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INTRODUCTION

Time and digital mediations of learning

Every day it becomes increasingly obvious that research cannot continue to treat e-learning as a monolithic phenomenon. From the very beginning, learning processes have been mediated by digital media in very diverse ways - so diverse that the nature of such mediations could even be considered as different phenomena for research. While this has been always true ever since the first proliferation of digital media, it is now truer than ever with the rapidly increasing ubiquity of the new digital media, introducing digital mediation into even the smallest spaces in all our activities, including learning. In my view, this should compel e-learning scholarship not to consider e-learning as one single phenomenon for research, but rather as a group of very different phenomena which therefore deserve different conceptualizations and different research approaches to fit different kinds of mediation by digital media. One attempt to conceptualize different kinds of digital mediation within e-learning in order to be considered differently by research and design was tried almost ten years ago by Strijbos, Martens, & Jochems, who revived a distinction made by Crook. These authors then distinguished between *interaction with computers*, *interaction at computers*, and *interaction through computers*. Now, considering the current ubiquity of digital media, we might remove the word "computers" and instead say simply "digital media". The idea of *interacting with digital media* refers to e-learning settings in which, rather than interacting with another human, the learner interacts directly with algorithms, which automatically interact with the learner by means of some kind of interface. The idea of *interacting at digital media* refers to e-learning settings in which the learner interacts with other human beings *around* a digital artifact; in this case, the human interaction can be face-to-face or online. The idea of *interacting through digital media* refers to e-learning settings in which the learner interacts with other human beings *by means* of digital media; so the digital mediation makes the human interaction possible. Note that all three kinds of digital mediation could occur in one and the same learning situation: for example, when a learner is playing an educational game (interacting with digital media) and is commenting with her classmates on how to get the next level in the game (interacting at digital media) by means of a chat (interacting through digital media). In my view, in this situation, all three kinds of mediation should be conceptualized and researched separately (although the relationships between them could be also researched) in order to gain a full understanding of this e-learning situation.

The introduction of any of these three kinds of digital mediation into learning processes transforms the temporal dimension of these processes in some way; indeed, each of these kinds of digital mediation transforms time in a different way. The transformation of the temporal dimension of learning deeply transforms the learning process itself, as temporality is a crucial aspect of learning phenomena. However, research has not focused very much on the temporal dimension of e-learning, on how different kinds of digital mediation transform learning time, and how these time transformations influence the learning process. In this respect, the eLearn Center has been conducting a large research program aimed at achieving a better understanding of the time dimensions in differently digitally mediated learning processes. In the present volume of the eLearn Center Research Paper Series, which is the second volume of the journal exclusively devoted to PhD students' research, we present four studies which focus on this issue by paying special attention to the role of time in different kinds of digital mediation of learning.

The first two papers focus on the study of perhaps the main political effort being made in Europe and worldwide to foster *interaction with and at digital media* in schools: the one-to-one project, in which governments all over the world have given one laptop to each child in schools and have encouraged the teaching materials industry to develop educational software. The paper by Guitert and Vázquez studies the perceptions of teachers participating in the implementation of the one-to-one project in Catalonia (Spain) (called Escuela 2.0). The authors particularly focus on time issues; for example, they identify some time requirements (or tensions) which the project introduces in the teachers' work and in classroom life in general, and they also explore the times in the classroom devoted to what we have called *interaction with digital media* and *interaction at digital media* by pupils. Meanwhile, the paper by Da Silva and Ornellas studies the implementation of the one-to-one project in Uruguay (called Plan Ceibal). These authors focus more on the potential of the Plan Ceibal project for transforming social and cultural communities and on the project's current failure to do so. In this paper, Da Silva and Ornellas propose a set of improvements to the Plan Ceibal project based on the experiences begun almost 20 years ago in marginal communities in San Diego (USA) by Cole and his team; experiences which have been spread out over the world and are known as "The fifth dimension". In the proposal by Da Silva and Ornellas, special attention is given to the time factor in the process of implementing a fifth dimension experience to improve the Plan Ceibal.

The other two papers in this issue focus on the third kind of digital mediation mentioned earlier: interacting through computers. The paper by Medina addresses one important problem with this kind of digital mediation which makes it very difficult to learn some competences online: the online student's difficulty in gaining access to and handling the specialized and expensive equipment necessary for some kinds of learning. In face-to-face settings, institutions acquire this equipment and make it available to students in a specific location. For online students, however, it is necessary to be able to use the equipment at a distance. One response to this problem has been the technical development of what has been called a Virtual Laboratory, which allows the remote use of specialized equipment. Medina's paper focuses on some pedagogical issues concerning the design and use of these Virtual Laboratories and offers some proposals for improving self-regulation, with special consideration given to time regulation, in learning processes in Virtual Laboratories. The self-regulation of time in *interacting through digital media* settings is precisely the main focus of the paper by Cortés and Barberà, which will close this issue of the eLearn Center Research Paper Series. Cortés and Barberà study how students' use of time on the Internet in online courses is related to their learning outcomes (knowledge acquisition, knowledge transfer and satisfaction).

In summary, in this issue, we present a selection of papers which externalize the on-going research effort by the eLearn Center to understand the complexity of the ways in which digital mediation of learning takes place, with a special focus on the role of time in these digital mediations.

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01

Guitert Catasús, M. & Vázquez Gutiérrez, A. (2013).
Teacher perceptions of the time factor in One Laptop per Child.
eLC Research Paper Series, 7, 06-14.

TEACHER PERCEPTIONS OF THE TIME FACTOR IN ONE LAPTOP PER CHILD

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Teacher perceptions of the time factor in One Laptop per Child

ABSTRACT:

In this paper we analyze teacher perceptions of the time factor in One Laptop per Child. In the first part of this paper we present the state of the art of the incorporation of ICT in schools of Spain following the One Laptop Per Child program (the State plan known as Escuela 2.0).

Secondly, we present the qualitative methodology that we use for the study. We will obtain the data by analyzing the questionnaire, with open questions, from teachers participating in the project in Catalonia, in TICSE[1] 2.0 framework.

Finally, we present the results and the teachers' conclusions about the time factor in the implementation of these programs. In general, the perception that teachers have about using technology is that it requires a lot of time. In their opinion, they need too much time to learn to use ICT and technical aspects of them mean wasted time.

KEYWORDS:

ICT, Formal learning, One Laptop Per Child, Teacher perception, Time management.

1. http://www.ite.educacion.es/es/inicio/noticias-de-interes/745-ique-opina-el-profesorado-sobre-el-programa-escuela-20

INTRODUCTION TO MODELS 1:1

Over the last 30 years many countries have designed plans that promote ICT in teaching and learning processes (Alonso *et al.*, 2010). The aim of these projects is for schools to prepare their students for a new kind of society which involves not only knowing and using ICT already present in their homes, but also using them as learning tools (Adell & Castañeda, 2012).

If we focus on the last five years, many of these educational plans are based on the One Laptop per Child project, which was presented by Nicholas Negroponte at the Davos World Forum (2005).

All these projects are focused on developing low-cost laptops and making them available to every school-age child on the premise that this technological equipment helps students to develop competently within the Digital Society they are living in (Alonso, Area, Guitert & Romeu, 2012).

This way, we can see how the 1:1 model has become a trend in many countries in very different geopolitical spaces, as we find excellent experiments in Europe (such as "Iniciativa Magalhaes" in Portugal), Asia (India and South Korea) and America (both North and Latin America). As well as developing remarkable plans including the "Conectar Igualdad" project (Argentina) or "Una Laptop por Niño" (Peru), Latin America has the first country to achieve full technological equipment: Uruguay, where every pupil in the country, and their teachers, have laptops, thanks to the so-called CEIBAL Plan[2] (acronym meaning Basic Computer Education Connectivity for Online Learning) that began in 2006. Despite the considerable investments devoted to providing each student with his/her own laptop, has not yet been possible to assess the impacts of such initiatives, draw conclusions and evaluate their cost-effectiveness (Alonso, Rivera & Guitert, 2013). This may be due to a variety of factors, such as short implementation deadlines, lack of clear goals or commitment to studying the impact and a lack of measurement tools. Along these lines, it should be noted that the reasons for investing in computer programs for pupils can be classified into three main categories (Severin & Capota, 2011):

- From an economic perspective, it is considered that technology plays an important role both in the production process and the results these processes offer.
- From a social perspective, we know these programs can help to reduce digital and social gaps. They also provide access to digital tools and to Internet to families and communities that would not otherwise be possible.
- From an educational perspective, these devices have the potential to provide new educational practices which by nature are student-centred and constructivist. They may also support the skills and abilities required in the 21st century.

Although, at first, the research on classrooms equipped with one computer per student was considered poor, the volume of documentation began to increase at the beginning of the 21st century. By 2006 Penuel had already identified 46 published studies focusing on this type of environment (Valiente, 2011). Among these studies, we could highlight the so-called "implementation studies" (Rockman, 2003; Russell, Bebell & Higgins, 2004). These are focused on describing the various initiatives studied, providing a comprehensive picture

2. http://www.ceibal.org.uy

of how the program was designed. Taking these lines into account, the feeling is that more research is needed to reach a deeper understanding of educational practices that occur in these environments (Bebell, 2005).

We can see how the different countries in which the use of one computer per student environments have been implemented, share the following common objectives (Valiente, 2011):

- To provide students with the ICT skills and competences necessary to function as a citizen in the knowledge economy.
- Reduce the digital gap between individuals and social groups and generalize their access to ICT so that they are available not only at school but also at home.
- Improve the quality of teaching making it strongly student-orientated in order to improve academic achievement and reduce the gap between formal (school) and informal learning.

Some of the positives and negatives aspects of 1:1 models featured in recent research in different geographical areas are (Martínez & Suñe, 2011):

1:1 MODELS IN SPAIN: ESCUELA 2.0

In Spain, the Ministry of Education designed the program called Escuela 2.0 for innovation and modernization in education systems. It began during 2009 and was contextualized in the so-called Plan-E. The goal of this program was to reactivate the country's economy, and one of its pillars was the fact of using a laptop per student while improving the traditional classrooms with interactive boards and Internet connection. Besides its technical aspects, the program (which was based on an investment of 200 million Euros, financed by the central government and the autonomous communities) stressed the training of teachers and ICT coordinators. This training was not only based on the use of tools, but also focused on working on the methodological aspects of the introduction of digital resources in teaching and learning processes. Specifically, the program's lines of action were:

- Digital classrooms. Providing students and schools with ICT resources; laptops for students and teachers as well as effective,

Figure 1. Some of the positive and negative aspects of 1:1 models (Martinez & Suñe, 2011).

POSITIVE ASPECTS
Teachers have perceived an increase in students' motivation.
The Digital Competence level of the students has been improved, along with their skills in terms of information.
The students have gained autonomy.
They have developed the corresponding listening and speaking skills typical of virtual environments.

NEGATIVE ASPECTS
The high financial cost of implementing this type of model.
Connectivity problems; sometimes the schools' bandwidth is not enough to perform the required tasks.
The shortage of supply of quality digital educational materials.

standardized digital resources in the classroom.

