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Self-Efficacy in Computer-Based Learning Environments: A Bibliometric Analysis*

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Abstract

The objective of the present study is to describe and analyze the state of research on the self-efficacy construct and its association with learning in computational environments based on the review of articles published in journals during the period between 2006 and 2015. To conduct the study, the Science Direct, Scopus, and SciELO databases were used and a bibliometric analysis was performed. Eighty-one (81) published scientific texts from 31 journals were analyzed. Most academic productivity on the subject matter came from Asian countries. A predominance of correlational studies was found. A total of 62 questionnaires to evaluate participants' self-efficacy in domains associated with Information and Communications Technologies (ICT) were found. The self-efficacy subscale of the Motivated Strategies for Learning Questionnaire (MSLQ) is used the most by researchers. It is possible to conclude that self-efficacy is a predictor of students' successful performance in computational environments, which, in turn, influences other variables that allow better attitudes in learning. Self-efficacy has positioned itself as a current and interesting subject matter, which is why e-learning designers and educators must pay attention to the contributions derived from research in order to put them into practice.

Keywords

Self-Efficacy, Computer Aided Learning, Information Technologies, Internet, Bibliometrics

1. Introduction

In recent years, the study of self-efficacy, a psychological notion that is significantly related to students' learning in traditional and computational environments, has gained importance. In an ICT in education context, self-efficacy has become a varia-

*This article represents a contribution to the first author's doctoral thesis.

ble of interest since studies show that it is positively associated with: academic performance (López & Triana, 2013), learning strategy choice and its results (Moos & Azevedo, 2009), individuals' expectations and their emotional reaction (Bates & Khasawneh, 2007), learning goal formulation (López, Ibáñez, & Chiguasuque, 2014), and favorable behaviors and attitudes towards learning (Torkzadeh, Chang, & Demirhan, 2006).

The present study has the purpose of describing and analyzing the state of research of the self-efficacy construct and its association with learning in computational environments based on the elaboration of a bibliometric study. To that end, three databases were selected, the first two of academic prestige in Anglo-Saxon literature, Science Direct and Scopus, and the third, SciELO, is a free access database of academic prestige in Ibero-America, and their publications corresponding to the period between 2006 and 2015 were analyzed.

Among the study's purposes, are to seek a scientific production approach to the subject matter in question and contribute quantitative data on the state of the publications, describe and evaluate the scientific activity and its authors, identify the domains of knowledge that explore the variables object of study, the types of research and methodological approaches, the populations involved, types of digital technologies used, and the information gathering instruments that are most employed (Valencia, Huertas, & Baracaldo, 2014).

In accordance with the foregoing, the intent is to present quantitative and qualitative data that may be used as an investigative and/or practical point of reference, and that at the same time, allow orienting research studies in the ICT field, which permit a better understanding of this psychological notion and its relationship with the man-computer interaction within an educational process framework.

2. Literature Review

2.1. Self-Efficacy

The notion of self-efficacy is defined as the judgements that a subject makes on their own abilities to organize and execute courses of action necessary to achieve different objectives (Bandura, 1986, 1989). Many factors exist that determine human behavior; Bandura (1997) identifies self-efficacy as an important mechanism that influences both individuals' performance in task execution and cognitive processing. In accordance with the foregoing, it is possible to assert that the mental construction that individuals make of their own self-efficacy has a variety of distinctive characteristics. These are important because they allow distinguishing it from other psychological notions; additionally, these include implication on how self-efficacy should be measured.

In the first place, self-efficacy has specific attributes through activities and contexts, which are: level, generality, and strength. Level refers to the difficulty of one task in particular, generality refers to the transference of the beliefs of self-efficacy of one task to another, and strength is determined by the amount of certainty that the individual has to successfully complete a determined task (Bandura, 1989). In the second place,

self-efficacy beliefs are not a unique disposition, they are multidimensional in form and differ on the level of the task or domain (Schunk, 1991). In the third place, regarding content, self-efficacy measures are focused on subjects' performance or abilities more than on personal qualities, such as physical development or psychological characteristics (Bandura, 1986).

