal today, and one that should view learning as a process of acquiring and building knowledge with a strong social and experiential component. Current pedagogy must allow students greater freedom to expand their thinking beyond conventional models, and collaborative learning methods are likely to generate learning environments that meet this objective. Building and sharing become transversal objectives for which the use of ICT proves to be quite advantageous for developing curricula and for teaching students. Education through the exchange of ideas is a far cry from bureaucratic education that values quantity over quality, and reaches out to inner transformation and mobilization. «Through such techniques as open discussion, people in small groups may change collective thinking, learn to mobilize energy and actions toward common goals, and rely on an intelligence that is superior to the sum of the individual talents of the members of the group» (Carneiro, 2009: 20).

Collaborative learning methods involve teamwork among students. Various strategies may be used to help students work together to achieve specific common objectives which are the responsibility of all members of the group. Collaborative

learning is based on the «construction» theory that assigns an important role to students as main protagonists in the learning process. The academic, social and psychological benefits of this type of learning have been demonstrated by many authors, among them Kolloffel, Eysink & Jong (2011), Kozma & Anderson (2002) or Panitz (2004), who highlighted a long list of advantages, such as boosting mega-cognition and permitting students to feel a sense of control over what they are learning (academic benefits). Collaborative learning encourages students to see situations from different perspectives, creates an environment where they can practice social and leadership skills (social benefits), and provides a satisfactory learning experience that significantly reduces anxiety (psychological benefits).

Constructive-collaborative learning works very well with the Internet, placing us in the realm of «collaborative learning using computers» (CSCL: Computer Supported Collaborative Learning), as a new model that unites learning theories with technological tools, based on a socio-cultural view of cognition that proposes an essentially social nature for the learning process, and looks to technology for its potential to create, support and enrich interpersonal contexts for learning (Kolloffel, Eysink & Jong, 2011; García, Gros & Noguera, 2010; Gómez, Puigvert & Flecha, 2011; Salmerón, Rodríguez & Gutiérrez, 2010).

According to this model, it is the role of information and communication technologies (ICT) to offer new possibilities for social intervention, to create collaborative learning environments (communities) that allow students to carry out group activities, activities that are integrated into the real world and planned with real objectives. Research in this area consistently points out the necessity of preparing technology to be used as a tool rather than as an end in and of itself, a tool the main purpose of which is to help students learn in a more efficient manner. Helping others to learn has to do with offering better channels for communication as well as better tools for exploring the domain that holds the primary materials for learning (Coll, Maurí & Onrubia, 2008; García-Valcárcel & Hernández, 2013).

Teachers at innovative European secondary schools who make significant use of ICT to support learning based on problem-solving report improvements in concepts and skills, motivation, responsibility and self-reliance (OCDE, 2003). For their part, the teachers and students who participate in collaborative learning projects with other schools express a high degree of satisfaction, especially concerning communication with students from other countries, as can be seen in the evaluation reports from the eTwinning project (Baca, 2010).

Data from a study published by Sáez (2011) reveal that almost half of teachers maximize self-reliance and individual work using ICT, and 40% of teachers make use of ICT for collaborative and group activities using technology.

In studies carried out in Latin America (Murillo & Martínez-Garrido, 2013; Puentes & al., 2013; Román & Murillo, 2012), the conclusion is that teachers are aware of the potential that ICT possess as motivators for the teaching-learning process, and that they also recognize that they promote collaborative learning.

In Spain, and specifically in the region of Castilla and León, the use of collaborative learning methods using ICT is both new and complex, even though technological tools are positively valued in the sense pointed out by Suárez & Gros (2013: 56): «The use of tools that allow for communication, collaboration and the

acquisition of knowledge is fundamental for improving learning processes.» (p. 56). The main advantages that they point out have to do with easing communication (Plomp & Voogt, 2009). The official website for the Escuela (School) 2.0 initiative lists seven advantages of using ICT as part of collaborative learning and work procedures: efficiency, moral values, the exchange of information, innovation, limitation of duplicities, viability and unity.