- Ensuring Internet connectivity and interconnectivity within the classroom for all equipment. Internet availability access in the students' homes at particular times.
- Promoting teacher training in the technological, methodological and social aspects of the integration of these resources into daily teaching practice.
- Generating and providing access to digital educational materials tailored to the curricula for teachers and students, as well as their families.
- Involving students and families in the acquisition, custody and use of these resources.

At the first phase, Escuela 2.0 was aimed to include the fifth and sixth years of primary education. However, there was a specific case, similar to that of Catalonia, where the program was initiated at different levels: as there was already a plan to implement ICT in primary education in Catalan schools, in this territory the initial stage of this program was implemented in the early years of secondary education.

Most of the regions of Spain, as well as the autonomous cities of Ceuta and Melilla, joined the government proposal to participate in the Escuela 2.0 Program. Only Madrid and Valencia did not join the initiative in order to move forward with ICT plans they had already designed. The program was renamed, with a variety of titles in on different regions: Eskola 2.0 in the Basque Country, Clic-Escuela 2.0 in the Canary Islands, Abalar in Galicia, Escuela TIC 2.0 in Andalusia and EduCAT in Catalonia.

In its first two years of implementation, the approximate figures were:

- 30,000 classrooms 2.0 implemented.
- 650,000 students in the third cycle of primary education and the first cycle of Secondary Education had of a laptop.
- 160,000 teachers participated in ICT training activities.
- The production and use of digital educational content, designed both by teachers and by publishers, increased significantly[3].

At a press conference in April 2012, the Secretary of State for Education, Training and Universities, Ministry of Education, Culture and Sport announced that budget cuts related to the educational system included the cancellation of the Escuela 2.0 Program. It was also explained that it would be replaced by another achieving a saving of 60% compared to the previous year's Escuela 2.0[4].

THE TICSE 2.0 PROJECT: THE POLICIES OF ONE COMPUTER PER CHILD IN SPAIN

The TICSE 2.0 project is the Spanish acronym for "*Las políticas de 'un ordenador por niño' en España*"; *the policies of "one computer per child" in Spain. Visions and practices of teachers in Escuela 2.0.* A comparative analysis between regions (EDU210-17037) is an approved project forming part of the 2010 National R + D round of the Ministry of Science and Innovation of the Spanish Government. It lasts 3 years and it is coordinated by the University of La Laguna, with Manuel Area as main researcher. More than 50 researchers are involved in this proposal, located at different universities (Laguna, Autónoma de Barcelona, Autónoma de Madrid, Barcelona, Cádiz, Coimbra, Complutense de Madrid, Extremadura, Oberta de Catalunya, Oviedo, País Vasco, Salamanca, Sevilla and Valencia).

3. http://www.ite.educacion.es/es/congresos/iii-congreso-escuela-20.
4. http://ordenadoresenelaula.blogspot.com.es/2012/04/escuela-20-y-el-final-de-la-politica.html.

The objectives of this project are:

1. To identify the opinions, expectations and ratings of primary and secondary education teachers participating in Escuela 2.0, as well as the use of ICT in their teaching in Spain.
2. To explore what types of teaching practices or learning activities are organized in the classroom context by using these technological resources and analysing their impact on the teaching and learning methodology, as well as the way they integrate and coexist with traditional materials, especially textbooks.
3. To write a comparative analysis of these phenomena among some Autonomous Communities currently participating in the Escuela 2.0 Program (Andalusia, Asturias, Catalonia, Canary Islands, Extremadura, and the Basque Country) and others not participating in it (Madrid, Valencia).
4. To create a website with an Observatory for policies called *one computer per child* intended for the mass provision of ICT in the school systems of countries in the Latin American community. It is dedicated political administrators and Spanish and Portuguese researchers and teachers.

The research is divided into different phases:

- **Phase one** (2010/2011 academic year). The aim of this first phase was to identify opinions and needs of teachers in Escuela 2.0. To collect data, we used an online questionnaire consisting of open and closed questions. The data collected in this survey are shown in a provisional report called: *What do teachers think about the 2.0 school program? An analysis by regions*[5]. In cooperation with the education authorities, the survey was e-mailed to the different schools that participated at Escuela2.0.
- **Phase two** (course 2011/2012). The intention of this second phase was to carry out 8/10 case studies by autonomous community, with the aim of exploring the teaching practice developed in the classroom context.

Below is an analysis of the 661 responses made by teachers in Catalonia in the phase one (survey), in relation to their perception of the time factor.

VIEWS AND PRACTICES OF TEACHERS IN CATALONIA CONSIDERING ESCUELA 2.0

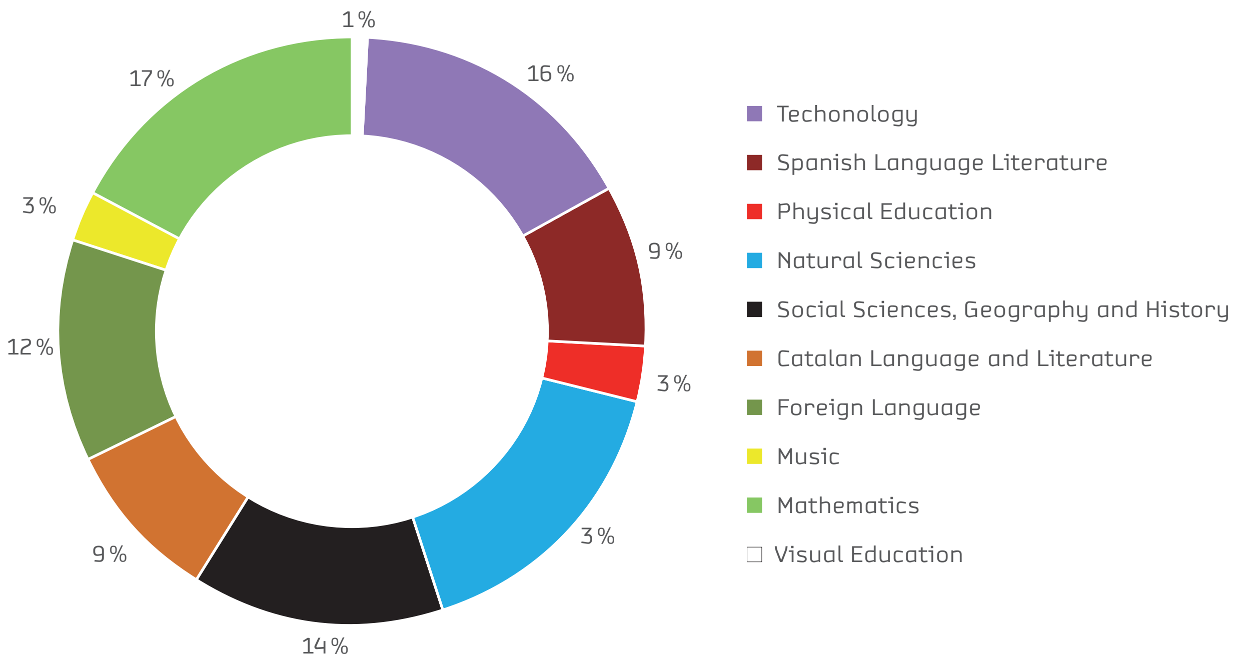
When analysing the profile of teachers who responded to the survey, it can be seen that they are mainly women (59% of cases), aged between 35 and 55 years old (76% of responses) and with more than ten years of experience in the classroom (77% of responses). These are secondary school teachers (96% of the cases) who work in a school where the laptops belong to the students (81% of responses) and are members of the Department of Mathematics, Technology and Natural Sciences (50% of cases, a high proportion considering that the questionnaire mentioned ten different educational areas).

Regarding the type of actions that are performed with ICT in the teachers' classrooms, the following are identified:

1. BY STUDENTS:

- Creating papers with a text editor (82% of responses).

5. http://ntic.educacion.es/w3/3congresoe20/Informe_Escuela20-Prof2011.pdf.



- Searching for information on the Internet (76% of responses).
- Doing online activities or exercises (74% of responses).
- Creating multimedia presentations or small videos (43% of responses).
- Exposing papers supported by the PDI or the projector (47% of responses).
- Publishing online papers in blogs, wikis, webs...(38% of responses)

2. BY THE TEACHERS:

- Explaining lessons or issues using the IWB or projector (73% of responses).
- Evaluating pupils (54% of responses).
- Contacting pupils or their families (54% of responses).
- Creating and/or using Webquest and other online resources to promote collaborative work among students (27% of responses).
- Participating in online projects collaborating with other schools (10% of responses).

TEACHERS' OPINION CONCERNING THE TIME FACTOR

Analysing the closed-ended questionnaire it can be perceived that 20% of teachers believe ICT is a distraction and waste of time and 80% of the teachers oppose this statement. It is also worth mentioning that 50% of the people involved claim that one of the effects of ICT in education is the necessary reorganization of time and space.

In order to answer the question of how teachers from Catalonia appreciate the time factor in 1x1 environments, we focus on analyzing the open questions from the questionnaire TICSE Project.

Regarding the role of the ICT coordinators or heads of technology in the classroom, the questionnaire indicates that they are highly appreciated by the teachers because they are always available to help their colleagues and willing to work extra hours: *He does hundreds of jobs and he doesn't have time for everything. He should have more time for his work.*

Lack of time is also shown when discussing training. In this sense, although teachers expressed willingness to participate in practical courses, lack of time prevents them from going further. They also ask for more time to implement what they learn.

When analyzing the responses about the most valued aspects of EduCAT program, we can see that only two of the 379 contributions received refer to the time factor, noting that the implementation of the 1:1 model has brought an improvement in learning time management as well as in the field of lesson design.

By contrast, among the 416 responses related to negative aspects of the project, there were approximately 60 direct references to the time factor:

- Firstly, we find a series of contributions referring to teachers' conceptions of time-wasting in different situations:
  - -The slowness of internet connections, which also disrupts the classroom: *When the network doesn't work you must have a plan B and, sometimes, even a plan C.*
  - -Too much time invested in accessing digital content.
  - -Time spent switching on devices: *In the end, classes last just 30 minutes. Lots of time is wasted switching every computer on.*
  - -Technical problems.
  - -Keeping the computers in a cart makes the distribution and start-up processes very slow. *Our experience shows that this process takes almost 20 minutes. If we multiply this time over the weeks, we find that many hours have been lost.*
- Secondly, a sector of teachers considered that students immersed in the program often waste time playing or chatting: *All the time you need to be making sure they are not connecting to Facebook instead of doing class work.*
- Thirdly, the lack of time for basic tasks, such as training or creating materials, is seen as negative by teachers. It is considered that if teachers had time, they could create much higher quality resources than those currently on the market:
  - *-I invite the person responsible to give teachers the opportunity to invest more time from their schedule in creating materials. At the same time, a financial or time reduction reward is also suggested for teachers who have already created materials. If this is not done, in five years the materials will remain as bad as they are today.*
  - *-Using applications is easy to learn but creating activities is more difficult and involves an amount of time that the teachers do not have.*
  - *-There is a lack of adequate teaching materials as well as the time to create them.*
  - *-Creating activities and maximizing those that we already have involves many hours that teachers do not have available.*
  - *-There is a lack of quality materials useful for working with students. This means teachers have to invest a huge number of hours in preparing resources.*
  - *-The most negative aspect of the project is the lack of time for teachers to work to form and create new materials.*
- Finally, it is considered that the number of hours available to technical or ICT coordinators to fulfil their tasks is nowhere near enough: *It is recognized that there is a lack of hours available for ICT coordination and for computers maintenance personnel.*

IN CONCLUSION

From an analysis of the responses, it is clear that, to a large extent, the teachers participating in the survey believe that, as indicated by Cuban, Kirkpatrick and Peck (2001), the time factor has a great influence on technology integration in the classroom. Firstly, the lack of time is seen by teachers as a limitation when training themselves or creating materials to use in their classrooms. Secondly, teachers feel that, in many cases they need to spend too much time in the classroom fixing technical aspects of ICT, especially when equipment does not work as expected.

