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Time factor in e-learning

*Issue coordinated by
Elena Barberà*

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Time factor in e-learning

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INTRODUCTION

This issue is the first that belongs to the eLC Research Paper Series launched by the eLearn Center (eLC) with the intention of offering a double opportunity to their audience. The first is related to the readers and is about not only accessing up-to-date information and satisfying unmet needs, but also and more importantly, to be in close contact with a dynamic space held by a community of researchers who concentrate their research practices around the e-learning.

The second is with regards to the writers because this Research Paper Series is open to anyone who works on e-learning research and feels like contributing from different fields and approaches. Any writer contributing a paper to this series pursues the dissemination of preliminary research findings, in a format intended to generate discussion within the e-learning researcher community. The community of researchers around can be achieved and the research topic clearly developed by all of them contributing collaboratively, leading to the chosen field evolving rationally.

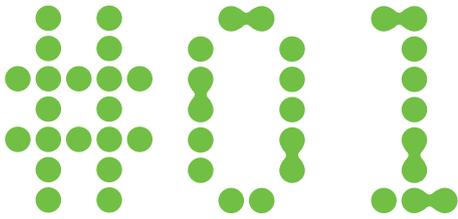
The eLC aims to foster research on e-learning, and more specifically from an interdisciplinary and thus multi-focused approach. For this reason, research at the eLC is organized around four year research programmes, that will also be the framework of this paper series.

Due to the fact that it is the launch of the series, it includes the first Research Programme of the eLearn Center at its core. This research initiates an original programme on the role and influence the time factor has or has to have in e-learning processes, including teaching, learning, management, policies and learning technologies.

In this first issue the eLC invites the e-learning research community around the world to collaborate in this fundamental topic covering the temporal factor, which is sometimes neglected, simply forgotten or often used as an excuse for mediocre results in our current e-learning practices.

Elena Barberà





RELEVANT VOICES AROUND THE WORLD

SENIOR FIGURES IN THE e-LEARNING FIELD TALK ABOUT THE TIME FACTOR IN e-LEARNING TO US AND THESE ARE THEIR CONTRIBUTIONS...

Tony Bates

University of British Columbia

CANADA

There are several dimensions to the time factor in e-learning:

1. The time of the learner.
2. The time of the learning activity.
3. The time affordances of different media and technologies.

I will discuss each briefly.

THE TIME OF THE LEARNER

This is perhaps the best understood factor in e-learning. One reason why e-learning is increasing rapidly, at least in North America, is because of the flexibility, particularly regarding time of study, that e-learning affords.

Because of increases in tuition fees (inevitable given the increased access to higher education and reluctance to increase taxes to pay for this), more and more students are working at least part-time to pay for their initial undergraduate and graduate education.

Furthermore, because of the demands of knowledge-based occupations such as health, telecommunications and computer software engineering, there is increasing demand from lifelong learners to return for postgraduate studies and continuing education. Thus increasingly students are combining work, family and study. Online learning is clearly providing the flexibility that such students need. It does this by allowing them to shift studying to times that are most convenient for them. A recent study by Statistics Canada (2009) found as many students over 24 years of age taking education or training programs as those under 24 in Canada, which probably accounts for the increasing demand for e-learning. However, such data needs more close examination and breaking down by type of program and institution. Thus while there is plenty of research to support the argument that e-learning provides increased flexibility for especially adult learners (e.g. the Sloan Commission studies) there is still room for more research on exactly what demographics are best served by e-learning, in terms of flexibility, and the implications of this for course and program design.

A second aspect of the time of the learner that is less well researched is the impact of e-learning on total hours of study. A recent metadata analysis by researchers at the U.S. Department of Education (Means et al, 2009) found that online learners did slightly better than face-to-face learners, and their conclusion from looking at variables in

the various studies was that this was due primarily to time on task - in other words, online learners spent more time studying than face-to-face learners. However, this conclusion was an indirect interpretation of third party results. More direct examination of this issue is really required to confirm the hypothesis.

THE TIME OF THE LEARNING ACTIVITY

Courses and programs in traditional classroom teaching, at least in post-secondary education, are strongly related to the concept of contact time, e.g. a three credit course is three hours of 'classes' a week. The credit system relies on 'banking' a total number of credits for a degree (e.g. in North America, 120 credits for a four year bachelors degree, which is equal to 40 one semester three credit courses, or 10 courses a year).

However, this is a peculiar concept as it does not relate to the actual time spent by students studying. With extra readings, students usually spend way more than three hours a week on a single course, and of course there are wide variations between students in actual study time as well as performance.

In designing e-learning courses, using quality-based instructional design, the aim is to ensure that students spend no more time on an e-learning course to obtain the same learning outcomes as would full-time class-based students. However, the length of a course (for instance, in North America, 13 weeks) is based on full-time classroom attendance. Many e-learners are not full time. Despite this, many will try to find the same amount of study time as a full-time student. However, since e-learning allows students to study at different times, some students may need longer to take a course than others. Some distance teaching institutions allow students to take longer to graduate, but e-learning often is used for traditional full-time students as well as lifelong learners.

This raises a whole set of questions about course design. Would what be the advantages and disadvantages of allowing students to complete a course over different time periods? What would such a course look like? What are the implications of moving to an outcomes-based approach that focuses on competency rather than time in class?

For instance, at Vancouver Community College, a course directed at apprentice car mechanics already in the workforce delivered the first 10 weeks of the course fully online. For the last three weeks of the course, students had to come on campus for the practical work. On their arrival, they were all tested on their practical skills. It was found that one third of the students already had learned the skills on the job (prior learning experience). They were sent home, so completed the course in 10 weeks. Another third needed only one of the three weeks to get to the required level of competency while the remaining third needed all three weeks.

In another college, an instructor moved a 13 week face-to-face course online and allowed the students to take the end of course exam at any time. Most of the students successfully completed the course in nine weeks. However, many part-time students may require longer than 13 weeks. Can courses be designed to facilitate different periods of study to reflect the lifestyle needs of learners?



THE TIME AFFORDANCES OF DIFFERENT TECHNOLOGIES

The time affordances of different media and technologies are well known (Bates, 2005). Some technologies permit synchronous teaching (face-to-face, video-conferencing, audio-conferencing, broadcasting), others afford asynchronous teaching and learning (podcasts, lecture capture, computer-mediated

communications, blogs, wikis, etc.). What is less well understood are the pedagogic and situational conditions that favour synchronous or asynchronous learning. Better understanding of these factors would facilitate course design.