ICT use has also been correlated with increased learning as it promotes better interaction between teachers and students. For Carrió (2007), collaborative learning is simply a very useful way of teaching in that students and teachers work together, whatever the subject matter. In his opinion, if we were to add technological advances to this model as they occurred, we would, at the same time, increase learning.

As far as drawbacks or disadvantages to collaborative learning using ICT, Suárez & Gros (2013: 59) use the following words to refer to planning for activities, «collaborative learning requires much greater preparation in order for students to be able to work independently in groups»; «The difficulties encountered in carrying out collaborative processes are usually the result of poorly designed activities and problems with communication and organization of those activities rather than with technical aspects of the programs or platforms used.» They also note that ICT «actually aggravate conflict when teachers misinterpret messages or when multiple messages that need to be answered immediately are received» (57-58). On the other hand, we find a lack of experience on the part of students with this type of method and with the tools they must use in virtual environments, which are frequently poorly thought out in terms of promoting work that is both continuous and easy to evaluate.

The other great disadvantage has to do with the time factor, an aspect that has also been mentioned in several research papers on the subject. Ferrero, Martinez & Otero (2009: 8) state that the use of ICT requires much more teacher time than do conventional methods. «Internet communication requires enough time to read and answer messages, and to surf the web, which may cause teachers to feel overwhelmed. Clearly, far from saving time, the use of ICT may actually use up time that could otherwise be spent performing other tasks that are also a part of a teacher´s responsibility.»

Finally, we should point out the importance of relating these methods based on collaboration and the use of ICTs to build knowledge with the variables that affect student performance- skills acquisition, motivation, satisfaction, etc. Studies of interest in this respect include those by Camilli, López & Barceló, 2012; Cox & Marshall, 2007; García-Valcárcel & Tejedor (2010); Martín & Tyner (2012); Monereo & Badía (2012); Rué (1998); Tejedor (2010); Zaho & Kenneth (2002).

2. Research methods

The objective of this study was to determine the conceptions held by teachers who work in schools that are well-equipped with information and communication technology (ICT) as to the advantages and disadvantages of collaborative learning methods based on their own teaching experience.

At the same time, our study sought to discover to what extent teachers value and use ICT to support collaborative work projects for students as well as for their own professional development.

We chose a method that was qualitative in nature so that we could straightforwardly explore teacher conceptions regarding the potential value of collaborative learning processes, their actual classroom experiences with collaborative work activities, and the role that ICT play in these activities. Our technique for gathering information comprised interviews with key persons at the schools; specifically, we spoke with groups of teachers in primary (third cycle) and secondary (first cycle) levels of education who teach at schools that have well-developed technological infrastructures. The population of interest was defined as schools that have received ICT accreditation (level 4 and 5) from the Junta of Castillaand León for 2010 and 2011, and again, specifically, teachers who work at the educational levels mentioned above, since they are the ones directly involved in the Red XXI Program for the region of Castilla and León. Twenty schools from the following provinces agreed to participate in the study and form the sample group: 2 schools in León, 2 in Palencia, 4 in Burgos, 1 in Soria, 3 in Valladolid, 2 in Zamora, 2 in Salamanca, and 4 in Segovia. Of these schools, 11 are city schools while the other 9 should be considered rural schools; there are 14 schools with pre-school and primary classes (CEIP), 2 secondary schools (IES), 2 compulsory education schools (CEO), and 3 clustered rural schools (CRA). The latter are schools that are part of a group of small schools in several nearby villages.

Field work was carried out during the school year 2011-12. In all cases, the administrators of each school had given their approval for the interviews, and an ordinary semi-structured protocol was applied. Each interview was led by a researcher with participation by a group of primary (third cycle) and/or secondary (first cycle) teachers at the school, teachers who taught different subjects, and an ICT coordinator whenever possible.