Concerning the use of ICT in the classroom, we can see how different types complement one another (Simon, 2007): Transmitting Technologies (traditional static teacher and student roles are maintained, ICT are used as a support tool in lectures); Interactive Technologies (students conduct individual tasks with computers); and Collaborative Technologies (resource-oriented collaborative knowledge construction).

Although we are aware of the limitations of relying on data exclusively based on a survey, we can see how the results are comparable with those extracted by other research. For example, these ideas are consistent with results of Pelgrum (2001), who conducted a study in which management teams from 24 different countries identified the main obstacles perceived by teachers when implementing ICT in their programming. Among the ten most frequent problems shown by the research, two are directly related to the time factor: the fourth is scheduling computer time and the seventh is insufficient teacher time.

In this sense it can be concluded that, although teachers are aware that ICT have a number of features that open up new educational possibilities and that are likely to produce improvement that would be very difficult to achieve their absence (Coll, Onrubia & Mauri, 2008), their implementation involves a necessary temporary sacrifice in terms of preparing learning and materials.

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#02

Da Silva, M. & Ornellas, A. (2013). ICT collective appropriation on childhood and its impact on the community: the 5D educational model potentials and limits. *eLC Research Paper Series, 7, 15-26.*

ICT COLLECTIVE APPROPRIATION ON CHILDHOOD AND ITS IMPACT ON THE COMMUNITY

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ICT collective appropriation on childhood and its impact on the community: the 5D educational model potentials and limits

ABSTRACT

Uruguay became the first – and so far the only – country in the world to provide a laptop to each public school student and teacher since 2007. Six years after the beginning of the plan, several studies and assessment reports have highlighted the breakdown of the pattern of inequality of access to computers and the Internet thanks to the Plan. Despite this, other studies find that the community impact of the plan is almost zero in social and neighborhood organizations. This article presents the theoretical and methodological framework for research that aims to analyze how the impact of the Ceibal Plan[1] can be improved by fostering the emergence of communities of practice through the introduction of the Fifth Dimension Educational Model (5D)[2] in a context of social vulnerability in Uruguay. The methodological approach adopted to implement the research is Participatory Action Research, which focuses on a recursive process of reflection and action and is carried out *with* local people rather than *on* them. In addition, the time factor becomes a key element for understanding the processes of negotiation and rearrangement that are required in constructing Participatory Action Research.

KEYWORDS

Ceibal Plan; Fifth Dimension Educational Model; Participatory Action Research, Time factor.

1. The Ceibal Plan (acronym for Basic Educational Connectivity for Online Learning) is a socially inclusive plan that has delivered one laptop to each child attending public schools at national level. It is inspired in the OLPC (One Laptop per Child) program, whose purpose is to provide each child with a low-cost and connected laptop.
2. 5D is an educational activity model based on cooperation between universities and communities, which promotes collaborative learning mediated by ICT.

Da Silva, M. & Ornellas, A. (2013). ICT collective appropriation on childhood and its impact on the community: the 5D educational model potentials and limits. *eLC Research Paper Series, 7, 15-26.*

INTRODUCTION: THE IMPACT OF THE 1X1 PROJECT IN URUGUAY

The mass integration of computers into the Uruguayan educational system is part of an overall strategy to transform and modernize education. Since 2007, the Ceibal Plan has sought to influence the reduction of the digital divide in Uruguay through universal access to computers and the Internet in education. Since its implementation, several studies and much research have been carried out on aspects related to the results and impacts of the Plan (Behrendt, 2010; Machado, Perazzo & Vernengo, 2010; Rivoir & Pittaluga, 2010). Some of these studies carried out by the University of the Republic and the Monitoring and Evaluation Area of the Ceibal Plan report a reduction in the digital gap and reveal some impacts of ICT in education, children, families, schools, and communities.

In relation to connectivity coverage for schools, at the end of 2010, 95% of public schools had been reached, although some rural schools that presented difficulties due to the lack of electric power still did not have coverage. Emphasis was given to the placement of antennas in squares and similar spaces in neighborhoods that were considered to be a priority, such as housing developments, complexes, etc. (Pérez Burger *et al.*, 2009; Pérez Burger *et al.*, 2011).

Rivoir and Pittaluga's study (2010) noted the reduction of the digital divide between students who attend public schools and students in private schools due to the use of and access to the XO[3] and Internet computers among the country's poorest population. However, the authors also emphasize that the community impact of the Plan is almost nil, as the application and use of computers by social and neighborhood organizations have not been identified. Nevertheless, the overall assessment made by respondents is very positive, specifically in relation to equal access for disadvantaged neighborhoods and in small towns.

From an educational perspective, the research of Machado Perazzo and Vernengo l. (2010) suggests an incremental effect on the performance of the students in public schools in the areas of language and mathematics beginning with the arrival of the Ceibal Plan in their schools. This impact is analyzed from the performance of a sample of students in two learning assessments taken in the years 2006 and 2009. However, the author in the study stresses that "… both the characteristics and behaviors of students and their families, as well as the teachers and the authorities of the school, in addition to the policies and specific programs implemented, can affect children's learning" (Machado *et al.*, 2010: 29).

A monitoring and assessment report from the Assessment Area of the Ceibal Plan (Sectoral Department of Education Planning) reveals that 50% of the teachers planned activities in the classroom with computers at least once a week, and 21% did so almost on a daily basis. The general assessment of the impact on the children points out that 77% liked working with a laptop in class more than without a computer (Pérez Burger *et al.*, 2009). On the other hand, a later version of the same report highlights the growing difficulty in the maintenance of the XO, which becomes a problem for the students and the school institutions in their daily planning (Pérez Burger *et al.*, 2011).

In addition, the master's degree dissertation of one of the authors of this article about the Ceibal Plan (Da Silva, 2012) sought to learn

3. The XO are laptops developed by OLPC (One Laptop per Child), with free and open software. The operating system used is Sugar. These machines were distributed in Uruguay by the Ceibal Plan to all students in the public educational system.

more about the collaborative interactions and collective productions between children stemming from the use of the XO. The findings of the study emphasize that the predominant use of the XO is through video games. Much of the digital knowledge children have is left on the fringes of school life and is not capitalized on, nor is it integrated as knowledge that can be related to the curriculum. When knowledge is not made use of as such, a gap is created between the culture of the school and the culture that permeates life outside of it. The study also reflects difficulties in relation to the implementation of new strategies for teaching and learning since the introduction of the XO into school life.

The research summarized here thus far shows how the Ceibal Plan has guaranteed digital access at a national level. However, its impact on education, new strategies of ICT-mediated learning, and in the community is incipient or almost zero. This highlights the importance of initiating deeper changes in education and community contexts which would require the development of research and interventions to promote the appropriation of digital resources, generating changes in educational processes, starting with the availability of technological resources.

This article presents a research proposal that aims to contribute to necessary changes in the community space and education through the integration of ICT. To achieve this, the construction of a learning community based on the "Fifth Dimension" model is taken as reference. This is a model of educational activity based on collaborative learning mediated by ICT that has been developed by a network of teams from universities in the United States, Mexico, Brazil, Australia and some European countries, including Spain, (Cole & Distributed Literacy Consortium, 2006; Nilson & Nocoon, 2005).

Through the creative use of ICT, the "Fifth Dimension" (5D) model seeks to construct a context of activity that allows the development of the skills necessary for the inclusion of the children participating in the proposal. This model is developed inside and outside the school, creating an environment of collaboration, where meanings, goals and tools are shared.

BACKGROUND RESEARCH

The joint construction of meanings, interlocution, inter-subjective processes, action, connection, possibilities for participation and significant knowledge constitutes an essential element in the generation of collaborative environments. It is from this participation that affiliation and membership is generated, promoting reciprocity through a shared experience. A collaborative activity is defined depending on the levels of participation, and the way the different participants find possibilities of creating opportunities for themselves and others (Gros, 2005). The environment is understood as the set of interrelated elements that make up a favorable system for interaction and learning. It is what constitutes and allows the interweaving that promotes the social production of knowledge through mediators.

According to Gros (2005), research in the field of collaborative learning mediated through technology is heterogeneous and complex, as there are many ramifications of lines of study such as: group behavior, commitment, and the tasks and mediators used, among others. Based on contributions from Reeves, Herringston and Oliver (2004), the author states that some of the initial research on the introduction of ICT in education shows a prevalence that highlights the benefits and effectiveness of mediated and collaborative learning, which is generally quite instrumental and superficial. The results are mostly statistical, concerning the number of interactions, and do not delve deeply into the interactions themselves and the consequences for the learning process.

The author proposes other different research groups focusing their studies on conditions that promote collaborative learning and the design of the environments that enable them. This is highlighted in the studies of Dillenbourg (1999), in Switzerland; Baker, Hansen, Joiner and Traum (1999), in France, and Wasson and Mørch (2000) in Norway. All used socio-cultural orientation towards learning, which assumes continuity from the works of Piagetians and Vygotksians on collaborative work and negotiation, including the analysis of the interactions based on the use of technology. Within the principal findings, the need arises to generate changes in curriculum management and school organization, to stress the importance of generating learning communities, to focus on and analyze the quality of the interactions between teachers and students, whether they be in person or virtual, and to ensure the authenticity of the tasks.

On the other hand, Crook (1994) carries out his investigations in relation to collaborative learning and the use of computers, focusing his studies on the task. He proposes that ICT are not qualitatively different from other resources as when confronted with collaborative work, but do have a few requirements that enhance their use. He explains that collaboration occurs in a specific problem-solving context involving emotional and cognitive reciprocity.

Lévy (1992) proposes thinking of technology and its interface as a cognitive network of interactions. In the words of the author:

> *"... on connecting the subjects, and intervening with them, the communication and representation techniques structure the collective cognitive network and contribute to determining their properties. Intellectual technologies are also present in the subjects through imagination and learning" (1992:186).*

The means of understanding the multifaceted character of technology refers us to the notion of mediation, understood as the way our action is connected and our activity is transformed. (Crook, 1994). In the cultural life of a community, technological devices form a part of the mediating resources of the culture. Children appropriate resources which feature in their community and these same resources allow them to participate in social life. As Crook puts it: "Our task is to participate in the action, and, thus, appropriate from the mediating instruments that which can help us to carry out exchanges between ourselves and others." (1998: 55).