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Mark Bullen

British Columbia Institute of Technology

CANADA

Using time to frame and help define an e-learning research program is both original and, pardon the pun, timely. So many of the issues that are of interest to e-learning researchers are affected by time yet our research to date has tended to ignore this variable and assume that time does not matter. Learning, by definition, requires time. Complex, deep learning requires a lot of time, yet much of our research tends to look at outcomes that might occur in the short time-span of a one semester course. Organizational change

requires even more time but how many studies take this factor into account? Time does not necessarily have to be an explicit focus of the research but by using it to define the program it will at least raise our awareness of its importance and relevance. This reminds me of how gender has come to the forefront of much social sciences research. Our studies may not focus on gender but we are much more conscious of it as potential factor. Time, like gender, is part of everything we do.

César Coll Salvador

Universitat de Barcelona

SPAIN

“The attempts directed towards a better understanding of how teachers and students organize their work on academic contents tend to adopt diverse analytical approaches (...). However, no matter what approach is chosen, the temporal dimension, the flow of activity of the participants through time, invariably constitutes an essential ingredient of the analysis. Few researchers question that the study of the interactive processes requires the temporal location of the behaviour of the participants and their communicative interchanges (...).

However, one thing is to postulate the importance of temporal dimension in the analysis of interactive processes and quite another is to respect the theoretical and

methodological demands derived from this postulate when an empirical approach is attempted. Serious consideration of the temporal dimension in the study of interactive processes obliges us to question and rethink the usual procedures used in the collection and registration of data; it also obliges us to question and rethink the usual procedures of analysis of interactive processes. And of no lesser importance, it obliges us to bring up the topic of units of analysis directly, of their basically molar or molecular character, of their theoretical and conceptual basis and of their relevance and pertinence in the study of the construction of knowledge inside the framework of the formal teaching/learning activities.”

References

Coll, C. & Onrubia, J. (1994). Temporal dimension and interactive processes in teaching/learning activities: a theoretical and methodological challenge. In N. Mercer & C. Coll (Eds.), *Explorations in Socio-Cultural Studies, volume 3. Teaching, Learning and Interaction* (pp. 107-122). Madrid: Fundación Infancia y Aprendizaje.

Betty Collis

University of Twente

THE NETHERLANDS

“The time (or temporal or “tempo in e-learning”) factor needs to be operationalised. What I miss (...) is a statement of what is meant by the key construct of the “time factor in e-learning. (...) It is good that the time construct can cover such a range of focuses but in order to not leave the research reader surprised by the sorts of questions that emerge, I suggest the document begin with a definition of the construct of the “time factor in e-learning”.

As a suggestion, “*Time as a construct in e-learning relates to when and at what rate learning-related processes are planned to occur and/or actually occur, and accompanying this, under whose control or choice, facilitated by what decisions or tools, and at what cost and benefit.*”

Given this as a construct definition (and of course, there could be many other definitions),



a causal representation in terms of dynamics and impact (not just descriptive, as is now the case with the “four core elements”) can be interesting. For example, stated in terms of the learner:

Keeping “time” for the e-learner equal to other learning settings, how and under what conditions can a richer experience occur within the same time for the e-learner? And at what implications for learner, teachers, support staff, and the institution?

Making “time” (for the e-learner) less compared to other learning settings, how and under what conditions can the same or better quality of learning occur for the e-learner? And what implications for learners, teachers, support staff and the institution?

My suggestion is thus: (a) to define the construct of “the time factor in e-learning” and (b) to simplify the focus of the research questions around two aspects of time for the e-learner: more (quality of learning) in the same time, or the same or more (quality of learning) in less time.

Having said this, I again compliment the eLC team for developing such a rich line of inquiry around the construct of the time factor in e-learning for its research.

Michael Moore

Pennsylvania State University

UNITED STATES OF AMERICA

For more years than I want to remember I have argued that two aspects of TIME are of critical and central importance in distance education. I do not say there are not others but the following two are of paramount importance. First, at the relatively micro-level I have no doubt that the quality of the design of every course is dependent on the extent to which those responsible for designing the course are able and willing to accommodate their teaching objectives, and to manage the content, according to the TIME that the student can be expected to spend on each unit and each module of the course. This is very obvious and it is so basic to knowledgeable distance educators, but is so often overlooked or ignored by so many educators, especially those coming new to distance education from classroom teaching backgrounds. Too often courses are constructed to accommodate

the content they think their students should know, without regard to the TIME constraints on the student. The inevitable result is that students fail to perform their best, or to meet their instructors’ excessive ambitions. When training distance educators, I always insist that instructors begin by stating what is the student’s TIME BUDGET, and then specifying learning objectives and fit them within that time budget, abandoning those that will not fit.

The second point about TIME refers to a relatively macro-level phenomenon and is the problem of institutions failing to invest in providing sufficient TIME for their instructors and instructional designers prior to the interactive phase of instruction, i.e. when the students begin to interact with instructors and each other. In 1992 I was working at University of Turku in Finland where I

observed the same phenomenon that had become so annoying in the USA, what seemed to be a too-hurried rush to get programs out to students, with insufficient time invested in their design. This prompted me to write an editorial for *The American Journal of Distance Education* that I called "Take Time to Design". In it I pointed out that in state-of-the-art distance teaching, the ratio of time spent on design to that spent by the student on study was as high as 100 hours of design to 1 hour of study. By contrast, I said "if you want to invest small amounts of money and personnel time, lower quality programs must be expected." Today, 17 years later I see little reason to change that warning. On the contrary I am afraid that more institutions and more administrators have found the arrival of new technology has provided the excuse for reducing the "time to design". In many institutions today the ratio of design time to instruction may be as low as 2:1.

With such low investment, -- as I said in the 1992 editorial -- "the consequence is that an under-resourced design team is desperately overworked; materials are produced that are good under the circumstances but much below what is possible; and the market if flooded with mediocre materials that threaten to undermine confidence in the distance education approach."

I am convinced that there could be few research projects more important and more rewarding in the potential improvement in the quality and success of distance education in the age of e-learning than research projects that focused on first, the effect of basing design decisions on a framework of student's time budgets, and, second, the effects of investing human resource hours in course design.