Bandura posits the existence of four main sources of information that determine individuals' self-efficacy: domain experiences, vicarious experiences, verbal persuasion and social influence, and physiological states (Bandura, 1986: p. 424). Of the four sources, domain experiences are the most effective way of creating a strong sense of self-efficacy (Bandura, 1997). These refer to the interpretations that individuals make of their past actions and they contribute the most authentic proof of the abilities possessed to successfully achieve the development of a learning task (Usher & Pajares, 2009). The second source of self-efficacy are vicarious experiences or indirect experiences. "Viewing or imagining that other similar individuals act successfully, possibly increases the observer's self-perception of self-efficacy, coming to believe that they themselves also possess the abilities" (Bandura, 1986: p. 425). Indirect experiences are not as strong as domain experiences, however, these can produce significant and lasting changes in self-efficacy through their effect on performance (Bandura, 1986).

Verbal persuasion and social influence is the third source of self-efficacy. It is used to induce individuals into believing that they are capable of reaching the objective laid out. Individuals that are convinced verbally by others that they possess the ability to carry out the tasks are susceptible of mobilizing a greater effort and maintaining it when faced with difficulties (Schunk, 1991). The last source of self-efficacy are the physiological states. Levels of moderate physiological activation (sweating, agitation, fatigue, etc.) will facilitate the deployment of abilities, while an elevated activation will influence the levels of self-efficacy.

2.2. Self-Efficacy in Computational Environments

In recent decades, an important number of studies have developed around self-efficacy in the field of ICT and education. In fact, diverse research has examined this notion from different perspectives according to Bandura (1997), who asserts that self-efficacy beliefs can be specified in the level of the task or domain. In accordance with this, and before presenting the results of the bibliometric study, it is convenient to identify the different fields of study of self-efficacy in association with ICT as a domain, which are found in the research that are analyzed in the present study.

The first field of study, academic self-efficacy, has been the object of study during the execution of learning tasks in computational scenarios (Jan, 2015). It refers to students' perception of their ability to complete academic tasks in these scenarios (Girasoli & Hannafin, 2008). Research reveal that students with high academic self-efficacy participate more actively in educational activities, make more of an effort, and can develop effective strategies when obstacles arise (Odaci, 2013). It is noteworthy to mention that the factors that influence individuals' AS derive from both the computational learning

environment and the topic of study (Moos & Azevedo, 2008).

The second field of study, computer self-efficacy, arises during the 90s with the boom of computers in educational contexts. It is defined as individuals' general beliefs about their abilites to use computers competently through multiple domains (Hasan, 2006). For Torkzadeh, Chang, & Demirhan (2006), computer self-efficacy plays an important role in an individual's decision to use a computer and its resources and, therefore, in the disposition to learn other knowledge related to the use of this device.

Computer self-efficacy and students' performance has also been object of study. For example, Compeau & Higgins (1995) assert that computer self-efficacy exercises significant effects on result expectations and performance in computational scenarios. Peinado & Ramírez (2014) found that students with a high level of computer self-efficacy exhibit better attitudes and academic achievements than their peers with a low or medium level of computer self-efficacy. According to the foregoing and to the findings of Moos & Azevedo (2009), behavioral and psychological factors have a positive relationship with computer self-efficacy, which, in turn, positively influences students' learning results in computational environments.

The third field of study, referred to as the field of interest, is self-efficacy in internet-based learning environments. Is defined as the judgements that students make about their ability to organize and execute activities related to the Internet in order to produce the desired results (Eastin & LaRose, 2000). More recently, Cheng & Tsai (2011) redefine it as students' expectations and confidence to participate and learn in Web-based environments. Diverse studies assert that the increase in levels of self-efficacy in internet-based learning environments can lead to the development of better cognitive and metacognitive abilites for information searches in a Web-based environment and, in turn, promote students' learning (Tzeng, 2009).