In analysing the interviews we focused on the advantages and disadvantages that teachers perceived in collaborative learning strategies oriented both towards students and towards their own professional development, since these are the considerations that determine to a great extent the practices that teachers carry out. Thus, using the information from the interviews on our topic, we inductively created a set of categories which, in turn, was validated by experts and subjected to control through double categorization of 5 interviews by two different researchers, obtaining a high index of reliability as revealed by the high degree of correlation between the two. We used the NVivo10 program to analyse the contents of the interviews and that provided us with frequencies for the categories and allowed us to compare the opinions from each school using cluster analysis and the Jaccard index.

3. Results

At first glance, a general calculation of the textual units referring to the advantages and disadvantages of collaborative learning and the use of ICT indicates that the teachers interviewed identified many more advantages than disadvantages. Specifically, there are 101 textual references to advantages as opposed to 76

mentions of disadvantages, i.e. 57% as opposed to 43% of interventions in this sense.

3.1. Advantages of Collaborative Learning and the Use of ICT
The main advantages that teachers attribute to collaborative learning are related to «developing transversal skills, », «interaction among students» and «curriculum development». They also make frequent reference to increased student learning, motivation, and the repercussions of collaborative learning on students with learning disabilities. Table 1 shows the frequency of mention for the various categories related to the advantages of collaborative learning:

Table 1. Advantages of Collaborative Learning	
Categories	Frequencies
Development of transversal learning skills	8
Interaction among students	7
Curriculum development	6
Increase in student attention and participation	4
Improvements in teacher professional development	4
Increased student learning	4
Increased motivation	3
Improvements in performance among students with learning disabilities	3
Evaluation of student learning	2
Promoting personal satisfaction for students	1
Promoting family participation	1

The transversal learning skills mentioned refer to social skills (such as respect), problem solving, and work habits (self-reliance, responsibility, organization...), plus the capacity for reflection, critical thinking, and initiative. Below are a few notable references to these skills:
- «They are more critical when it comes to carrying out tasks. Since they have access to more material, they discuss things more among themselves, in such ways as, what do we all think?, what do we want to do?, I think this bit would be better farther up or farther down in our writing.» interview 14).
- «To learn to learn, so that in the future they will know how to do things for themselves, how to cooperate with others, to work as a team, to speak in public, and all these kinds of things. That is what is really going to be of value to them in the future» (interview 2).
- «Yes, and especially camaraderie, getting along with others, being able to work with others, knowing how to fit in with the world, in society, to respect differences and opinions» (interview 6).
- Regarding curriculum development, teachers expressed the following:
- -«Less and less time is spent transmitting information. The student gets bored less and the teacher has more time to truly evaluate, and can be
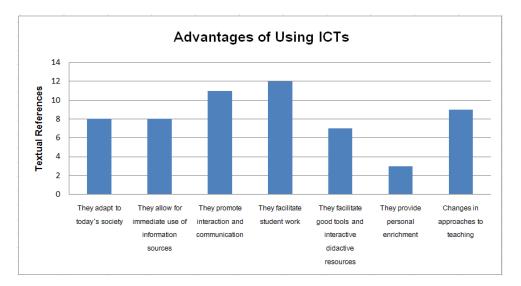
there with the student groups, lending support, observing.... At the same time you can be evaluating; you are able to follow the learning process much better» (interview 2).

- -«Working collaboratively, students create digital walls on which each student, depending on the subject he has been given, places an image and a commentary. They also use Webquest. For history class, one teacher uses a timeline with slides where students look for images and add data» (interview 14).

Graph 1 shows the different points that teachers identified as the advantages of collaborative learning using ICT. The notion they mention most often is that «they facilitate student work», which includes the following subcategories: they economize student work, they motivate students, they grab students´ attention, they promote student responsibility and self-reliance as they carry out their tasks, they help students with learning disabilities, ICT can be adapted to each student´s level, and student learning increases.