Reference

Moore, M.G. (1992). Take Time to Design. *The American Journal of Distance Education*, 6-2.

Lalita Rajasingham

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NEW ZEALAND

While time itself is a relational and complex concept, its use in e-learning is precise. E-learning is time and place independent learning made possible by advances in computing and telecommunications such as the internet to network teachers, learners and the learning institution in synchronous (realtime) and/or asynchronous (flexi-time) mode for communication and collaboration. Research issues are examined in the following categories:

➤ TEACHING AND LEARNING PROCESSES

Teachers help learners to apply knowledge to problems. This requires technology that enables timely and rapid question and feedback, and symmetry of time factors between teachers and learners, which today is yet to be achieved. Currently students as digital natives, seek instant gratification using mobile technology for education on the go. Teachers as digital immigrants need



to achieve symmetry with temporal needs of learners in curricula design and teaching approaches.

➤ EDUCATIONAL ORGANISATION, MANAGEMENT AND POLICIES

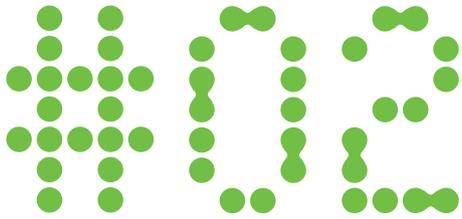
The main challenge for this sector is to develop policies and management practices in an integrated holistic way for learning and teaching in the new multimediated educational environment that demands response to timeliness and redesign of education processes in consultation with the stakeholders.

➤ TECHNOLOGICAL LEARNING RESOURCES

While information and communications technologies for efficient, effective e-learning that can be delivered at the convenience of the learner in culturally appropriate way exists, appropriate timely technology support systems for faculty, students and management is often lacking. If online learning is subject to technological breakdowns which invariably happens as the internet is still evolving, it is essential to have technical support 24/7, or else learners and teachers give up

the process in frustration. It appears that serving changing student demographics, just in time applications based on artificial intelligence (AI) for just in time artificially intelligent teachers (JITAITs) can be available, like a private tutor, anytime a student needs because human teachers cannot be endlessly available all the time for every student. JITAITs would strengthen synchronous communications and feedback for learning as and when students need.

Finally, the concept of time is now associated with speed and economic profit. Speed and economic imperatives are not natural bedfellows of education. Research is yet to prove that speed in learning would lead to deep learning, which requires reflexive time to absorb concepts and connect with prior knowledge. Even though it is now possible to download a whole encyclopaedia in seconds, human eyes as receptors of information can only process information at 50 bits per second! Therefore, using the technology for speed dumping may prove to be overkill and less than useful.



Barberà, E. (2010). Time factor in e-learning: eLC Research Programme 2009-2012. *eLC Research Paper Series, 0*, 12-15. Barcelona: eLearn Center. UOC.

eLC RESEARCH PROGRAMME ABOUT TIME FACTOR

IN THIS SECTION A SUMMARY OF THE ORIGINAL eLC RESEARCH PROGRAMME IS PRESENTED.

Elena Barberà
eLearn Center
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Time factor in e-learning: eLC Research Programme 2009-2012

CONTEXT

The research work of the eLearn Center is structured into four-year research programmes that thematically focus the activities carried out by researchers working from or with the eLC during specific periods of time. The decision to organise the research into programmes was based on the need to advance in a joint and thematically convergent way, providing a greater visibility of results about the subject being studied. The research programmes set out the thematic pertinence and relevance

in a way which places the programmes firmly within the current trends of concerns, gaps and possible improvements in e-learning. The multi-dimensional response to the problems posed will be one of the most important characteristics of the programmes. The aim of these programmes will be to present the most coherent construct possible, the fruit of different contributions made by the studies involved in the programme.

LINES OF RESEARCH

In order to obtain this explanatory construct, which will advance knowledge about the programme's theme, three stable lines of research are proposed. These lines of research respond to an agreed classification

from the area of e-learning which assures a very diverse and complete scientific contribution as well as to a phenomenon as complex as e-learning.



The lines of research into e-learning are:

1. Research related to teaching and learning processes.
2. Research related to educational organisation and management.
3. Research related to technological learning resources.

OBJECTIVE AND THEME

The theme of the research programme for the first four-year period (2009-2012) is “The time factor in e-learning”. The time factor in this case refers to all those elements that are related to a perspective of influence and benefit from the time factor in online learning. All research objects related to what could be called “tempo in e-learning” are included, which in this programme are understood as being the questions related to time which bring about improvements in learning. In a generic way, this “temporal dimension in e-learning” is considered as a real tool which is always present and which spreads out into the planning and implementation of online education. Perhaps the time factor does not appear as a keyword for research and conferences but its good management and conscious adaptation is decisive for the good functioning of online learning. This research theme integrates, by way of an example, elements as diverse as: learning rhythms, curricular timings, contingent support for learning, student continuation rates, automatic feedback technologies, self-management study calendars, speed and duration of courses, chronology of competence achievement, ubiquity and distribution of

teaching, institutional flexibility, latency of online discourse, learning support structures, short, medium and long-term resources, validated qualifications and previous knowledge, synchrony, use of time on campus, continuous assessment technologies, etc.

The programme is presented under double verification in the area of study into e-learning: on the one hand, the time factor is very often ignored in research into e-learning, taking for granted its presence and influence, which means that the specific requirements are not dealt with carefully and research is carried out into the learning process, applying or analyzing a set of factors that do not take into account the progression marked by learning achievements and, on the other hand, the programme also shows the belief that by varying some elements related to tempo in e-learning, improved results can be achieved that are different to those being achieved until now.

To summarise, the programme is designed to gather empirically argued actions and decisions related to the time factor in online education, with the aim of improving learning.

RESEARCH ELEMENTS

From the experience accumulated it seems logical that the theme of the research be contextualised in higher education in these first stages and that it should remain predominant throughout the different

research programmes that may be developed. However, a sufficiently complex representation of the research view is required to be able to understand the main focuses and future research actions.

To this effect we are equipped with a representation in which the different possible thematic focuses are reflected and in whose inter-relation the different nodes of current research could be situated, as well as indicating some others for the future.