Research into self-efficacy in internet-based learning environments has been more prominent than in the foregoing postulates. In this regard, Tsai et al. (2011) asserts that IS has been linked to: learning processes (Lu et al., 2007), learning results (Chu & Tsai, 2009), anxiety (Ekizoglu & Ozcinar, 2010), results expectations (Bates & Khasawneh, 2007), and information searches (Chiou & Wan, 2007), among others.

Based on the foregoing, it is possible to assert that in the research into the role that individuals' self-efficacy plays when they interact with computational learning environments, this has been researched significantly in recent decades (Tsai et al., 2011). A practical evolution of the concept can be observed, which has allowed researchers to effectively link it as a variable object of study, which, in turn, derived into the establishment of didactic strategies for the design of computational scenarios that take into account students' motivational dimension (López, Hederich, & Camargo, 2012). Consequently, the present study has gathered and studied 81 research articles published between 2006 and 2015, derived from the fields of study already described, and it performs a bibliometric analysis of the literature in question.

3. Methodology

With the purpose of obtaining a scientific production approach to the subject matter of

self-efficacy and its association with learning in computational environments, a bibliometric study is conducted with descriptive type techniques.

To that end, three databases were chosen, the first two of an international nature, Science Direct and Scopus, and the third of a regional nature and free to access, SciELO. Subsequently, a set of search words was determined in order to obtain a more precise and representative sample of the published papers. The expressions used were "self-efficacy", "computer", "computer-based learning", "academic self-efficacy", and "Internet-based learning" for the Science Direct and Scopus databases, and the expressions "*autoeficacia* [self-efficacy]", "*autoeficacia académica* [academic self-efficacy]", "*aprendizaje en línea* [onlined learning]", "*enseñanza asistida por computador* [computer-aided learning]", "*educación a distancia* [distance learning]", and "Internet", for SciELO. These expressions were established for the fields of: Title, abstract, and keywords, using as a connector the logic operator "AND". The search was limited to publication dates between the years 2006 and 2015. Additionally, the search was filtered by refereed and published; books, conference papers, dissertations, and other type of documents were not taken into account.

The bibliographical data report was imported into an Excel file. This was debugged by eliminating publication entries repeated two or more times, preferably opting for information obtained from Science Direct, given that the complete texts in PDF files can be found with high-frequency in this database. To obtain the number of citations of each publication, the Google Scholar site was visited. Additionally, the impact factor of the journals where the articles were published were examined. To that end, SCI-mago[1] information was used to identify the publications metrics based on the SCIMAGO Journal Rank (SJR)[2]. The resulting data matrix considered the fields: article title, publication year, authors, journal name, abstract, keywords, country where the study was conducted, number of citations reported in Google Scholar, participants' identification by level of education and number, research approach, methodological design and type of data, instruments, chosen knowledge area of the study, type of computational scenario used, and references according to American Psychological Association (APA) style.

4. Bibliometric Study Results

The initial results showed a total of 142 publications, which were reviewed to establish their relevance and identify duplicate entries. A total of 81 papers that systematically study the subject matter of self-efficacy and its association with learning in computational environments were confirmed. Of this set of articles, 53 were obtained from Science Direct, 19 from Scopus, and 9 from SciELO.

4.1. General Aspects

Regarding the origin of the scientific papers, it was found that they proceed from 19 countries. In terms of production by country (**Figure 1**), the countries that stand out

[1]Accessed on 03/16/2016 retreieved from http://www.scimagojr.com/index.php

[2]SCImago Journal Ranking (SJR indicator) is a measurements of the scientific influence of the specialized journals.

for exhibiting greater research and productivity in the subject matter are Taiwan, with 23 papers; United States, with 17, and Turkey, with 11. These papers, as a whole, represent 63% of total papers. Asian countries contribute 49% of the research in the area of interest, followed by North America, with 21%; Europe, with 20%, and, finally, South America, with 10%.