Rated second as an important advantage are «promoting interaction and communication» and «changes in approaches to teaching».

Graph 1. Advantages of Using ICT with Collaborative Learning.

Teachers point out the high level of motivation for collaborative learning that digital tools inspire in students, as can be seen in the following opinions:

- «ICT provide the motivational component for collaborative projects» (interview 17).
- «Students help each other and it´s easier for them to work collaboratively with the computer than with traditional materials (paper and pencil); the process becomes more practical» (interview 5).
- The following teacher opinions regarding including students with learning disabilities are especially interesting:

- «Somehow, the ones that truly grasp or understand the project pull the others along; the ones doing the work bring the others up to the group little by little, and in the end we have a homogenous bunch» (interview 18).
- «The use of ICT with collaborative projects has an added value, which is that it promotes the integration of students with learning disabilities» (interview 6).

3.2. Disadvantages of Collaborative Learning and the Use of ICT

Even though the various schools all consider collaborating work as fundamental, they also describe a few disadvantages, in many cases related to curriculum development (table 2):

Table 2. Disadvantages of Collaborative Learning	
Categories	Frequencies
Curriculum Development	12
Pressure from the Educational System and the Official Curricula	5
Aspects Related to School Organization	5
Learning Outcomes	4
Expectations of Families in Favour of Traditional Methods	1
Teacher Practices	1

Some aspects related to curriculum development, such as time wasted in the classroom, loss of control over students, differences in level of involvement among students in the group (the more self-reliant direct the work, the least reliant just go along), inherent limitations because of students being so young (too young to be left on their own), student evaluation more difficult and incoherent (students evaluated individually even though they are working collaboratively), and difficulty in applying collaborative learning to all subjects are the major obstacles that teachers perceive when using collaborative learning-teaching strategies. Below are a few examples along these lines:
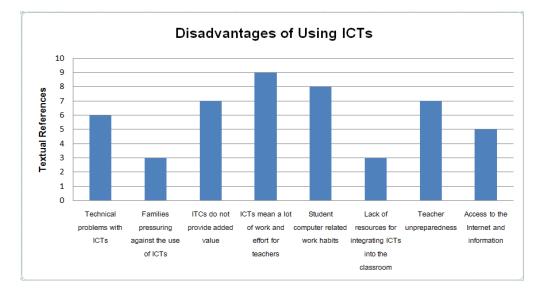
- «Collaborative activities with ICT are usually used with subjects that carry less academic weight» (interview 10).
- «They are very needy; sometimes I have to… not deny them help, but certainly delay giving it because otherwise they have a tendency to take the easy road, which is the way they think solves all their problems» (interview 8).
- «There is a contradiction in that what is proposed is that the work be done collaboratively, as a group, but then the exams be taken individually» (interview 16)

Teachers also feel that collaborative learning with ICT means a lot of work and effort, that is to say, that it requires very good planning and, above all, time to prepare the sessions (see graph 2). Some teachers do not see the added value of ICT for collaborative learning. They also feel that students already have certain work habits regarding computers that make collaboration difficult, such as computer game expectations, individualized work, and difficulties with reading (they

copy and paste text without reading it first). They express themselves in the following manner with respect to planning efforts:

o «It requires much more preparation beforehand. You have to have everything very well prepared in advance; before you start, you have to figure out more or less what will be confusing for the children so you can guide them as they work» (interview 12).

o «The drawback with collaborative work with ICT is the time needed to prepare for it. It's different because you have to gather together a lot of information; you have to choose the information that suits what you're trying to accomplish; well, it's more work but the results are perhaps better» (interview 18).