The representation has four core elements:

A) SUBJECT/S

Who is/are the recipient/s of the research results: teachers, students, designers, business people, technicians, institutions, etc.

C) TECHNOLOGICAL

Technological tools involved in educational solutions: virtual campus, 2.0 tools, mobile technology, 3D, etc.

B) CONTEXTUAL

Which educational level is being addressed, principally, the research solutions: compulsory education, post-compulsory, higher, non-formal, informal, etc.

D) STRUCTURAL

If the selected research plan is of an institutional nature or of a programme, course, resource or material nature, etc.

A greater determination of the research theme and of its priority focus for this first period of time will help to shape the lines of research. Therefore, in accordance with the proposal that the theme of the programme should be “The time factor in e-learning” and maintaining the three lines of research (time factor in/of teaching and learning processes, time factor in/of educational organization and management and the time

factor in/of technological learning resources) a greater level of precision is required, reflected in guiding research questions for each of the lines. Despite the fact that these questions are still generic and do not exhaust all the research possibilities, they aim to focus the results of the research along all lines and they respond to the specific and contrasted problems in coherence with the practical focus of the programme.

RESEARCH QUESTIONS

Dealing with the time factor means, according to the proposed lines of research, responding to some of the following guiding questions:

1. TEACHING AND LEARNING PROCESSES:

- Is it possible to identify and strengthen an increase in the *cognitive level* achieved by online students if they use learning support tools in real time?
- Is the *faint process* in online learning a gradual process of the same nature as the structured support process? Which specific mechanisms in relation to the time factor are involved in the withdrawal process?

- Can the quality of the content and the real achievement of feedback online be related to the moment at which the teaching and learning sequence is provided?

2. EDUCATIONAL ORGANISATION, MANAGEMENT AND POLICIES:

- Which factors must be taken into account when planning and implementing an educational institution that is truly *open and flexible* through the use of technological learning tools?



- What is the nature of the conceptions about the educational organisation of an institution and its teachers in the *continuance and level of completion of studies* online?
 - What are the *problems of an organisational character* related to the time factor which institutions have to face in order to develop quality online educational proposals?
-
- ### 3. TECHNOLOGICAL LEARNING RESOURCES:
-
- How can one set out a more efficient *technological mediation* in the implementation of continuous assessment coherent with the achievement of competences?
 - How can technology help to *manage time* in a rational way for online students?
 - Which resources of a *synchronous* nature provide a significant change that could lead to the consideration that technology is an *amplifying tool* in teaching and a strengthener in learning?

APPROACH

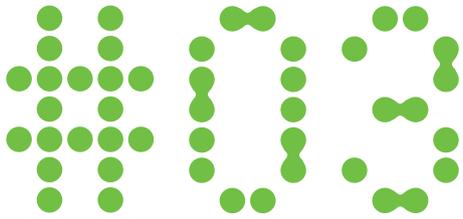
The approach of the research programme prioritises two fundamental aspects for knowledge advancement:

1. The research must be clearly directed toward the *resolution of problems* that are current, objectively relevant and with the widest possible reach. This research has to seek solutions in an empirical way to a problem which is well delimited, which although it may arise from normal practise, it must always be possible to place it within the framework of a research thread and global debate at the point at which it is started (reflected in specialised magazines, committees, fundamental reports, etc.)
2. The research must be focused on providing *innovative and specific results for improvement* in the chosen field of research, in a clear way, providing instruments that provide evidence to support the contributions made. Likewise, the results of the research have to constitute a clear base of innovation in their field of application.

ANTICIPATED RESULTS

Without differentiating between products of short or half term, we expect to see contrasting results coming directly from the research, referring to:

1. Contrasting instructional guidance for improving online teaching and learning through aspects related to the time factor.
2. Specific validated instruments which are mediators of this improvement in the online learning process (protocols, patterns, others).
3. Technological processes and validated technologies which respond to some subsidiary need of the time factor.
4. A final explanatory construct on the influence of time on the improvement of segmented online learning from the contributions of all the research involved in the programme.



Gros, B., Barberà, E. & Kirshner, P. (2010). Time factor in e-learning: impact literature review. *eLC Research Paper Series, 0*, 16-31. Barcelona: eLearn Center. UOC.

TIME FACTOR IN e-LEARNING: IMPACT LITERATURE REVIEW *SOME EXPLORATORY RESEARCH*

WITH THE AIM OF LOOKING AT HOW THE TOPIC OF TIME IN E-LEARNING IS ADDRESSED IN RELEVANT RESEARCH A TENTATIVE STUDY IS BEING CONDUCTED BASED ON A LITERATURE REVIEW.

This research is now in a second phase and includes wider specialized journals, data base gathering and also some readjustments on the technological resources area analysis. Below are the results from phase one. Accepted as an important issue in e-learning, this phase

has been crucial in pursuing the new stage that has to lead to a broader knowledge about not only the importance of the time factor in e-learning but the real role it has in research in e-learning.

Begoña Gros
Elena Barberà
Paul Kirshner
.....
eLearn Center
UOC

Time factor in e-learning: impact literature review

ABSTRACT

PURPOSE

Time factor research in the e-learning field has gained significance due to the influence it has on the teaching and learning process and its administration. The aim of this study was to undertake systematic research on the literature available, to investigate the different approaches and to study the resulting research topics.

METHOD

We conducted a systematic literature search of studies from two impact journals; the first one is the British Journal of Educational Technology from January 2007 to May 2009 and the second one, the Computers and Education Journal, from January 2008 to May 2009. We grouped identified articles in three common areas in e-learning: teaching and learning process; educational organization,



management and policies and technological learning resources. A total of 646 papers have been analysed in terms of presence of the temporal factor in their research proposals.

RESULTS

In the analysis, from a total of 55 research papers that treat the temporal factor in some way in the studies presented, we included: 28 papers in the teaching and learning process criteria, 11 papers in organization, management and policies in e-learning and 16 papers in learning resources in e-learning. Almost all the papers deal with formal education (mostly undergraduate) and they are methodologically more frequently quantitatively oriented. It cannot be said that the time factor is more commonly

RATIONALE

This study analyses various pieces of research that have been carried out in the e-learning area with the main purpose of undertaking a preliminary review of factors related to time and that are mentioned explicitly or implicitly in impact journals.

The research has two different motivations.