Crook (1994) also states that inter-subjectivity is the human capacity that is deployed as an explicit way of obtaining help and guidance in areas of joint activity, involving mutually recognized, shared knowledge. Following Rommetveit (1979, cited by Crook, 1994) the concept of inter-subjectivity refers to a state of mutual understanding, developed in everyday communication, related to the task of creating common references. Inter-subjectivity involves understanding and reciprocity sustained by the interaction that is based on the shared experience. The notion of inter-subjectivity allows us to capture social meanings and the reality built from shared meanings.

The construction of meanings has several dimensions – it occurs in the person, but also in relation to others and in the socio-historical context produced. At the same time it is singular, because each person has a unique way of experiencing and perceiving the world, which can be shared by means of communication. (Bleichmar, 2007) Meanings are negotiated and shared, which refers us to the social process of the construction of knowledge, where dialogue and participation are important.

Technologies, conceived as mediating artifacts in the process of knowledge construction, become integrated as a part of the context and culture in which they are immersed. In the Vygotskian sense, technologies are mediators in the learning process; we learn with them, like cognitive tools that are part of the process of the construction of knowledge. (Vygotsky, 1988).

Leontiev, (1975) in a departure from Piaget's contemplations about the active construction of knowledge by children in relation with their environment, replaces the concept of assimilation with that of appropriation, giving a fundamental weight to socio-historical aspects where, immersed in cultural activities, the child makes the instruments and the signs of each society its own. The idea of appropriation of knowledge is conceived as a process through which teachers and students, adults and children participate together and give their own meaning to the contents and the use of ICT-mediated activities (Crook, 1994).

Therefore, based on these theoretical references, the research we present proposes a study in which the center of interest is learning as social participation mediated by ICT (Wenger, 1998). The implementation of the 5D model is the favored setting to discuss collaborative interactions oriented towards ICT-mediated learning. The interest of the analysis is the activity and the processes and collaborative interactions generated that are mediated through the use of technological objects[4], with a focus on learning and its characteristics. The research will also include a transversal exploration of how the time factor impacts on the processes of collaborative learning in relation to the contexts where 5D will be developed. According to Leontiev (1975), the unit of analysis is the activity, that is to say the relationships between the subjects, as well as its goals and the tools used to achieve them.

THE 5D EDUCATIONAL MODEL

The educational model called the "Fifth Dimension" (5D) aims to build a context of activity where technologies are used in creative ways, enabling the development of skills for inclusive education and the digitized world. With 5D, a space is created which is under permanent construction beginning from the different contributions of the participants. A meaningful learning process is constructed, based on negotiation and cooperation, starting with the different contributions of the participants and following the objectives of the proposal.

Originally, 5D was supposed to cater to the cultural situation of minority groups, oriented towards the strengthening of social identity and the preservation of cultural heritage. This is particularly highlighted in the work of Cole (1996) and Cole and Distributed Literacy Consortium (2006) with Mexican immigrants in the United States and with the Gypsy community in Barcelona (Lalueza, Crespo, Palli & Luque, 1999; Lalueza, Crespo & Luque 2009). Several authors (Lave & Wenger, 1991; Rogoff, 1990; Wertsch, 1985) suggest that a central element for learning processes is the consideration of the place where it is developed, as learning is a localized process.

The projects inspired by the 5D model are based on the theoretical framework of Cultural Psychology (Cole, 1996; Rogoff, 1990), as well as in the contributions of Community Social

4. Photo-cameras, cell phones, computers, etc.

Psychology (Krause, 2001; Martín Baró, 1987; Montero, 2004; Sawaia, 2004). The guiding principles of the 5D model are that children, families and teachers are considered partners with the capacity to formulate and follow the objectives, and therefore transform the activity, while being respected both in their own right and as constructors of the approach. The model is therefore based on the participation, collaboration and identity of the participants involved. Thus, the activity has to be linked to the community where it is being developed so that learning is meaningful and connected to their interests, creating flexible, horizontal roles that depend on the activities and the objectives of each stage of the work.

5D is a proposal for educational intervention and research in which negotiation and participation among all social participants are fundamental to the creation of systems of meanings shared and constructed between academic knowledge and local knowledge (Cole, 1996). It requires the use of a complex process of negotiation with the locality where it is implemented. The interaction between the researcher and the population he or she will work with is essential not only for obtaining information, but also for the permanent evaluation of the research design and development.

The social context in which we are carrying out this research and implementing 5D in Uruguay is considered a context in a situation of social vulnerability. Specifically addressed is the Pinar North neighborhood, Canelones, created at the end of the sixties where families from the capital and the interior of the Uruguay settled. The neighborhood has few services and no sidewalks, and the unpaved, dirt streets are often flooded when it rains and there is no sanitation. There are approximately 10,000 inhabitants and the population is mainly young, with an average age of 27. 94% of the population is served by public health services and 70% attend public or State educational facilities (INE, 2010). Part of the population lives in informal settlements and their homes are precarious constructions, the inhabitants crowded into small rooms.

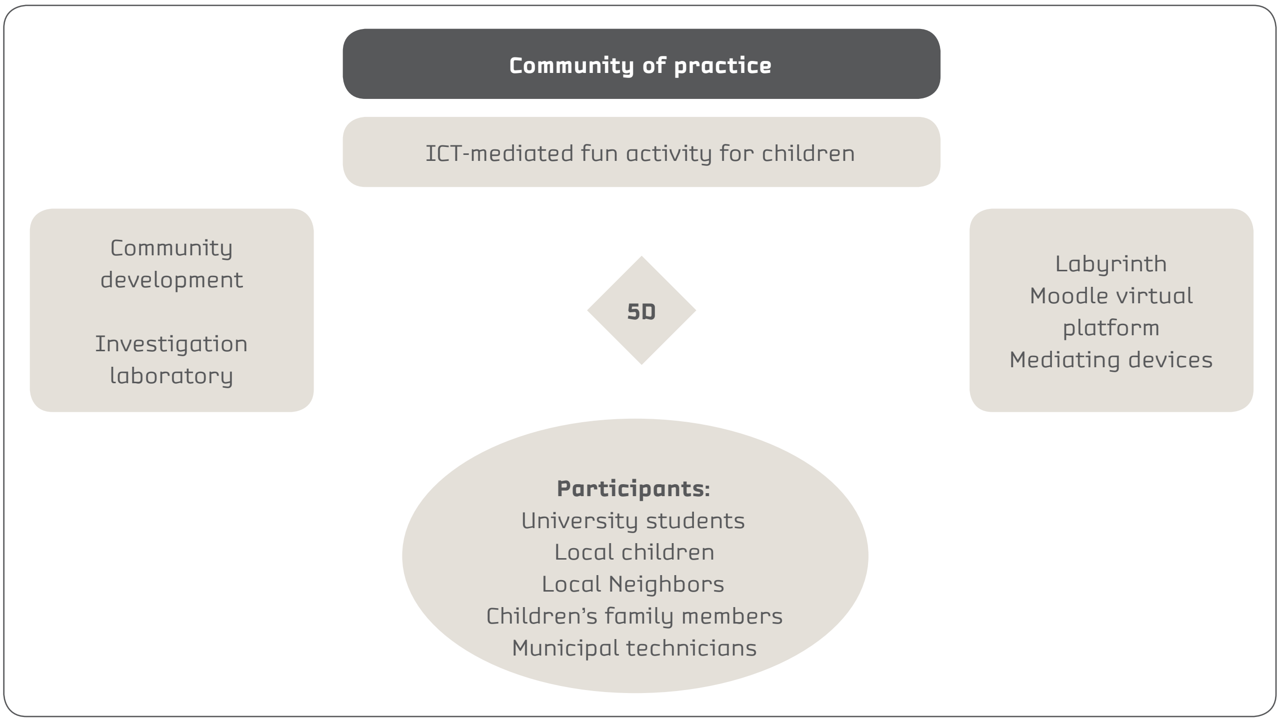
The 5D proposal has arisen as a response to the problems and needs felt by residents. They valued the importance of having an extra-curricular space for children in the neighborhood where the technological resources distributed by the Ceibal Plan could be used in a significant way. 5D is constructed with neighborhood participation, adapted to the specific characteristics of the context, seeking the integration of groups of children from the neighborhood. The adaptability and the narrative are two cornerstones in the construction of the proposal, i.e. it is adapted to local characteristics and interests, looking for meaning in the facts from the construction of a story.

Research activities began in August 2012; the proposal includes the training of University students from various disciplines. The Pinar North neighborhood Center is the community site where 5D is being developed. This center was opened in the year 2009 and is co-managed between the municipality and a committee of residents from the neighborhood.

The 5D project involved the production of a context shared by everyone, including resistance, contradictions, participation and permanent negotiation. The creation of the proposal takes into consideration the characteristics, rhythms and particular features of the local area and is also influenced by the academic culture, resulting in the construction of systems of shared meanings between participants, or what Cole (1996) calls a “micro-culture”.

Adults accompanying children in the proposal are fundamental; affective and cognitive harmony is needed to be able to generate an

Figure 1. Components of the 5D model.



atmosphere conducive to the activity. College students have the function of accompanying the children along the path as they make their way through the maze (virtual and real game scenario). The child and the college student together create a team in which both must overcome the different challenges to complete the game. Thus an interaction between the participants is achieved, where meanings are shared and the children are able to expand their knowledge and skills in the "zone of proximal development" (Vygotsky, 1977; Vygotsky, 1979).

A scenario of learning in a shared space is built, where the participants seek to attain ownership and knowledge, negotiated and constructed from the tools proposed.

METHODOLOGICAL DESIGN

The research presented focuses on the analysis of 5D activities and the processes and collaborative interactions generated by the introduction of technology at community level in a context of social vulnerability. One part of the resulting question is: what are the potentials and limits of the 5D collaborative learning model to generate new forms of interaction and knowledge construction mediated by ICT in the selected context? This raises the need to analyze how the 5D model adapts to the characteristics or needs of the environment where it is implemented and how it constitutes a tool for education and community development, as well as to find out which activities are most attractive for the children and what are the learning processes that are constructed with the same activities.

OBJECTIVES:

The overall objective of the research is the design, implementation and analysis of the 5D model in social organization in Uruguay.

Linked to this objective are the following specific objectives:

- To identify the needs, visions and attitudes of parents and community participants in relation to ICT-mediated collaborative learning.
- To design the 5D model according to the needs and characteristics of the researched context.
- To implement the 5D model together with the participants involved in the heart of the Pinar Norte neighborhood, Canelones, Uruguay.
- To describe the collaboration processes that contribute to the creation of a community of practice mediated through the use of ICT.
- To analyze the time factor involved in the process of the implementation of 5D.
- To analyze the potentials and limits of the 5D model in the selected town.