Graph 2. Disadvantages of Using ICT for Collaborative Learning.
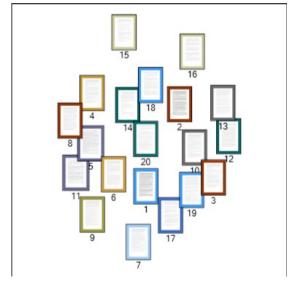
3.3. Comparative Analysis of Teachers from Different Schools

Cluster analysis was used as a multivariable technique to classify our set of interviews into homogeneous groups. This markedly exploratory type of analysis was used to measure similarity (or difference) in content in function of the codification that we set up. Similarity was calculated by comparing all the interviews in pairs using the Jaccard index, a coefficient that makes comparisons based on presence-absence data.

Graphs 3 and 4 show the similarity codifications between schools. A high degree of similarity is observed in some cases such as 5 and 11, or 14 and 20, which would indicate that the teachers in these schools, in general, share the same opinions. In any case, no interview was observed to be significantly different from the rest, a fact that allows us to confirm the cohesion of opinions expressed by the different sets of teachers.
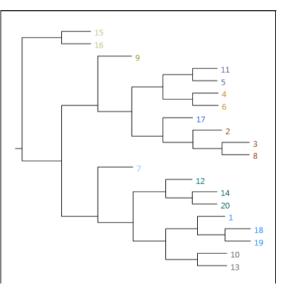
Schools Grouped According to Similarity in Codification

Graph 3. Graphic representation of Similarity Between Schools.

Schools Grouped According to Similarity in Codification

Graph 4. Tree Graph of Similarity Between Schools.

As we can see in graphs 3 and 4, the interviews or sets of teachers that are most distant one from the other in their conceptions about the subject at hand, according to the codification we carried out, are interviews 4 and 15 which correspond to two urban schools located in the province of Burgos. At one of the schools the teachers pointed out more advantages than disadvantages when speaking about collaborative learning and the use of ICT. We note, as an example: «Collaborative work produces improvements at both the individual and collective level, students are more motivated, ICT favour inclusion, and teachers learn a lot when they collaborate among themselves» (interview 4). At the same time, at the other school, teachers pointed out more disadvantages, stating: «ICT do not provide any added value for collaborative work; maybe when society becomes better prepared, because it is too individualistic. There is extra effort in creating materials and an increase in time spent on preparing students to handle the technology» (interviews 15). We feel that such different opinions between these schools may be linked, among other things, to the existence or not of an ICT coordinator. At the first of the two schools, there is a person who carries out these functions and who develops training plans for the school, while also conferring with staff virtually. On the other hand, at the second school, the headmaster must also play the role of ICT coordinator, which means that this person has less time to devote to ICT.

3.4. Analysis of the Context of the Concept «Collaborative»

We chose the key word «collaborative» to analyse in its context, creating the word and sentence tree shown in figure 1. This tree shows the sentences from the dif-

ferent interviews in which the selected term appears and the number in parenthesis tells which interview they came from.
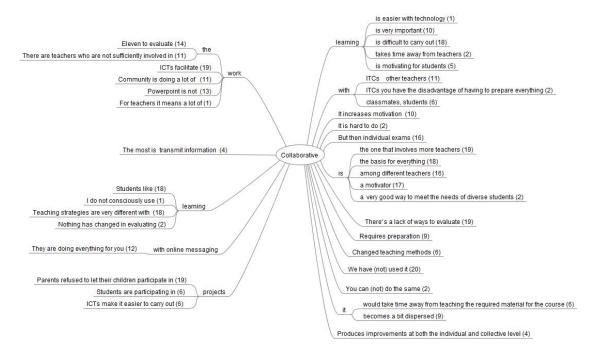

Figure 1.Word and Sentence Tree for the Key Word «Collaborative».