- The time factor has generally been ignored in e-learning research. It has left aside the importance it has in the teaching and learning processes as the factors are commonly studied without taking into consideration the way progress through time influences them.

OBJECTIVES

The time factor is very often neglected in e-learning research, taking for granted its presence and influence. This means that the specific requirements are not dealt with

understood as an independent or dependent variable in learning as a whole because the approach changes regarding the different areas of analysis. Amongst other qualitative results they point to contents related to time participation and time perception in a communication and interaction framework.

CONCLUSION

More than giving specific or definitive conclusions (variety and partiality of scopes in time topics but converging trends in some issues related the methodological approach) the study offers relevant questions related to the validity of the some of the research components and gives the second research phase its meaning.

- It is proposed that making variations in factors related to time in the e-learning process, significant changes and improvements in e-learning could be achieved.

This research has been designed to obtain empiric data in relation to the facts that need to be taken into consideration for future investigations in the e-learning area and the time factor although this research contemplates a more exhaustive phase consecutively to the one presented here.

carefully and research is carried out into the learning process by applying or analyzing a set of factors that do not take into account the progression marked by learning achievements.

The time factor does not appear as a keyword for research and conferences but its good management and conscious adaptation is decisive for the well-functioning of online learning.

The general objective of this literature review will help us to identify how this subject has been studied. Therefore, we will be able to recognize which have been the main research lines that have been followed to work on this decisive topic and analyse the level and nature of presence time has in e-learning research.

The study was divided in the following specific objectives (for the two phases):

- To review a range of the published literature that includes the time factor concept in e-learning research.
- To report on key messages and themes arising in the literature.
- To identify omissions in previous research.
- To provide a relevant analysis of time factor in e-learning contexts beyond place and time axes (social, educational, methodological,...).
- To recommend relevant research questions.
- To build a fundamental and connected corpus of dimensions and categories with the aim of organising the relevance of e-learning time.

METHOD

The methodology used for the systematic literature review was described by Fink (2005) and presents a method for identifying, evaluating, synthesizing, interpreting and analyzing research literature. Fink mentions that it is important for an efficient search to decide the criteria for including and excluding articles and to sort relevant and strong studies from others.

The first screening was primarily practical and for identifying a broad range of articles that may be potentially usable. These were published in impact journals of the field of interest and cover the topic of research. We have performed a systematic review of the literature published from 2007 onwards, to ascertain the relevance of the time factor.

The first study selection criterion was focused on two referenced journals. The first one is the British Journal of Educational Technology from January 2007 to May 2009; with 15 issues

and 230 articles (without the books review) and the second, the Computers and Education Journal, from January 2008 to May 2009 with 15 issues and 416 articles.

The second criterion for the identification and inclusion of these articles was that it addressed the use of time in an educational context in an implicit or explicit way.



In addition, a heavy emphasis was placed on material which provided evidence concerning these three broad areas:

A) TEACHING AND LEARNING PROCESS IN e-LEARNING

B) ORGANIZATION, MANAGEMENT AND POLICIES IN e-LEARNING¹

C) LEARNING RESOURCES IN e-LEARNING

However, in some cases, material of a more polemical nature has been included due to its level of importance in setting the context.

Following the guidelines of the conventional systematic review methodology, inclusion and exclusion criteria were applied to the 646 studies by three independent researchers. The articles were reviewed firstly by title and abstract and finally by full text, excluding at each step those which did not satisfy the inclusion and exclusion criteria.

Once they were selected by title and abstract, each abstract was read and included according to the above criteria, studies were rejected if they did not include the use of the time, some of the articles' abstracts vary considerably in their content and for example, some fail to state the research paradigm used or the level and type of education.

591 articles were excluded from the analysis since they failed to meet the stipulated criteria in the designing of the current research.

As a result, 55 papers (8.5 % of the total number of abstracts) were fully analysed to determine whether the studies met the three broad areas mentioned.

In the analysis 28 papers (51% of the total number of full papers) were included in the teaching and learning process in e-learning criteria; 11 papers (20% of the total number of full papers) in organization, management and policies in e-learning and 16 papers (29% of the total number of full papers) in learning resources in e-learning.

For the analysis of the reliability we selected, randomly, 10% of the total of the abstracts and they were analyzed by a fourth researcher. The interjudge reliability for selection and classification of the papers of the three researchers' judgements and a fourth researcher was quite high, 803.

The study now continues with the analysis of literature on specialised data bases that contain different kind of journals and hold distinct paper approaches and topics.

¹In this area's phase the analysis is more related to the use of a particular technology in some way in the research rather than about the development of the technology itself.

RESULTS

Results are presented by e-learning areas following the analysis protocol categories for the quantitative analysis and following the main elements concerned with a research process for the qualitative analysis.

A) TEACHING AND LEARNING PROCESS IN e-LEARNING

QUANTITATIVE

Time	Num	Percentage
A) Explicitly	23	82%
B) Implicitly	5	18%
TOTAL	28	100%

Level of Education	Num	Percentage
A) Primary/Secondary	5	18%
B) Undergraduate	16	57%
C) Graduate (Master and PhD)	6	21%
D) Other	1	4%
TOTAL	28	100%

Type of education	Num	Percentage
A) Formal (school, university,...)	26	92,9%
B) Non formal (work place, ...)	1	3,6%
C) Informal (daily learning, ...)	1	3,6%
TOTAL	28	100%

Methodology	Num	Percentage
A) Qualitative	6	21,4%
B) Quantitative	16	57,1%
C) Hybrid	6	21,4%
TOTAL	28	100%

Mediating Variable	Num	Percentage
A) Independent variable - as a requirement <i>(i.e. key factor took for granted or needed in the progression of learning/teaching but explicitly, lack of time)</i>	11	39%
B) Controlled variable - as a part of the process <i>(i.e. how to manage time to be more effective)</i>	10	36%
C) Dependent variable - as a result <i>(i.e., doing X the students or teachers save time)</i>	7	25%
TOTAL	28	100%



Time Category	Percentage
A) Time of participation (in forums, chats, during feedback, grading, individual study time, etc.)	38%
B) Time perceptions (participants experience, i.e., Are asynchronous students more positive about their experience than synchronous students?)	34%
C) Time conceptions (Personalization, the richness of the dialogue, the level of involvement of students and teachers in discussions and the different means of communication)	9%
D) Time personalisation (rhythms, adaptive time, acceleration, etc.)	16%
E) Other categories: Evolving over time, saving time, effects of things on pace of delivery	3%

Topic Category	Percentage
A) Materials/resources	21,1%
B) Formative Assessment	7,9%
C) Sumative Assessment	5,3%
D) Instructional Design	13,2%
E) Communication/Interaction	36,8%
F) Teaching/Learning	13,2%
G) Motivation, Team conflict	2,6%

QUALITATIVE

RESEARCH COMPONENT ANALYSIS

Participants. In the learning and teaching process area of e-learning studies the main, and to a certain extent exclusive, *subject participants* are students or groups of students in a formal education system taking synchronous and asynchronous computer-mediated courses. Except in research where the technology is new (i.e., m-learning, whiteboard) where the objective is to test an instruction tool and the target includes instructors as well. In just one case, the participants are parents showing the impact of online resources on informal learners.