PARTICIPATORY ACTION RESEARCH AS A METHOD

The method adopted for the development of this research and the questions and objectives it seeks to respond to are framed within qualitative and participatory methodologies and include two distinct complementary phases.

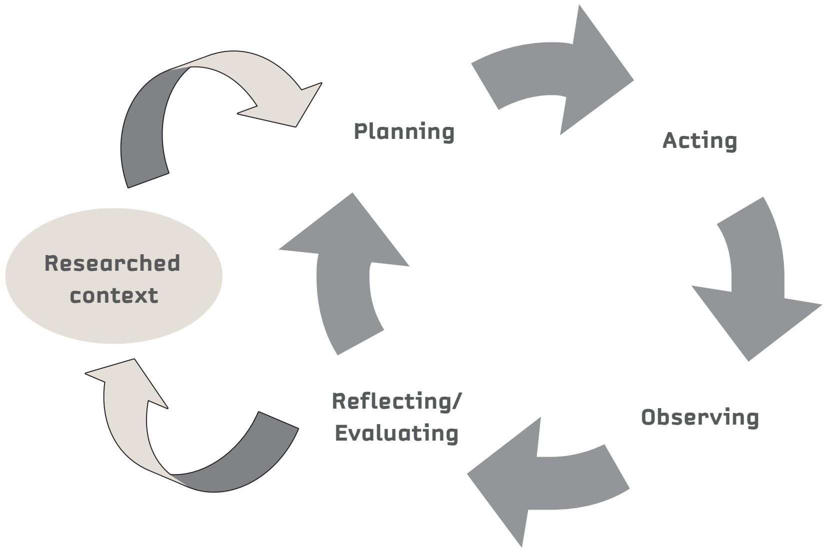
The first phase is conceptually and methodologically based on the interpretive or constructivist paradigm of educational research and focuses on the understanding and interpretation of the educational reality from the point of view of the meanings and intentions of the subjects involved in the educational setting (Arnal, Rincon & Latorre, 1994). With this aim, a contextual analysis is carried out, collecting information about the needs, expectations, evaluations and beliefs of the families of children and community participants. The favored instruments for collecting the information are open interviews and group discussions.

In the second phase Participatory Action Research (PAR) is carried out, (Greenwood, Whyte, & Harkavy, 1993; Reason & Bradbury, 2007; Whyte, 1991) which seeks to transform the investigated socio-educational reality contributing to the changes in the levels of appropriation and use of ICT by the community. PAR involves a cyclical action, the “reflect, plan and act” model of engaging with the community (Figure 2). The PAR approach of the research works towards closing the gap between researcher and researched and involves a joint process of knowledge-production leading to new insights on the part of all those involved in the research (researcher, parents, children, educators, social workers and college students).

The participants’ observations are used with their respective activity log, as well as a table of qualitative indicators to assess various factors such as: the participation of children in the proposal; the collaboration between the children and the college students; the quality of interaction between the children and the college students; motivation with regard to the proposal; children’s knowledge of ICT; the autonomy of the children in the completing the tasks and the use of reading and writing as a mediator in the carrying out of the activity.

The methodological perspective adopted seeks to create conditions that allow the development of processes of reflection, self-education, planning and equal participation. It means introducing a methodological rigor in which the different interests and points of view of the participants in the approach are integrated. A process of design, progress, testing, analysis of results and a return to the design is developed through a feedback in practice. The participation of stakeholders in the design, implementation and development of 5D is essential. The participatory status of the 5D model involves multiple forms and cycles of knowledge production.

Figure 2. Phases of the research process



THE TIME FACTOR IN PAR

In the process of designing and carrying out the Participatory Action Research the time factor plays an important role. Research takes place in the context of non-formal education and gives priority to community participation in the process of appropriation of ICT by children and the improvement of specific practices of use and integration of ICT in the community.

Temporality is a key characteristic of the core concepts of computer-supported collaborative learning – interaction, communication, learning, knowledge building, technology use – especially in our case, where collaboration and learning processes are studied by people who work together over months (Reimann, 2009).

The phases of the research process, as well as the design and implementation of the 5D model, require a process of collective construction in which all the subjects involved are actively participating in generating the approach. In this sense, the consideration of different phases is fundamental, as the effectiveness of negotiation and articulation of the various levels of participation are dependent upon it.

In this respect, the research pays special attention to the following aspects related to the time factor: the temporal features of research methodology (McGrath & Kelly, 1986); the time for negotiating the availability of educators and families to engage in the tasks; the time for training volunteer university students; the amount of time children are engaged in collaborative activities; the time needed for the children's learning to take place (Caldwell, Huitt & Graeber, 1982); and, finally, the researcher's time.

The construction of 5D requires collective processes, based on the affiliation of the different participants, respecting the time of the encounter and the construction of stable social relationships. The characteristics of each participant distinguish the time needed to carry out each activity consistently and in depth, requiring a consensus regarding the structuring of the educational space and the uniqueness of each student's stage in the schedule of proposed activities. What is paramount is the interaction of the children with the college students, the use of ITC mediators, customization, and finally the personal and emotional involvement of the participants.

CLOSING REMARKS

This research assumes a commitment to science in the service of social transformation, seeking the involvement of community stakeholders for the benefit of the children at the local school. The importance of the participation and commitment of university students, community participants, parents and local residents requires the combination of different phases that come into play when developing the approach. The regard for and articulation of phases generates benefits and revaluates the link being constructed, while developing the civic capacity of the participants engaged in the research.

The attitudes and beliefs of parents and stakeholders in relation to the use of ICT have changed along with and at the same level as the advance of the research, the levels of involvement, and the development of 5D. The use of ICT in an educational proposal, which includes games, imagination, and narrative, has contributed to improving knowledge among children and parents about the features of the device. Children use new applications, provided by the project, enhancing the range of possibilities of use for communication. The concentration on the task of 5D and its resolution as a game or a challenge promotes a feeling of safety for the children themselves. At the same time, it contributes to the acquisition of specific communication and computer tool handling skills.

An important point of the proposed 5D impact is associated with the approach of children and parents new to the Neighborhood Center who had not previously visualized it as a space to be used by them, or as something for them. The use of ICT, internet connectivity and the support of college students become elements attracting many families in the neighborhood.

These early impacts suggest a return to design, planning and execution, an acknowledgement of the findings, the continuation of reflection and self-correction of the approach, a return to practice and retrieval learning from one another. The systematization and energizing effect of the action, the reflection of the actions and the educational process of participation produce changes in everyone involved.

The research is currently at the phase of characterizing the particular features that the 5D model in this community adopts in order to validate it and give an account of reality and its application to the situation in Uruguay – a phase which will allow it to have significant elements for the development of future communities of practice and strengthen the line of research on collaborative learning mediated by ICT.

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SELF-REGULATION AND TIME FACTOR IN VIRTUAL AND REMOTE LABORATORIES

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Self-regulation and time factor in virtual and remote laboratories

ABSTRACT

In the field of practical development of competences in scientific and engineering studies, the emergence of distance learning programs in these disciplines, as well as the rapid development of ICT, has allowed the evolution of classical laboratories towards a new typology of laboratories: the commonly called **virtual labs**, focused on the development of simulation-based practices in both classroom or remote sessions and **remote laboratories** equipped with real equipment that are connected and accessible remotely, by providing the student a practical resource not defined in a specific space and time such as onsite laboratories.

Currently extensive information on the different types of laboratories can be found; their structure, the tools that they use, the type of experiment performed, but there is less information about teaching and pedagogical application of these technologies. Factors like self-regulation, allowing a constructivist approach to training with these tools; the Time factor and assessment are subjects susceptible to be studied.

Starting from the generic structure of remote laboratory, exposed in the first section, we will study how this structure can influence the factors under study: self-regulation and Time Factor, and how to approach this structure and the elements that make it up to improve these aspects.

KEYWORDS:

Remote laboratories, self-regulation, Time factor

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INTRODUCTION

Traditionally, in technical or scientific disciplines, a separation between theoretical and practical sessions has always been clear. The theoretical sessions are developed through lectures or materials supplied to the student by the instructor and the practical sessions are developed in laboratories, where the student implements the theoretical knowledge received, usually through guided practices sessions focused to solve a problem o project. In these disciplines, the emergence of distance learning programs has caused the evolution of classical laboratories. This new structure has had a clear separation into two distinct types: the called virtual labs (VL), focused on the development of simulation-based practices and remote laboratories (RL) based on real equipment that are connected and accessible remotely, by providing the student a practical resource not defined in a specific space and time. It is becoming an attractive and economical solution for developing and sharing practical environments with a high cost equipment.

In the last decade and especially the last few years, have been developed and implemented a large number of remote laboratories in many institutions of higher education and publications concerning several aspects have appeared (García-Zubía, Díaz Labrador, Jacob Taquet & Canivell, 2008) in terms of its advantages and disadvantages (Luís & García-Zubía, 2007), the different architectures and designs (Gobbo & Vaccari, 2005), technologies for implementation (Indrusiak, Glesner & Reis, 2007) or applied teaching (Ma & Nickerson, 2006).

Furthermore, the development of open source Web applications enabling the management of content and users for virtual environments, also called Learning Management Systems (LMS), allows the use of conducive and constructive methodologies, where the process of student learning (Reeves, Herrington & Oliver, 2004) is conducted through collaboration, cooperation and participation in discussion forums, construction and development work collaboratively.

These two technologies, the remote labs and LMS, have often worked together, because one complements the other. The integration of practical resources in distance learning environments, either through activities that students can perform at home using materials provided or by accessing remote resources available to the institution within the theoretical material, is becoming a natural way of acquiring knowledge. It is also, a methodological change in the way of teaching/learning that deserves study. The flexibility of remote environments must enable students to acquire the practical skills by adapting the content to their specific learning needs, at their own pace and progress in terms of content, without diminishing the quality of the content taught.

Pedagogical factors as self-regulation, allowing a constructivist approach; or the Time factor are the scope of this work. Starting from the generic structure of remote laboratory, exposed in the next section, we will study how this structure can influence the elements under study and how this structure and the elements that make it up can improve these aspects.

GENERIC STRUCTURE OF REMOTE LABORATORIES: FACTORS THAT DETERMINE THE SELF-REGULATIONS AND TIME FACTOR

The factors that determine the pedagogical appliances of the remote laboratories are connected both in teaching strategies and hardware-software infrastructure. The generic structure for both RL and VL has as terminal aim conducting remote experiments and practical experiences so that students acquire practical skills (Fig. 1). The architecture must support the laboratory, but it also requires other resources such as its configuration, equipment configuration, reserve management, access control, possibility of collaborative work or integration with the theoretical subjects that have to be taken into account when designing the entire infrastructure supporting laboratories.

The final element of the whole structure of this kind of laboratories is based on processes or systems that the student could find both in real work environments but also here with a clear pedagogical function. The physical (RL) or virtual process (VL) is the purpose why the structure is designed and it is the primary focus of the experience or project to be developed by the student.