There are some especially interesting ideas on the tree for analysing the subject at hand and that summarize in one way or the other the ideas expressed by this set of teachers as far as the potential of ICT and collaborative learning, but also its weak points or the demands it makes on teachers: «ICT provide many benefits for collaborative learning»; «Collaborative learning is easier with technology»; «Students like collaborative learning»; «ICT make it easier to carry out collaborative projects»; «It kindles student interest»; «It increases student motivation»; «It is a very good way to meet the needs of diverse students»; «There are teachers who do not get sufficiently involved»; «Collaborative learning is difficult to carry out»; «Collaborative learning has the drawback of having to be thoroughly prepared beforehand»; «Collaborative work but then individual exams»; «There is a lack of tools for evaluation»; «It would take time away from other topics to be covered in the class».

4. Discussion and conclusions

The data we analysed clearly shows that the conceptions held by teachers who work in schools that are well-equipped with ICT regarding the potential for collaborative learning and the use of ICT for its implementation are complex and reflect both the positive aspects and the limitations of this type of educational practices.

The principal advantages of collaborative learning are those related to developing transversal skills that stimulate social skills, problem solving, self-reliance, responsibility, and the capacity for reflection and initiative, all of which are

considered of great relevance by teachers for achieving a well-rounded education for students. As for ICT, they are valued for the way they facilitate student work, giving them more independence, motivating them, grabbing their attention, and adapting to varying student levels, which especially supports students with learning disabilities, while increasing learning for all students.

These results coincide with those of other researchers (Alfageme, 2003; Cabero, 1994; García-Valcárcel & Tejedor, 2010; Lee & Tsai, 2013), who note that collaborative learning is a strategy for improving the acquisition and retention of knowledge, one that enhances specific strategies that students may use when acquiring knowledge (problem solving, expressing ideas and thoughts, and expanding vocabulary). These authors also point to the high motivating power of ICT for students, the development of responsibility towards others and for their own learning, and the possibilities for integrating students with learning disabilities.

Regarding the principal obstacles when implementing collaborative learning methods in the classroom, several questions have been raised that will impact curriculum development: These include more time spent on preparation, a certain loss of control, the unequal participation of students in the process, or the difficulties found in evaluating the learning process and the results obtained for each student. These conclusions also fall in line with those expressed by other authors. Nogueiras, Membiela & Suárez (1993: 23) concluded that teachers noted the following disadvantages: «poor performance by some groups, problems with classroom organization, unequal participation by members of the groups, the work progressed more slowly, a decrease in the amount of material that can be covered...». For his part, Lobato (1998: 31) says that in this mode of work we may run into such difficulties as differences in academic levels and work pace, strikingly individualistic attitudes and learning patterns in students, a lack of teacher preparedness, difficulties establishing parameters and modes for evaluation, lack of support by groups of teachers, and the mind-set of families.

These examples lead us to suppose that the same problems that teachers pointed out years ago regarding the implementation of this type of teaching method are still plaguing us today, in spite of the many changes in infrastructure that schools and other educational centres have experienced in recent years. This is another indication of the difficult and slow methodological reconversion in schools, which, in spite of being well-equipped with technology, have not seen a change in conceptions or practices in consonance with the new perspectives for learning which demand more personal and independent learning environments, while at the same time being interactive, mobile, universal, etc. and all of this certainly requires new teaching strategies.

Both the document associated with the OEI´s (Organization of Ibero-American States) Educational Goals for 2021 and the report written by Puentes & others (2013) reflect upon the necessity of training teachers better. We must insist once again on the transformation that needs to take place in school practices, so that practices will promote the development of collaborative projects with ICT, and so that ICT will become the channel for communication and information that is essential for guaranteeing learning environments that are open, interactive,

replete with incentives and sources of information, motivating for students, and focused on developing skills. In this sense, we must continue to maximize teacher training and the communities of practice that have been and are still working in this area (Pino & Soto, 2010; Watson, 1997; Windchiti & Sahl, 2002).

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References

Alfageme, M.B. (2003). Modelo colaborativo de enseñanza-aprendizaje en situaciones no presenciales. Universidad de Murcia: Tesis doctoral.