Target groups are instructors, instructional and technology designers and researchers.

Research questions undertake different subject matters, explained later on, but the stress on results is shown. The most frequent questions tackle the effectiveness of an instructional approach using a certain technology. The role of time is normally secondary, which means it is not the central or the only question in the research. When it is central, it is about time preferences (time of the day preferred to be examined) or sequences and succession (how the day of posting affects the level of critical discourse). For the rest of the research, time is most frequently referred to: position -where an element appears in the didactic chain-, speed -i.e., effects of the instant feedback-, occurrence -i.e., more instructor statements yield student participation- and saving -how much time students save if they behave or use technology in a particular way-.

Methodology. The most common techniques used in these research studies were questionnaires and pre/post surveys to measure the students' motivation, study habits when doing a course online, comparing experiences of online methods and traditional activities. In the latter techniques, time is used as the main factor and it was explicitly mentioned. Likewise, in the following techniques the time factor is used either explicitly or implicitly and it is considered part of the elements in the research process: online individual interviews in a chat room setting; focus group discussions; observations of whole class lessons using interactive whiteboards; content analysis approach to identify interactions within an online learning group; time sequence analysis to observe and describe patterns of participation, interaction, affect and behaviour over time; analysis of the quality of language used in synchronous and asynchronous online discussions; case-study methodologies to explore participants' experiences; observations of team meetings online; interviews with individual members; analysis of electronic documents exchanged among team members and observations of whole-class lessons and scheduled tests to measure achievement.

The outcome measures included data related to factors that facilitated or impeded development and/or effective practice in those subjects across time such as motivation for the course across time, study habits, achievements and learning satisfaction via synchronous versus an asynchronous distance learning system, time-of-day preferences to do tasks, the changes in users' beliefs and attitudes after using learning objects, students' attitudes towards webCT and subjective norms over time, the frequency of using a computer at home, motivation for the course they were in, satisfaction with the grades they got, time spent by students per week on computer games and its effect on academic achievement and time saving tasks.

In this area the *unit of observation* of the researches analysed is principally a course and normally a part of it (discussions are the most popular). A bigger unit is rarely found (a programme, for example) even though a teaching and learning process takes longer than a single course. If a longitudinal approach is found this is applied to the course sequences or courses in different years as well. Other research shows a global approach to the frequency of computer use (or a particular software) and performance. Informal education uses communication material written in a specific parenting portal.

More common time units of analysis are: time invested, quickness in communication, day or week occurrence, immediacy (feedback), delay in interaction, didactical sequence location, change and progression (beliefs, grades, contributions, perceptions).

CONTENT ANALYSIS

1. Studies that attempt *time employed* by students, generally saved or spent using computers, Internet or an e-learning tool (games, discussions, podcast). These relations are not always positive arriving to the conclusion that sometimes the tool is not really worthy connecting the results with the subject matter or the level of attainment, particularly when the time is limited. Nevertheless, there is confirmation of the benefits for podcasting on the subject revision processes. Simply in very specific moments related to teachers (automatic feedback that enhances higher performance and the use of a blackboard that adapts teaching practices and the pace of sessions) and parents (parenting skills and time spent with their children).



2. *Participation time and time spent studying* when teachers use personal motivation messages (that are also related to an increment in achievement), for example; or using technology that engages students to use or be in contact with the subject contents more frequently, consequently leads to better performances. In one case, when this participation is related to the instructor yield, substantial enhanced learning is observed.
3. *Time location and progression* of relevant parts on a discussion or argumentation activities like the content which is developed in different stages of a learning activity (beginning, middle, ending), that shows the importance and success prediction of the first exchanges in collaborative learning due the determined influence that early exchanges provide to the groups.
4. *Individual evolution* over time leads to changing usage patterns of learning objects, the development of parents' self-conceptions and the acquisition of skills from synchronous inter-networked teacher training.

The Technology involved in the research of teaching and learning process in e-learning are basically asynchronous -and sometimes synchronous- communication tools with varying complexity or importance (CSCL,CSCA), as well as web-based initiatives. Only a low percentage of the studies use the latest generation technology, except in the cases of the ones that test a particular technology with the aim of enhancing learning or contrasting their efficiency (video and computer games, podcast, and whiteboard). In these cases the objective is to discover the pedagogical benefits of the technology and how they relate to the temporal dimension of absorbing more or less student time (the scope does not include teachers).

B) ORGANIZATION, MANAGEMENT AND POLICIES IN e-LEARNING

QUANTITATIVE

Time	Num	Percentage
A) Explicitly	7	63,6%
B) Implicitly	4	36,4%
TOTAL	11	100%

Level of Education	Num	Percentage
A) Primary/Secondary	2	18,2%
B) Undergraduate	8	72,7%
C) Graduate (Master and PhD)	1	9,1%
TOTAL	11	100%

Type of education	Num	Percentage
A) Formal (school, university,..)	11	100%
TOTAL	11	100%

Methodology	Num	Percentage
A) Qualitative	4	36,4%
B) Quantitative	7	63,6%
TOTAL	11	100%

Time Category	Num	Percentage
A) Time of participation <i>(in forums, chats, during feedback, grading, individual study time, etc.)</i>	6	54,5%
B) Time perceptions <i>(participants experience, i.e., Are asynchronous students more positive about their experience than synchronous students?)</i>	4	36,4%
D) Time personalisation <i>(rhythms, adaptive time, acceleration, etc.)</i>	1	9,1%
TOTAL	11	100%

Topic Category	Num	Percentage
A) Materials/resources	2	18,2%
D) Instructional Design	1	9,1%
D) Instructional Design, f)Teaching/Learning	1	9,1%
E) Communication/Interaction	3	27,3%
E) Communication/Interaction, f)Teaching/Learning	2	18,2%
F) Teaching/Learning	2	18,2%
TOTAL	11	100%

QUALITATIVE

RESEARCH COMPONENT ANALYSIS

Participants. In the organizational area of e-learning studies the main subject participants are the teachers and the institution in both synchronous and asynchronous computer-mediated courses in formal educational systems. In just two cases, the participants are students and they show the impact of the use of computer at home and the relationship with academic results.

