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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.

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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 (in forums, chats, during feedback, grading, individual study time, etc.)	6	54,5%
B) Time perceptions (participants experience, i.e., Are asynchronous students more positive about their experience than synchronous students?)	4	36,4%
D) Time personalisation (rhythms, adaptive time, acceleration, etc.)	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)?
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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.