In relation to the contexts within which the studies are conducted and participants' levels of education, higher education stands out as the context within which the subject matter is studied the most. In Figure 2, a representation of the situation is shown. Indeed, of the 81 articles found, 48 (62%) refer to applications in universities. With much smaller shares, there are applications in secondary and middle education 12 (15%), basic primary education 8 (10%), distance education through Internet 7 (9%), and adult education 3 (4%) in informal contexts. It is noteworthy to mention that these values do not take into account 3 studies of a documentary nature.

Figure 1. Country of origin of research.

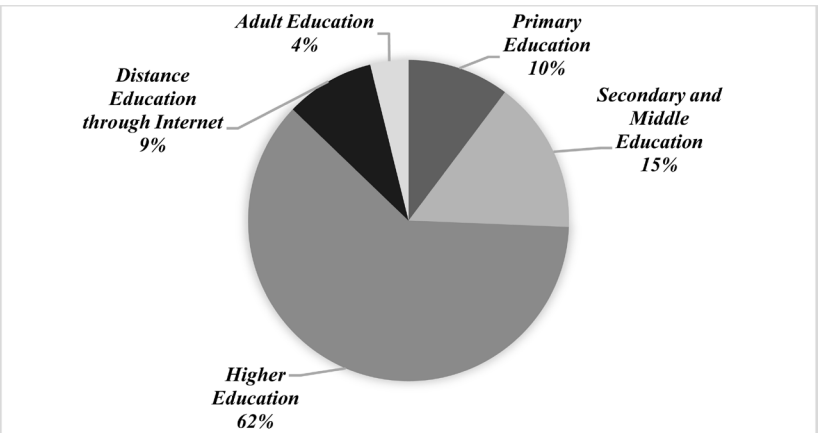

Figure 2. Levels of education.

Figure 3 shows the distribution of participants only in the context of higher education by discipline. As it can be observed, participants that come from higher education programs that educate educators represent 38% of the population in this context and, in turn, these represent 22% of the total of studies on the subject matter. There are also participants from nursing and medicine programs (11%), engineering (8%), and psychology (8%). It is noteworthy to mention that 18% of the participants come from diverse disciplines, such as social sciences, humanities, and architecture among others.

On the other hand, Figure 4 shows the types of computational environments that researchers use to develop the studies, which are the scenarios with which participants interact. E-learning environments are the most used: courses embedded in Learning Management System (LMS) platforms, mainly Moodle and Blackboard. These are followed by the Internet and to a lesser degree, hypermedia environments.

Figure 5 shows the domains of knowledge that frame the development of research activities, according to the evidence gathered. As it can be observed, the field where most publications converge is Computer Science, with 63% (digital literacy, Internet,

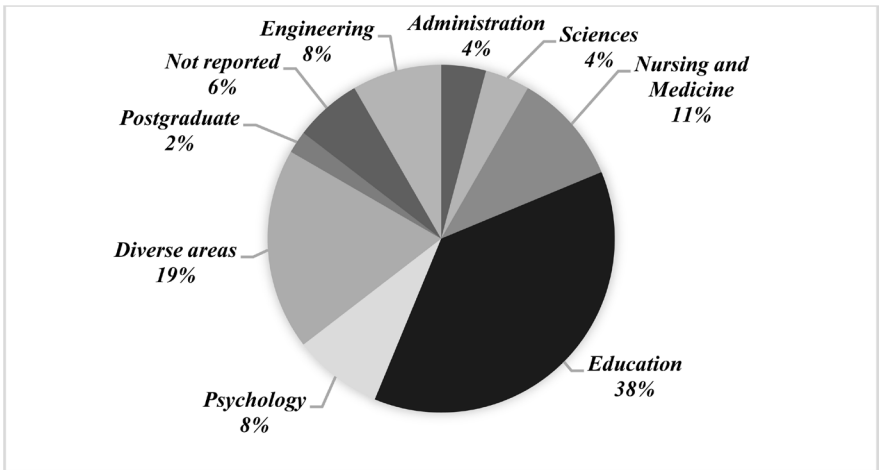

Figure 3. Distribution of higher education participants.