The target group consists of teachers who are responsible for the management of the organization.



The most frequently used **research questions** tackle the factors determining the successful implementation of ICT and the integration and adoption of the ICT during the teaching and learning process. In some cases, the research question focuses on the role of the use of technology in an informal context and the real influence of this use on academic performance. In two studies, they look at the influence of genre and focus on its influence on the success in distance learning environments. The role of the time is normally secondary, which means it is not the central or the only question studied. In the cases where it is central, it considers the time of adoption of technology, and time (lack of time) as a perception of teachers in many studies. For the rest of the research, time is most frequently referred to as how much time students save by changing their behaviour or using technology in a particular way.

Methodology. The most common techniques used are questionnaires and pre/post surveys to measure the teachers' perceptions and personal beliefs on the use of technology, and surveys to measure the use of ICT by the students in informal settings. The time factor is used either explicitly or implicitly and is considered part of the elements in the research process.

The outcome measures included data related to the factors of successful implementation of technology in the organization with especial emphasis on the aspects that facilitated or impeded the integration of ICT in synchronous and asynchronous distance learning systems.

There is also a group of studies that centre on the frequency of using a computer at home, time spent by students per week on social networks, computer games, etc. and its effect on academic achievement and time saving tasks.

In this area the research *observation unit* principally analysed the institution, the programme and, in many cases, the study takes longer than a single course. It is a longitudinal approach.

Other research uses a global approach to look at the frequency of computer use in informal education and the influence on the academic performance. Finally, it is important to mention that all the papers are situated in different countries (Brazil, Greece, Israel, Oman, Taiwan, the UK and the USA) and the cultural and political context is important in the study. In fact, in most cases the paper compares the results obtained in the study with other research situated in different countries.

The most common time units of analysis are: changes and progression over time (integration, adoption, perception) and time invested.

CONTENT ANALYSIS

1. *The participation time* of the teachers using technology and the time to adopt technology related to institutional support, as well as the attitude of teachers are critical factors for elearning and institutional change. In many cases, the studies show that it is relevant for the institution to have a global view of the factors that help to support the integration of ICT (courses, career of the teachers, support of the organisation, technology, etc.) and to define policies to facilitate the use.

2. *The teachers' evolution* over the time changes their beliefs in learning objects use, as they gain skills through synchronous inter-networked teacher training. In some cases, the evolution of perception and adoption is very slow and it is difficult to increase the speed of change.
3. The participation of women in online courses. The studies conclude that participation improves and promotes equal opportunities in some cultures in which women have difficulties to participate in face to face classrooms.
4. Studies look at the *time employed* by students using computers, the Internet and videogames. These relations are not always positive, which leads us to the conclusion that sometimes the tool is not really worthy of being connected to academic results.
5. Studies that investigate *time related to the design of learning experiences* save time for the institutions. For instance, cyberpracticum, which is an immersion course for future teachers taken before they undertake real practice in schools.
6. Studies of the institutions of the satisfaction of learners using online courses in relation to flexibility and not having time limitations.

In the research of the organization area, *technology* is mention as something general (ICT, online courses, use of technology, etc.) without specific references to a particular technology.

C) LEARNING RESOURCES IN e-LEARNING

QUANTITATIVE

Time	Num	Percentage
A) Explicitly	8	50%
B) Implicitly	8	50%
TOTAL	16	100%

Level of Education	Num	Percentage
A) Primary/Secondary	2	12,5%
B) Undergraduate	12	75,0%
C) Graduate (Master and PhD)	2	12,5%
TOTAL	16	100%

Type of education	Num	Percentage
A) Formal (school, university,..)	16	100%
TOTAL	16	100%



Methodology	Num	Percentage
A) Qualitative	2	12,5%
B) Quantitative	9	56,3%
C) Hybrid	5	31,3%
TOTAL	16	100%

Mediating Variable	Num	Percentage
A) Independent variable - as a requirement <i>(i.e. key factor took for granted or needed in the progression of learning/teaching but explicitly, lack of time)</i>	7	43,75%
B) Controlled variable - as a part of the process <i>(i.e. how to manage time to be more effective)</i>	8	50%
C) Dependent variable - as a result <i>(i.e., doing X the students or teachers save time)</i>	1	6,25%
TOTAL	16	100%

Time Category	Percentage
A) Time of participation <i>(in forums, chats, during feedback, grading, individual study time, etc.)</i>	52,17%
B) Time perceptions <i>(participants experience, i.e., Are asynchronous students more positive about their experience than synchronous students?)</i>	30,43%
C) Time conceptions <i>(Personalization, the richness of the dialogue, the level of involvement of students and teachers in discussions and the different means of communication)</i>	4,35%
D) Time personalisation <i>(rhythms, adaptive time, acceleration, etc.)</i>	8,70%
E) Other: Tutor marking time	4,35%
TOTAL GENERAL	100%

Topic Category	Percentage
A) Materials/resources	30%
B) Formative Assessment	5%
C) Summative Assessment	5%
D) Instructional Design	10%
E) Communication/Interaction	30%
F) Teaching/Learning	10%
G) Others: marking time	5%
H) Mobile learning	5%
TOTAL GENERAL	100%

QUALITATIVE

RESEARCH COMPONENT ANALYSIS

Participants. In the resource area of the studies included in the analysis, as stated, the main *subject participants* are the students in formal educational systems. There were relatively few studies that dealt with differences either within or between synchronous and asynchronous computer-mediated courses. In only two cases, the participants are students showing the impact of the use of a computer at home and the relationship with academic results.