Closely connected with the process there is the equipment or software that performs the control functions. The control device is variable depending on the objectives for which the laboratory has been designed: microcontroller-based systems, Programmable Logic Controllers (PLC), robot controllers or computers and equipment generally targeted to a specific scientific or technical discipline. These devices have the function of performing the, pOrocess.

The typology of the experiment and its controller are the elements that have a wide variation. In studies developed in the last years (Gravier, Fayolle, Bayard, Ates & Lardon, 2008) (MA & Nickerson, 2006), a great number of laboratories dedicated to teaching electronics, ICT, automatic, multidisciplinary physical has been found while a low number to other subject areas such as chemistry, hydraulics, mechatronics or astronomy.

The other elements that make up the structure are focused on managing the work from the different users:

- The whole system manager or administrator, who has the task of maintaining the overall structure of the laboratory in terms of hardware, software and connectivity.
- The profile of the teacher, who has to program and control the teaching-learning process, opening or closing the access to resources, determining the time required for execution, sequencing and evaluating experiences of the work done by the student. The student finally has access to the laboratory by means of the booking application, accessing and interacting with the process through a graphical interface generally located in the server of the experiment.
- The student as a subject around whom the design and implementation of these tools. The student must have enough information to run applications as well as handling and feedback of results.

Most equipment and tools that comprise the rest of the structure are within the scope of ICT. As shown in Figure 1, the element connected to one or more control system is the **laboratory or experiment server**, usually a computer that has several roles:

- The **experiment manager**, developing operations of input and output information to and from the experiment.
- The server must have the **tools to perform the experiment by programming or control the device** (Awkash & Srivastava, 2007). These tools are normally proprietary and generally belonging to manufacturers like Matlab (Mathworks, 2013) or Labview (Instruments, 2013) (Gravier, Fayolle, Bayard, Ates & Lardon, 2008). Others tools are also found in this particular field, used to design applications with specific programming languages associated to the controlled devices.
- The server must give **external access to the network** for the process and the tools to control it. The technologies applied in this

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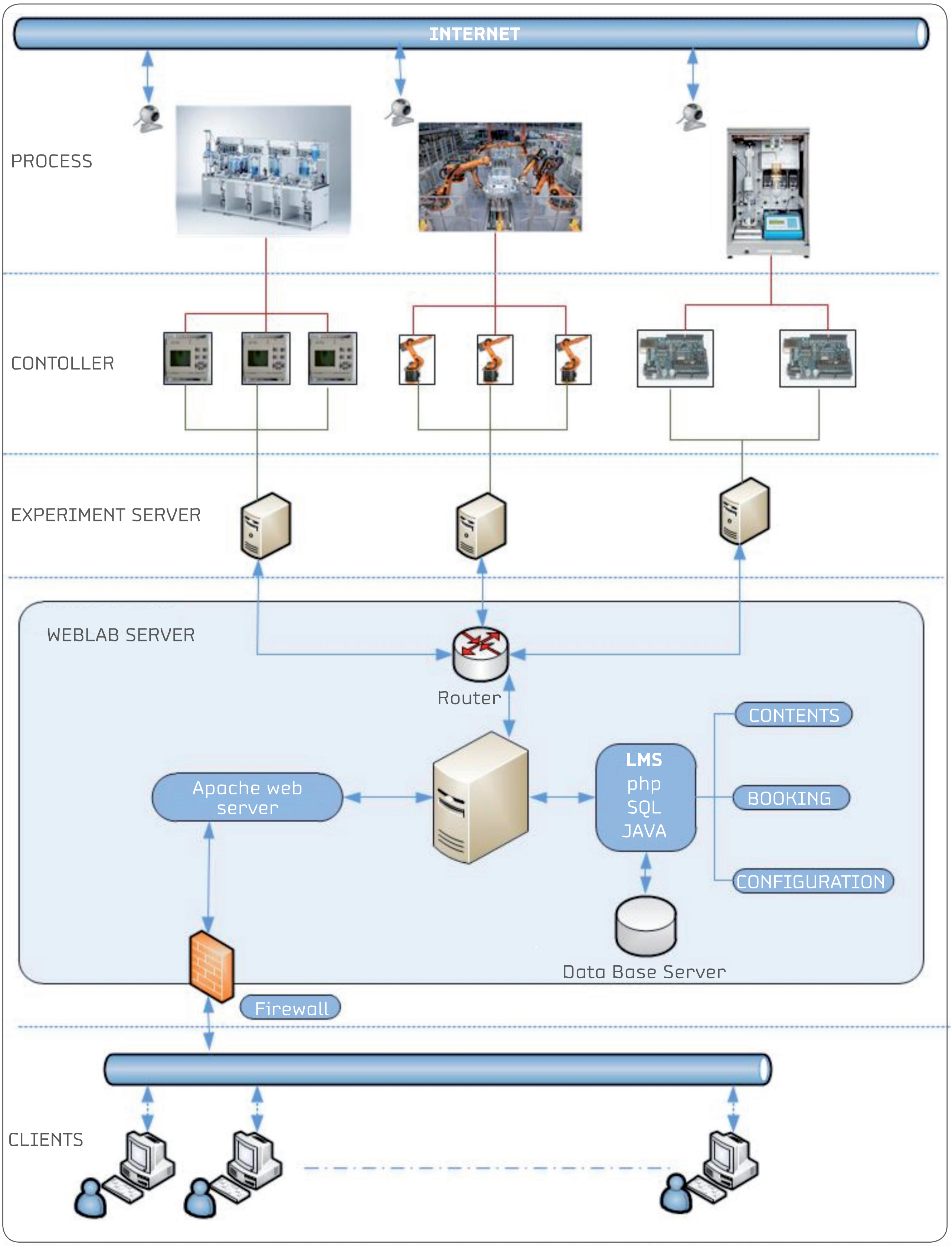
Figure 1. Generic RL structure.



part, are normally programming languages such as Java and Java applets, dynamic web pages, programming languages (XML, C + +, etc.) or connections VNC in order to connect the computer remotely (Gravier, Fayolle, Bayard, Ates & Lardon, 2008).

The management of different server's experiments, located in the same geographical area or geographically distributed in different institutions, should be centralized in the **WebLab Server** that provides two functions: **the management of resources** and access to **experiment managers**.

It will be generally a computer with a network operating system that incorporates user management tools and web services. A widespread typology is performed with Linux operating system, Apache as web server, MySQL databases and PHP programming language, without discarding other tools that are also used, following in a greater or lesser degree this philosophy LAMP (Linux + Apache + MySQL + PHP). This computer should be responsible for authentication, schedule and management of all the experiments; also it must centralize the records of the student work and the access security (Awkash & Srivastava, 2007).

The function of the weblab server is the control of the Laboratory, but it must have a close relationship with the LMS that integrate the courses. Small departments or institutions could have in the same equipment the LMS and the Weblab server, but normally two different equipments assume these two functions, and a module integrated in the LMS has the functions to linking the LMS with the laboratory. The LMS allows creating a web interface between the user and the laboratory not depending on the type of computer and operating system, increasing its versatility and functionality. The web environment must integrate the screens and services that allow laboratory management of different users.

FACTORS AFFECTING SELF-REGULATION IN REMOTE LABORATORIES

The student retention and completion rates in distance learning have been investigated extensively (Berge & Huang, 2004). One of the variables that can help to solve low rates of completion in e-learning studies is applying self-regulatory strategies, redefining the role of the instructor as support of the student in his self-regulated and independent knowledge through the use web tools (Dabbagh & Kitsantas, 2004). So the remote laboratory, as a tool, must be an important factor that helps students achieve their goals by improving their results and reducing abandonment.

The self-regulation as an important factor in a constructivist e-learning educational system can be defined as the skills required for students to understand and control their learning environment. The student must set goals, select strategies to achieve the goals, implementing and monitoring their progress toward goals (Schunk, 1996). Self-regulation is very important in the learning process because students with better self-regulation skills learn with less effort and get better academic results (Pintrich, 2000; Zimmerman, 2000).

Three elements are decisive in defining the profile of self-regulation that could have a student (Gregory Schraw, Hartley & Hartley, 2006):

1. **Cognition**, defined as the skills necessary to encode, memorize and retrieve information, includes three types of skills:
   a. **Cognitive strategies** used by both the student and the teacher to enhance learning (graphs, charts, summaries, mind maps).
   b. **Problem-solving strategies**, such as predict-observe-explain: POE (Rickey

& Stacy, 2000) frequently used in laboratories.

c. Critical thinking for the analysis of the results and consistency.

2. Metacognition defined as the skills that enable students to understand and control their cognitive processes The two subcomponents define this parameter (Rickey & Stacy, 2000):

a. Knowledge of cognition, based on the self-recognition of skills available to the student (**declarative knowledge**), knowledge and application of strategies and procedures (**procedural knowledge**) and how and when to use these strategies (**conditional knowledge**).

b. Regulation of cognition that includes planning, monitoring and self-evaluation of the whole learning process.

3. Motivation defined as beliefs and attitudes that affect student use and development of cognitive and metacognitive skills:

a. Self-efficacy refers to the degree to which an individual is sure to perform a task.

b. Epistemology. In general, there is a growing consensus that students and teachers disagree on epistemological world views. The point of view of students and teachers are different, this problem difficult the degree of transmission and affects student motivation in problem solving or practical experience (Roth & Tobin, 2001; Schraw & Olafson, 2002; Tsai, 2001)

Autoregulation processes are determined by the combination of three factors simultaneously, the arrangement of one of them independently is insufficient and it is the combination of the three factors which determine an improvement in educational results.

In the area of cognition, the use of remote labs is to be treated as a tool that will enable the development of students' cognitive skills. To develop these skills, the first step to a correct use in this type of laboratory is marking the objectives to be met within the learning process, highlighting factors such as (Bauer, Fedak, Hajek & Lampropoulos, 2008):

- Understanding the structured design and methodology to be applied to solve the application
- Analyze the system in a structured way by dividing complex systems into subsystems.
- Understand the differences between simulations and real processes
- Enabling the student to select the right equipment in every situation to perform the tasks or programs of a real process.

In accordance with the cognitive skills and the objectives established by the remote laboratory the learning methodology that would achieve those objectives must be defined (Rojko, Hercog & Jezemik, 2009) highlighting different phases:

- Initial study of the process to monitor and forecast results.
- Experimental validation of the process by remote laboratory, comparison of theoretical and practical results with report writing.
- Feedback to the instructor with the information generated and activities feedback with improved functionality process the information from the instructor.

Using remote laboratories integrated in distance learning platforms should enable the improvement of the factors that affect metacognition: diversifying the types of theoretical material offered, adapting to different media (text, video, simulations, guided activities, remote monitoring of experiments, etc.) (Buiu, 2009). Using the possibilities and versatility of these formats that can be integrated in LMS that allows the theoretical contents to adapt to the abilities of each student. The possibility of working with standard learning objects, together with an environment that enables learning path planning, adapting the contents to the metacognitive profiles of students could improve the factors related to the self-regulation and therefore could lead to improvements in terms of student achievement. The integration of remote laboratories as learning objects, interspersing practical experience in theoretical training process would create a theoretical-practical flexible and adaptable environment for the users that will improve their results.