Baca, V.M. (2010). El proyecto Etwinning. Revista Contribuciones a las Ciencias Sociales (www.eumed.net/rev/cccss/08/vmbm.htm) (20-04-2013).

Cabero, J. & Márquez, D. (1997). Colaborando y aprendiendo. La utilización del vídeo en la enseñanza de la geografía. Sevilla: Kronos.

Camilli, C., López, E. & Barceló, M.L. (2012). Eficacia del aprendizaje cooperativo en comparación con situaciones competitivas o individuales. Su aplicación en la tecnología: una revisión sistemática. Enseñanza & Teaching, 30 (2), 81-103.

Carneiro, R. (2009). Las TIC y los nuevos paradigmas educativos: la transformación de la escuela en una sociedad que se transforma. In R. Carneiro, J.C. Toscano, & T. Díaz (Coord.), Los desafíos de las TIC para el cambio educativo (pp. 15-28). Madrid: OEI /Fundación Santillana.

Carrió, M.L. (2007). Ventajas del uso de la tecnología en el aprendizaje colaborativo. Revista Iberoamericana de Educación, 41, 1-10.

Coll, C., Maurí, T. & Onrubia, J. (2008). Análisis de los usos reales de las TIC en contextos educativos formales: una aproximación socio-cultural. Revista Electrónica de Investigación Educativa, 10, 1-18.

Cox, M. & Marshall, G. (2007). Effects of ICT: Do we know what we should know? Education and Information Technologies, 12 (2), 59-70.

Ferro, C., Martínez A. & Otero, M.C. (2009). Ventajas del uso de las TIC en el proceso de enseñanza-aprendizaje desde la óptica de los docentes universitarios españoles. Revista Electrónica de Tecnología Educativa, 29 (http://edutec.rediris.es/-Revelec2/revelec29/ articulos_n29_pdf/5Edutec-E_Ferro-Martinez-Otero_n29.pdf) (27-04-2013).

García, I., Gros, B. & Noguera, I. (2010). La relación entre las prestaciones tecnológicas y el diseño de las actividades de aprendizaje para la construcción colaborativa del conocimiento. Cultura y Educación, 22 (4), 395-418.

García-Valcárcel, A. & Tejedor, F.J. (2010). Evaluación de procesos de innovación escolar basados en el uso de las TIC desarrollados en la Comunidad de Castilla y León. Revista de Educacion, 352, 125-148.

García-Valcárcel, A. & Hernández, A. (2013). Recursos tecnológicos para la enseñanza e innovación educativa. Madrid: Síntesis.

Gómez, A., Puigvert, L. & Flecha R. (2011). Critical Communicative Methodology: Informing Real Social Transformation Through Research. Qualitative Inquiry, 17, 3, 235-245.

Kolloffel, B., Eysink, T. & Jong, T. (2011). Comparing the Effects of Representational Tools in Collaborative and Individual Inquiry Learning. Computer-Supported Collaborative Learning, 6, 223-251.

Kozma, R.B. & Anderson, R.E. (2002). Qualitative Case Studies of Innovative Pedagogical Practices Using ICT. Journal of computer assisted learning, 18, 4, 387-394.

Lee, S.W. & Tsai, C.C. (2013). Technology-supported Learning in Secondary and Undergraduate Biologial Education: Observations from Literature Review. Journal of Science Education and Technology, 22, 226-233. (DOI: 10.1007/s10956-012-9388-6).

Lobato, C. (1998). El trabajo en grupo. Aprendizaje cooperativo en secundaria. Bilbao: Universidad del País Vasco.

Martín, A.G., & Tyner, K. (2012). Educación para los medios, alfabetización mediática y competencia digital. Comunicar, 38, 31-39.

Monereo, C. & Badía, A. (2012) La competencia informacional desde una perspectiva psicoeducativa: enseñanza basada en la resolución de problemas prototípicos y emergentes. Revista Española de Documentación Científica, monográfico, 75-99. (DOI: 10.3989/redc.2012.mono.978).