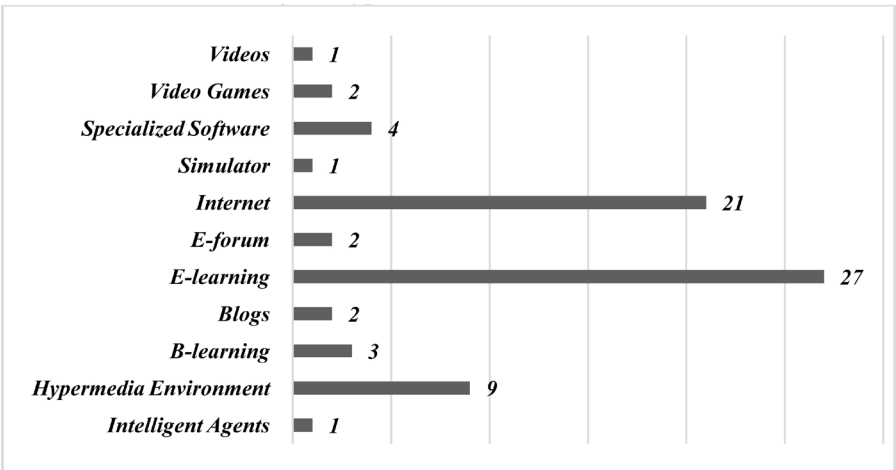

Figure 4. Types of computational environments.

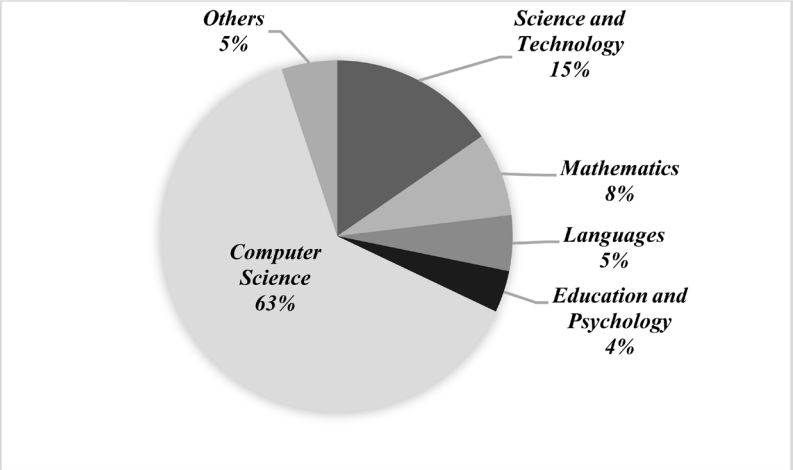

Figure 5. Knowledge areas of study.

Table 1. Production per year in social sciences and humanities journals.

Year	Number of Articles
2006	7
2007	5
2008	7
2009	5
2010	13
2011	10
2012	6
2013	10
2014	8
2015	10

hardware, and software), followed by Science and Technology (15%), and to a lesser extent Mathematics (8%), Languages (5%) and Education and Psychology (4%).

4.2. Bibliographical Aspects

Table 1 shows the number of publications found in this review by year of publication. The year 2010 is the period with the most publications on the subject matter with a total of 13 articles, followed by the years 2011, 2013, and 2015, each one with 10 articles. In contrast, the years 2007 and 2009 have the lowest number of publications: 5 articles per year. An important increase can be observed in the number of publications starting from the year 2010 and up to the year 2015, this period represents 70% of total papers. An increase can be observed in the number of publications in the last five years as a result of the heightened academic interest in the subject matter of self-efficacy associated with the use of a computer.