The flexibility in the learning process is bound up to both the formative itinerary planning and the capacities of the working environment in order to make it extensively available to the users. A booking system integrated in the LMS, allows extensive use of the laboratory continuously 24 hours a day 7 days a week (24/7) (Murray, 2012) and the inclusion of self-assessment tests, theoretical and practical that will allow the student to monitor his learning process.

Self-efficaccy can be improved by learning through observation of peers or teachers, sequencing tasks into more manageable elements of learning and frequent feedbacks about the work performed and how to improve it. It is important the inclusion of tutorials, video demonstrations and hands-on demonstrations by the instructor to ensure greater student confidence in using computers. One important factor that can help the Self-efficacy is the collaborative work so, some environments allow simultaneous management of multiple users connected on the same experiment, usually limited to a low number, three or four players at most users to not cause chaos in interacting with computers (Nedic, Machotka & Nafalski, 2008) as well as public demonstrations carried out by the instructor and monitored via webcam or graphic panels by students.

In order to break epistemological beliefs, communication elements and transmission of information between instructors and students are important to clarify expectations and the work performed with equipment. This is why the inclusion of communication tools between instructor and student (email, forums, reports, etc.) are important elements to include in the work environment.

As can be inferred from the preceding paragraphs, the attendance by teachers is a very important factor in the development of a constructivist space in e-learning. A limitation in some remote laboratories is the lack of assistance to the students (Böhne, Faltin & Wagner, 2002), so, the presence of an expert mentor is critical in the development of the learning strategies. The use of synchronous and asynchronous media to assist to the students can be performed in several ways:

- Give information and assistance to solve technical problems
- Stimulate the meta-cognition of the learners
- Advise of the learning goals and acting goals
- Give feedback to motivate the students
- Organize the learning process

To perform these tasks, the tutor may use the several applications that normally are integrated in a e-learning platform, as e-mail, forums, notice boards

TIME FACTOR

The introduction of new technologies to manage time allows students to organize, plan and carry out their tasks in a flexible way to increase their learning capacities (Gadzhanov & Nafalski, 2010).

One of the first advantages of a remote laboratory is to break the barriers of classroom laboratories, where practices are tied to a specific space and limited in time. But the fact of having a remote laboratory 24/7 does not mean by itself that improves the flexibility and self-management ability of the student. Working overload or a bad planning can in some cases give the student a perception of excessive consumption of time for possible poor results with it (Corter, Nickerson, Esche & Chassapis, 2007). Therefore, the strategies of usage and time management should be related to the availability of the student, which will determine the effectiveness of working with these tools.

From the point of view of time factor, there are four important factors to be treated:

- **Access to the labs.** The remote labs must be the maximum time available for the users, with the necessary securities and access tools, allowing not concurrent use, except in the collaborative works or demonstrative exercises made by the teacher. Therefore, one remote lab must integrate a flexible booking system to manage the various services that it offers.

  From the point of view of the booking system that should be incorporated in the laboratory, it should be flexible enough to allow both instructor and student to develop their activities. On one hand the instructor should be able to **decide the experiences** that are to be performed and the system must incorporate and allow **easy removal of new equipment** to **create slots that can** be accessed as well as the **duration of practical** experience.

  On the other hand, from the point of view of the students' work, It is important for the booking system to allow knowing **the slots available** equipment and the free slots for reservation. But not only the system of reserve management is important, the RL must ensure that once the student accesses the computer Iit must be on the **initial conditions**, restarting previously the processes or experiments.

- **Time dedicated to each of the experiences.** The diversity of experiments in remote laboratories usually involves several actions by the user: **Preparing the equipment**, **experiment setup**, **execution of the experiment**, **gathering and analyzing results**. All these tasks may take from minutes to several hours or days depending on the experiment. So the first task for the instructor is to define the time needed for the experiment.

  Depending on the type of experiment, it is possible to define two categories: the **batch data processing**, where the user enters the data required for experimentation and processing queued, and when it ends they are shown or sent to the user and completely **interactively online.** The choice between one and other type, determines largely the degree of interactivity between the user and the experiment. Batch processing means that the user does not receive an immediate response of the experiment, while the process in online mode allows continuous observation and dynamic process and the user receives a continuous flow of numerical or graphical information that allows users to interact with the process changing the parameters of this and therefore their behavior.

- **Time dedication to the practical experiences in relation to all material available to the subjects.** One of the worst perceptions for a student on a course is that the time spent on practical experience is excessive compared to the results of academic knowledge finally acquired (Corter, Nickerson, Esche & Chassapis, 2007). Strategies that are carried out to adapt the temporary dedication to practical experience of academic results will greatly improve the student's perception.

It is important in this regard to have practical tutorials on how to access the lab and interact with the device and the computer prior to work with subject and its contents (Murray, 2012). It should help students to plan their work thorough the relationship of the theoretical and practical content. Also, it is important in this case to link practical experiences with theoretical material.

- **Flexibility in performing experiments.** Clearly, a distance learning environment has among its advantages the flexibility that the student perceives developing his studies in both time slots dedicated to carry out the tasks and the duration of these time slots. Increasing flexibility is certainly one of the strengths of learning systems using new technologies (Fox, 2005) The ideal laboratory environment should be a platform (hardware and software) ready to work with any kind of experimentation without changes in the environment (Costa, Alves & Zenha-Rela), therefore a first element from the point of view of the student is to have a common integrated environment for all subjects included in the curriculum.

  Furthermore, flexibility goes together with individualization of the learning process. This system should incorporate a library of practical experience that can be developed in remote laboratories, so that in this set of experiences, as discussed in the previous section, have to distinguish between the basic experiences of understanding the theoretical and the advanced experience, that users can choose other experiments based on their preferences. Thus, learning interest of the students increases (Wang Dai & Yao, 2010).

Improving the perception of the student in all these aspects is essential in achieving learning objects.

CONCLUSIONS

As has been sated, design, creation and use of a remote teaching laboratory is a multidisciplinary task which involve from the design process, highly variable and dependent on the subject to teach, the information and communication technologies and finally to the didactic approach of its implementation.

The variety of remote laboratories proposals analysed has revealed a great heterogeneity of structures and very different approaches. In some way this heterogeneity precludes a systematic study of all didactic elements that have been developed.

One of the deficiencies, the result of the relatively short time that they have been applying these tools, it is possible that this area of knowledge has not yet reached a level of maturity that allows standardization of the elements involved in the definition of a remote laboratory analysis methodologies and teaching, but this is an area which already is starting up research and development proposals.

Self-regulation, closely related to the cognitive strategies used, self-recognition of one's skills by students and their planning and confidence in their capabilities are elements that have to strengthen in LMS platforms that include management tools, planning and collaboration to help students enhance their self.

On the Time Factor, tools to include access and booking laboratories, flexibility in the choice of the experiences and the relationship of time spent on the practical and theoretical content are essential. Finally assessment tools by the teacher must serve to strengthen monitoring and continuity of students.

The common framework to improve all these elements is to have an interface that includes tools tailored to improve each of the aspects involved. The emergence of open source LMS platforms, many modular types, has allowed many developers to design different modules that work in each of the areas studied.

As mentioned above, this heterogeneity proposals and studies focused on personal needs, determine that currently can find various solutions to each of the issues discussed. The time and research in each of these points will determine a convergence of these tools to a common and standardised study.

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#04

Cortés, A. & Barberà, E. (2013). Time patterns and perceptions of online learning success factors. *eLC Research Paper Series, 7, 39-46.*

TIME PATTERNS AND PERCEPTIONS OF ONLINE LEARNING SUCCESS FACTORS

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Time patterns and perceptions of online learning success factors

ABSTRACT

Online learning provides the opportunity to work on academic tasks at any time at the same time as doing other activities, such as using in web 2.0 tools. This study identifies factors that contribute to success in online learning from the students' perspective and their relationship with time patterns. A survey of learning outputs was used to find relationships between students' satisfaction, knowledge acquisition and knowledge transfer with time for working on academic tasks. In this study, 199 students from a university in Mexico completed the survey. Findings suggest that knowledge transfer has a significant association with the number of hours online per day, hours spent on social networks and the use made of e-learning during working hours. Learner satisfaction has a strong relationship with the time in years a learner has been using the Internet and the number of hours devoted to the course per week. The findings of this research will be helpful for faculty and instructional designers for implementing learning strategies.

KEYWORDS

Learner satisfaction, knowledge acquisition, knowledge transfer, student perception, time management, time pattern

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INTRODUCTION

Research on learners' success in online programs uses numerous factors, which may be pedagogical, institutional, technical, related to the learner or the teacher, etc. However, the time factor is normally neglected by researchers (Barberà, Gros & Kirschner, 2012).

Time and place are the first barriers broken by online learning, and now learners have several possibilities for working on academic tasks. They can work during the day at the same time they are doing their jobs or other activities, such as using social networks.

There is new interest in knowing the effect of social media on success (Abramson, 2011), as the percentage of learners using social networks is growing and research shows that between 85% and 99% of university learners use Facebook (Jones & Fox, 2009). However, there is little research about the effects of the time spent on social networks on academic outcomes.

LITERATURE REVIEW

OUTCOMES

Outcome factors include what students receive from their online learning experience. In this context, there are several studies positively associating the learner's time-related factors with learning performance, success and satisfaction in online learning.

Learner time-related variables have been shown to impact on learning performance. Romero and Barberà (2011) reported that time flexibility and availability for learning were related to learner performance in online courses. The average time learners spent on the online discussion and group work per week was found to be enhancing students' learning achievements (Zhu, 2012).

Following the model of online success created by Barbera and Linder-VanBerschot (2011), the outcomes in online learning consist of learner satisfaction, knowledge acquisition and knowledge transfer.

LEARNER SATISFACTION

One factor that often arises in the literature as an indicator for a learner's success in e-learning is satisfaction with the course. Levy and Murphy (2002) stated that staff, researchers and instructors should have a thorough understanding of this factor to maximize effectiveness of online courses. This factor, also considered as critical, has been studied to identify factors that influence it. Allen and colleagues (2007) found that time participation is a key factor for measuring satisfaction and learning gains.

Puzziferro (2008) stated that success is related to the learner's satisfaction and, furthermore, Puzziferro and Shelton (2008) included time spent on a task as good practice for emphasizing quality in their *model for developing high-quality online courses.*

KNOWLEDGE ACQUISITION

According to Mayer (2009), significant knowledge is achieved when learners can remember, at least, the most important concepts of the lesson and when they can use this information to solve and suggest solutions to problems. They can also use this knowledge to understand new concepts and use it in new circumstances and problems. In this case, according to Mayer, the learner constructs knowledge, making it different from "non-learning" and "rote learning". Meaningful learning is personal and cannot be directly observed.

KNOWLEDGE TRANSFER

Knowledge transfer is the process in which the learner applies what has been learned on the course in a different context. According to Holton, Bates and Ruona (2000), it is important to evaluate the application or transfer, as this is how you can identify whether there is an improvement in the student performance. According to Mayer (2008), there are two types of transfer: learning transfer (when the previous learning affects new learning) and problem-solving transfer (when previous learning affects the ability to solve new problems).