Murillo, F.J. & Martínez-Garrido, C. (2013). Impact of Homework on Academic Performance. A Study of Iberoamerican Students of Primary Education. Revista de Psicodidáctica, 18 (1), 157-171. (DOI: 10.1387/RevPsicodidact.6156).

Nogueiras, E., Membiela, P. & Suárez, M. (1993). Triangulando perspectivas. El trabajo en grupo a debate. Revista de Educación, 302, 259-271.

OEI (2013). Metas educativas para el 2021. (www.oei.es/metas2021/expertos02.htm) (27-04-2013).

OCDE (2003). Los desafíos de las Tecnologías de la Información y las Comunicaciones en la Educación. Madrid, Ministerio de Educación, Cultura y Deporte.

Panitz, T. (2001). Collaborative Versus Cooperative Learning. A Comparison of the Two Concepts which will Helps Us Understand the Underlying Nature of Interactive Learning. (http://home.capecod.net/~tpanitz/tedsarticles/coopdefinition.htm) (30-04-2013).

Piaget, J.P. (1981). Intelligence and Affectivity. New York: Basic Books.

Pino, M. & Soto, J. (2010). Identificación del dominio de competencias digitales en el alumnado del grado de magisterio. Revista Teoría de la Educación: Educación y Cultura en la Sociedad de la Información, 11, 3, 336-362.

Plomp, T. & Voogt, J. (2009). Pedagogical Practices and ICT Use around the World: Findings from the IEA International Comparative Study SITES 2006. Education and Information Technologies, 14 (4), 285-292.

Puentes, A. & al. (2013). Concepciones sobre las tecnologías de la información y la comunicación (TIC) y sus implicaciones educativas: Un estudio exploratorio con profesorado de la provincia de Ñuble, Chile. Revista Iberoamericana de Ciencia, Tecnología y Sociedad, 22, 8, 75-88.

Román, M. & Murillo, F.J. (2012). Learning Environments with Technological Resources: A Look at their Contribution to Student Performance in Latin American Elementary Schools. Educational Technology Research and Development, 60 (6), 1107-1118. (DOI: 10.1007/s11423-012-9262-5).

Rué, J. (1998). El aula: un espacio para la cooperación. In C. Mir. (Coord.), Cooperar en la escuela. La responsabilidad de educar para la democracia (pp. 17-49). Barcelona: Graó.

Sáez, J.M. (2011). Opiniones y práctica de los docentes respecto al uso pedagógico de las tecnologías de la información y la comunicación. Revista Electrónica de Investigación y Docencia, 5, 95-113.

Salmerón, H., Rodríguez, S. & Gutiérrez, C. (2010). Metodologías que optimizan la comunicación en entornos de aprendizaje virtual. Comunicar, 34, 163-171. (DOI http://dx.doi.org/10.3916/C34-2010-03-16).

Suárez, C. & Gros, B. (2013). Aprender en red: de la interacción a la colaboración. Barcelona: UOC.

Tejedor, F.J. (Coord.) (2010). Evaluación de procesos de innovación escolar basados en el uso de las TIC desarrollados en la Comunidad de Castilla y León. Salamanca: Universidad de Salamanca.

Watson, G. (1997). Pre-service Teachers' Views on their Information Technology Education. Journal of Information Technology for Teacher Education, 6, 3, 255-270.

Windchiti, M. & Sahl, K. (2002). Tracing Teachers' Use of Technology in a Laptop Computer School: The Interplay of Teacher Beliefs, Social Dynamics, and Institutional Culture. American Educational Research Journal, 39, 1, 165-205.

Zhao, J. & Kenneth, F. (2002). Factors Affecting Technology Uses in Schools: An Ecological Perspective. American Educational Research Journal, 40, 4, 807-840.