Articles on the subject matter located in this study have been published in a total of 31 refereed scientific journals. Table 2 shows the list of the journals' names, the amount

Table 2. Included journals that have published on self-efficacy associated with the use of a computer in learning situations.

Journal Name/Country	Number of publications	Indexing	Impact Factor-SJR (2014)
Acta Colombiana de Psicología (Colombia)	1	A1	0.13
American Journal of Distance Education (United Kingdom)	2	A2	0.34
Children and Youth Services Review (United Kingdom)	1	A1	0.77
Computers and Education (United Kingdom)	27	A1	2.58
Computers in Human Behavior (United Kingdom)	11	A1	1.58
Contemporary Educational Psychology (United States)	1	A1	1.99
Educational Technology and Society (United States)	3	A1	0.92
Evaluation and Program Planning (United Kingdom)	1	A2	0.47
International Journal of Human Computer Studies (United States)	1	A2	0.9
Interactive Learning Environments (United Kingdom)	1	A1	0.99
Internet and Higher Education (Netherlands)	2	A1	2.52
Investigación y Postgrado (Venezuela)	1	C	-----
Journal of Computer Assisted Learning (United Kingdom)	2	A1	2.05
Journal of Information Technology Education: Research (United States)	1	A2	0.74
Nurse Education Today (United Kingdom)	2	A1	0.73
Pensamiento Psicológico (Colombia)	1	A1	-----
Procedia-Social and Behavioral Sciences (Netherlands)	7	-----	0.16
Psicología desde el caribe (Colombia)	1	A1	-----
Teaching and Teacher Education (United Kingdom)	1	A1	1.77
Transportation Research Part F (United Kingdom)	1	A1	0.98
Journal of Academic Librarianship (Netherlands)	1	A1	0.73
Universitas Psychologica (Colombia)	1	A1	0.26
Educación Química (Mexico)	1	A1	0.21
Revista Psicologia: Organizações e Trabalho (Brazil)	1	C	-----
Revista Brasileira de Orientacao Profissional (Brazil)	1	A2	0.21
Revista Colombiana de Educación (Colombia)	1	A2	-----
TOJET: The Turkish Online Journal of Educational Technology (Turkey)	2	B	0.49
Electronic Library (United Kingdom)	1	A1	0.62
Information & Management (Netherlands)	2	A1	1.18
Journal of Educational Computing Research (United States)	1	A1	0.87
Cyberpsychology, Behavior, and Social Networking (United States)	1	C	1.65

of articles published on the subject matter during the period of observation, indexing type according to the 2015 Colombian National System of Indexing and Official Approval of Specialized Journals of Science, Technology, and Innovation (PUBLINDEX) and the impact factor. Among the journals that stand out are two from the United Kingdom, *Computers & Education*, with 27 publications on the subject matter, and *Computers in Human Behavior*, with 11 publications. These journals are the basis of the high productivity in the field of the present study. The rest of the journals have between 1 and 3 publications, with the exception of *Procedia-Social and Behavioral Sciences*, which has 7 publications.

Table 3 shows the relationship between the number of articles and the number of citations per year. A total of 3317 citations were found during the period of observation, of which 2744 citations correspond to the set of publications yielded by the Science Direct database, 532 correspond to Scopus, and 9 to SciELO. The year 2006 is the period with the largest number of citations, with 744 citations in 7 articles; followed by the year 2010, with 587 citations, and the year 2008, with 554 citations. The year 2015 had the lowest number of citations.

Figure 6 shows the indexes of references per year. This bibliometric indicator is obtained based on the quotient between the number of references and the number of published articles per year. It is an indicator of the use of scientific literature for a specific period of time. As can be observed, the index of references peaked in the year 2006, with a value of 106.3, followed by the year 2007, with 90.6, and the year 2008, with 79.1. These values are consistent with the time that the articles have been in circulation and available to the academic community.