Several authors (Holton, Bates & Ruona, 2000; Yamnill & McLean, 2001) explain that transfer mainly depends on three factors: the learner's characteristics; the course characteristics, and environmental characteristics, such as characteristics of the institution and the context. Holton (2005), indicates that transfer depends not only on intrinsic factors but also on external one that should be considered. Lim and Morris (2009) study showed that prior experiences with distance learning, preference in delivery and average study time are the learner antecedents differentiating learning outcomes (knowledge acquisition and knowledge transfer)

PURPOSE AND RESEARCH QUESTIONS

What are the effects of time-related learner factors (hours spent on Internet per day, years using the Internet, hours spent on social networks every day, hours per week devoted to the course and time patterns) on the three types of outcomes (learner satisfaction, knowledge acquisition and knowledge transfer)?

METHOD

Participants

The sample for this research consists of learners enrolled on online courses at the Autonomous Popular University of the State of Puebla in Mexico. Most of the courses were taught in the Social Science Department.

Table 1 shows demographic distributions for learners by gender, age, education and ICT experience. There were more female (60.3%) respondents than male ones (39.7%); this is in accordance with student numbers on the University's courses and with other studies with online students.

Most of the respondents were either 25-34 or 36-54 years old, while a few were under 24 years old and only 2 students were older than

Table 1. Student background

Demographic	Frequency	Percent
Gender:		
Female	120	60.3
Male	79	39.7
Age:		
under 18	1	.5
18-24	36	18.1
25-34	87	43.7
35-54	73	36.7
55+	2	1.0
Education:		
Bachelor's Degree	190	95.5
Master's Degree	9	4.5
Experience:		
Experience with ICT		
Beginner	28	14.1
Intermediate	99	49.7
Advanced	72	36.2

55. This age profile matches that of online learning students in Mexico and is different from traditional university students.

Most students are taking undergraduate level courses (95%). Only 4.5% of the respondents were from graduate level.

Half of the respondents (49.7%) are intermediate users of ICT; and 36.2 % of the respondents are advanced users of ICT. 14.1% reported being beginners.

INSTRUMENTS

The survey included questions on demographics, five time variables and a scale of outcome factors. This study adopted the outcome scale from the systemic and socio-constructivist instrument of inputs-process-outputs of learning created by Barbera and Linder-VanBerschot (2011).

Five items were used for each outcome factor, with a total of 15 items. All items used a four-point Likert-type scale of potential responses: strongly agree, agree, disagree and strongly disagree.

As table 2 shows, Cronbach's alpha was used to measure the reliability of the test survey with a score of 0.93, indicating high reliability.

Table 2. Learners: average score and reliability information for the scale

	α	M	Number of items	Range
Outcome Factors	0.93	3.16	15	1-4

PROCEDURE AND DATA ANALYSIS

One online questionnaire was sent at the end of the course to collect information, accompanied by consent forms. This was originally written in English and then translated into the official language of the country. The anonymous questionnaire was sent online to University learners using a web-based data collection system.

In order to analyse data, the SPSS 19.0 was used. A descriptive analysis was carried out to find out demographic information and the means and standard deviations of time variables. A one-way ANOVA was carried out to find out the effect of time variables on the outcome variables.

RESULTS

ANOVA Analyses

As table 3 shows the number of hours online by day was significantly associated with transfer of knowledge, Learners who spent more than 12 hours a day on the Internet (M = 3.04, SD = 0.58)

Table 3. One-way ANOVA of hours spent on the Internet per day on outcome variables

	0-2 hours		3-5 hours		6-8 hours		9-12 hours		more than 12 hours		F(4.189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.927	.5470	3.007	.4420	2.862	.5722	2.824	.4716	2.709	.5452	1.382
Knowledge Transfer	2.791	.5537	2.667	.4076	2.846	.5336	2.878	.4896	3.040	.5817	2.09**
Learner satisfaction	2.809	.5327	2.926	.5439	2.708	5.281	2.898	.5237	2.817	.5828	1.164

Note. The maximum score is 4
*$p < .05$ **$p < .01$

had a significantly higher level of knowledge transfer than those who spent between 3 and 5 hours a day on it (M = 2.6, SD = 0.4), F(4,189) = 2.09, $p < 0.05$.

As indicated in table 4, the time in years using Internet was significantly associated with learner satisfaction. Learners who had used the Internet for 5 years (M = 2.93, SD = 0.55) had a significantly higher level of learner satisfaction than those who had spent one year using the Internet (M = 2.6, SD = 0.5), F(9,185) = 1.93, $p < 0.05$.

As table 5 shows, the number of hours spent on social networks per day was significantly associated with knowledge transfer. Learners who had spent more than 12 hours a day on social networks (M = 2.96, SD = 0.58) had a significantly higher level of knowledge transfer than those who had spent between 6 and 8 hours a day (M = 2.67, SD = 0.46), F(4,189) = 1.79, $p < 0.05$.

The number of hours devoted to the course per week was significantly associated with learner satisfaction. Learners who had spent less than 2 hours a week on the course (M = 2.96, SD = 0.48) had a significantly higher level of satisfaction than those who had spent more than 12 hours a week on it (M = 2.67, SD = 0.5), F(4,189) = 1.162, $p < 0.05$. (Table 6)

Table 4. One-way ANOVA of years using the Internet on outcome variables

	1		2		3		4		5		6	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Knowledge acquisition	2.856	.5078	2.929	.4298	2.864	.4855	2.853	.4937	2.791	.6094	2.969	.5528
Knowledge Transfer	2.889	.4957	2.741	.4459	2.936	.5589	2.884	.5047	2.945	.5926	2.877	.4658
Learner satisfaction	2.678	.5663	2.729	.5785	2.896	.5777	2.916	.4586	2.936	.5534	2.846	.6385

	7		8		9		more than 10		F(9.185)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	3.000	.3266	2.723	.6501	3.000	.4542	2.687	.5749	.750
Knowledge Transfer	3.120	3.293	2.592	.5528	3.040	.5175	2.637	.4334	.596
Learner satisfaction	2.680	.4733	2.854	.6055	2.770	.5667	2.700	.3933	1.934*

Note. The maximum score is 4
*p < .05 **p < .01

Table 5. One-way ANOVA of hours spent per day on social networks (Facebook, Hi5, etc.) on outcome variables.

	0-2 hours		3-5 hours		6-8 hours		9-12 hours		more than 12 hours		F(4.189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.922	.5274	2.813	.6217	2.806	.5420	2.842	.5093	2.875	.3959	.337
Knowledge Transfer	2.804	.5680	2.917	.4122	2.673	.4632	2.921	.5808	2.969	.5839	1.791*
Learner satisfaction	2.778	.5116	2.800	.5317	2.945	.5081	2.770	.5812	2.781	.5975	.623

Note. The maximum score is 4
*p < .05 **p < .01

Table 6. One-way ANOVA of hours per week devoted to the course on outcome variables

	0-2 hours		3-5 hours		6-8 hours		9-12 hours		more than 12 hours		F(4,189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.769	.5407	2.775	.6456	2.961	.4780	2.884	.4954	2.810	.4939	.838
Knowledge Transfer	3.062	.4718	2.855	.5359	2.810	.4836	2.891	.5386	2.795	.5612	.769
Learner satisfaction	2.969	.4820	2.840	.5382	2.780	.6615	2.876	.4784	2.678	.5018	1.162*

Note. The maximum score is 4
*$p < .05$ **$p < .01$

Table 7. One-way ANOVA of the time of day learners attend their online classroom on outcome variables

	Morning		Midday		Evening		Night		Indiferent		F(4,189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.945	.5629	2.845	.4426	2.927	.4894	2.750	.5764	2.794	.5904	0.908
Knowledge Transfer	2.979	.4996	2.815	.4470	2.894	.5309	2.894	.5942	2.717	.5438	1.206*
Learner satisfaction	2.848	.5944	2.855	.5620	2.722	.5610	2.811	.4874	2.856	.5118	.484

Note. The maximum score is 4
*$p < .05$ **$p < .01$

As table 7 shows, the time during the day spent on academic tasks was significantly associated with knowledge transfer. Learners who worked on their academic tasks during the morning (M = 2.97, SD = 0.49) had a significantly higher level of knowledge transfer than those who did so at no specific time (M = 2.71, SD = 0.54), F(4,189) = 1.206, $p < 0.05$.

DISCUSSION AND SOME CONCLUSIONS

The research question concerned the overall perception of the level of knowledge transfer and time variables. Results show that there is a significant association with the number of hours online per day. Learners who spent more than 12 hours a day online had greater knowledge transfer than those who were online between 3 and 5 hours a day. It seems that learners spent a large amount of time because they had access in their workplace or via smart phones. These findings have a relationship with the number of hours spent on social networks per day because this was significantly associated with knowledge transfer. Learners who spent more than 12 hours a day on social networks had a significantly higher level of knowledge transfer than those who spent between 6 and 8 hours a day on them.

Learners who had full-time jobs could spend the whole day online and could be also on social networks for more than 12 hours a day. They could also be online on smart phones after work, and they could manage their time and complete their required tasks during the morning, when they get to work. Furthermore, this study found that the time during the day spent doing academic tasks was significantly associated with knowledge transfer. Learners who worked on their academic tasks during the morning had a significantly higher level of knowledge transfer than those who worked on them at no specific time. Petrova and Sinclair

(2005) and Spennemann (2007) echoed this view when they examined student use of computer infrastructure. They found that students preferred to work during the day and almost no-one preferred to work in the evenings.

It seems that learners with full-time jobs spend more than 12 hours a day online. They are connected to social networks for long periods of time and normally complete their academic tasks in the morning. They had skills in applying knowledge in different contexts, like the workplace or on other courses.

This findings support Lim and Morris (2009) study, which reported that knowledge transfer was most influenced by prior experience with distance learning opportunities, preference in delivery, and average study time.

Learning satisfaction was significantly associated with the learners' time in years using Internet. Learners who had used Internet for 5 years had a significantly higher level of learner satisfaction than those who had spent one year using Internet. Learner satisfaction was also significantly associated with the number of hours devoted to the course per week.

Learners who spent less than 2 hours a week on the course had a significantly higher level of satisfaction than those who spent more than 12 hours a week on it. This echoes Zhu`s (2012) findings that the average time learners devoted per week was found to be enhancing students learning achievement.

This result suggested that learners with more experience using the Internet are more confident in using the platform and completing the tasks. They have enough skills for finishing activities in a short period of time and using the course as a useful learning experience.

This research did not find a significant relationship between knowledge acquisition and time variables.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This study had some limitations. The sample was small and all learners were volunteers, so future research could generalize the findings with learners with other characteristics and look for relationships between other variables, for instance, gender, size class or course design. The access to learners' social network profiles was limited due to privacy concerns. Future research should find out the relationship between learning outcomes and variables related to social networks, for instance, number of friends, shared content, likes, etc.

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