The target group is mainly made up by students in formal educational systems.

The **research questions** that the studies attempt to tackle relate here to the effectiveness or impact of the choice of a specific technology. There is unfortunately no trend that can be discerned. Examples of research questions are:

- Do students appreciate receiving PowerPoint® slides before a lecture as opposed to after a lecture and does this affect appreciation (result: yes) and exam results (result: no)?
 - How do team designs evolve across time with a specific collaborative environment (result: they evolve)?
 - How useful and convenient is mobile synchronous learning compared to desktop synchronous learning (result: increased motivation, allows use in environments where a desktop is impossible)?
 - What are the most appreciated aspects of learning management for students (result: efficiency/time saving, improved communication) and teachers (result: improved communication, efficiency/time saving)?
 - Does using Skype® to converse with other students lead to higher oral proficiency in learning a second language (result: no effect)?
 - Does a specific wiki tool lead to needing less time to develop a wiki (result: quicker development)?
 - What are the effects of a computerised multiple choice testing system where students have to answer the question where there is a time limit including a countdown timer (result: less time, higher retention)?
 - What are the effects/benefits - as perceived by teachers and students - of computerised assignment of students to teams (result: fairer, saves time)?
-

Methodology. The most common techniques used in these research studies were questionnaires, pre-test and post-test surveys, online surveys, observations and interviews. Some of them adopted the mixed-methods research protocol to measure the students' motivation, their study habits when doing a course online, they compare experiences of online methods, their traditional activities and found out their point views on e-learning as compared to traditional learning methods.



The outcome measures included data related to factors that promote interaction between the students and the teacher's feedback. In this particular case, interactions in real time and frequency of use are highlighted.

Among the most important factors which were measured in the studies we could find: motivations to participate in accessed continuous learning activities and their perceptions on taking online classes and m-Learning via cell phones, students' perceptions on the helpfulness, thoroughness, changes in belief and attitude.

Some studies use focus groups for class consultation procedures such as observations of whole-class lessons to get students' perceptions and to know their opinions on the benefits; to find out their attitudes with regard to time, knowledge and confidence in their involvement; their attitudes to lectures, podcasts, notes, textbooks and multimedia e-learning systems.

Finally, some studies use interviews in order to compare whether subjects' beliefs and behavioral intentions change and how they do it over time.

In this area the *observation unit* of the research analysed is principally the single course.

CONTENT ANALYSIS

1. Time employed by students before and after the session.

Students use tools such as Learning Management Systems, blogs or digital repositories at home, so as to have access, in advance, to the school material and to do exams online, either alone or in a team (web-based tool for assigning students to groups) in order to gain time and to increase their participation online.

2. Time participation and time sharing.

Participation in class is more frequent when the student has previously acceded to the material or has done the activities using the available tools. Learners spend time sharing information and interacting with other learners and teachers using Web-based services and applications (weblog-based electronic portfolios, electronic voting systems, mobile devices, Wikis).

Some studies are specifically focused on the benefits that technology conveys in order to have more efficient feedback by doing it faster and in some cases, doing it in real time (mobile interaction with smart phones, computer-assisted feedback, Electronic Feedback freeware, mobile synchronous learning). In the latter, students can make questions or suggestions and instructors can answer immediately by means of an automatic system or special algorithms.

3. Students' evolution over time.

The research into improvement in second language skills using the Skype Internet telephone service does not demonstrate higher levels of oral proficiency than those who participated in unstructured discussions; however, conclusions consider longer periods of time to meet goals.

Another study refers to the differences between boys and girls in the process of a computer game. During this activity, boys tended to be completely engaged several times, whilst girls

did this less frequently. The latter tended to make groups in which some of them only watched the game and they were barely engaged with it. In contrast, frequency and time in the game was longer with boys.

The technology involved in the research of technological learning resources in e-learning shows an enormous variety. It is difficult to point out a solid trend or uses related to the time treatment in the resource field. As an example, the following technology is used: Web 2.0 services and applications, blogs, wikis, Skype, audio blogging, podcasting, multimedia sharing, and the objectives are promoting learning, communication, interactive teaching and learning practices.

Other tools employed in the research were related to mobile technology (smart phones). They were mostly used for communication in real time, feedback and questioning, with the objectives of promoting interaction between students and instructors, enhancing motivation and improving the students' development.

As a final point, the rest of the studies are focused on classic technological tools such as Power Point slides posted in institutional websites and learning management systems, in which the main objective was to increase the student engagement and enhancing learning.

SOME CONCLUSIONS

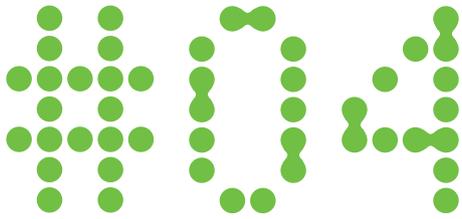
Overall the present study supports the perceptive idea of the importance of time in the e-learning field not only due to the number and diversity of research papers that include the temporal factor in some way but the place this supposed factor occupies. According to its exploratory aims, more than real conclusions, this study indicates several ascertains that opens new challenging questions that need to be corroborated in a larger scenario.

Some of these questions point to the validity of the decisions chosen in the research process. For example, aspects related to the unit of observation and analysis or aspects related to the type of methodology have been used for analysing an electronic teaching and learning process. In the first case, regarding the unit of analysis, it seems that it is put out of focus in the sense that the educational sequence that has been observed is a (formal)

course and this fact seems contradictory if the centre of attention is flexible itself or there are time advantages or other organizational conflicts related to time. So, is a course the best curricular format to select if we are interested in issues related to time or do we need to explore other formats to have new solutions? In the second case, considering the results and the fact that the methodology is mainly quantitative, another approach may be more suitable at times as the basic question is more qualitative because it needs a reasonable pass of time to be really developed. Surprisingly, research about time does not involve sequenced methodologies (episodes, behaviours,...) but punctual ones (questionnaires, surveys,...). Therefore, in this sense, no longitudinal research has been found to answer questions about the evolution of an educational fact or event through time.



Besides taking it for granted that the time factor is an unmet need and beyond the lack of time is accepted as an effective pretext in teaching, learning, designing, organizing and evaluating e-learning, more empirical evidence on the complexity of these limits and additional knowledge of their effects and solutions are needed.



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