The number of citations received by each article was obtained through Google Scholar. The range is between 0 and 175 citations. The most cited articles are "The relationship of e-Learner's self-regulatory efficacy and perception of e-Learning environmental quality" by Lee and Lee (2008), with 175 citations; "Computer use and the gender gap: The issue of access, use, motivation, and performance" by Imhof, Vollmeyer, & Beierlein (2007), with 169 citations; and "University Students' Internet Attitudes and

Table 3. Number of citations per year.

Year	Number of articles	Number of citations
2006	7	744
2007	5	453
2008	7	554
2009	5	260
2010	13	587
2011	10	358
2012	6	173
2013	10	107
2014	8	76
2015	10	5

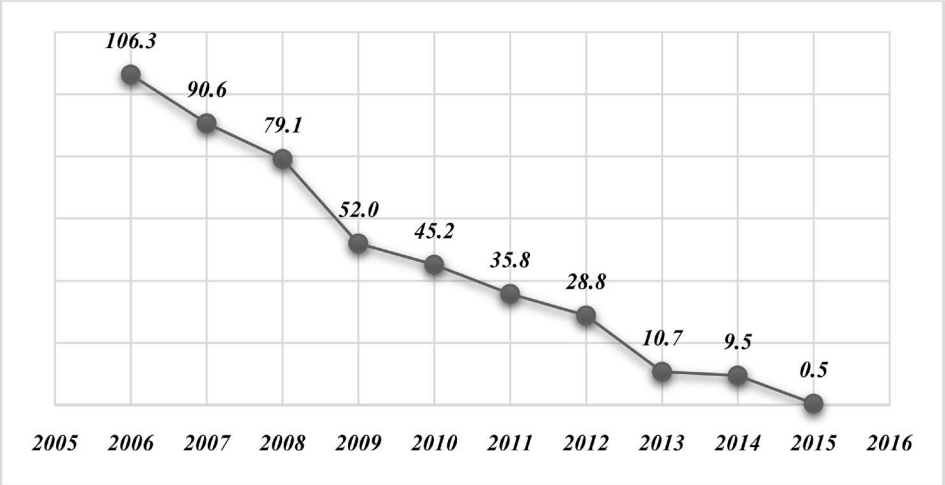

Figure 6. Index of references.

Internet Self-Efficacy: A Study at Three Universities in Taiwan" by Wu & Tsai (2006), with 159 citations, during the 2006-2015 period.

4.3. Author Characterization

In the 81 studies analyzed in this review, 194 authors were identified. **Table 4** shows the relationship between widely published authors in the subject matter and the number of articles in which they have participated, whether in an author or coauthor condition. Sixteen authors have participated in two publications; two authors participated in three publications; one author participated in four publications; and one author participated in eleven publications. As can be observed in **Table 4**, Dr. Chin-Chung Tsai, professor at the Graduate Institute of Digital Learning and Education of the National Taiwan University of Science and Technology, is the most cited author, with 11 publications on the subject matter.

Similarly, **Table 5** shows the coauthorship index or signatories/article per period. This Bibliometric indicator refers to the quotient between the total number of signatories (authors) and the number of published articles per year. As can be observed, the authors' mean oscillates between 2.0 authors, corresponding to the years 2009 and 2012, and 2.8 authors, in the years 2007 and 2013.

Research Methods

With respect to research methods, **Table 6** shows those identified. Correlational type studies are predominant, with a frequency of 51 studies (63%), followed by studies of an experimental nature, with a frequency of 14 studies (17%), and quasi-experimental nature, with 7 studies (9%); all of these with a quantitive approach. Descriptive and documentary type studies are used to a lesser extent, each one with three studies, and the exploratory type studies and case study, each one with one study. These results are similar to those reported by Tsai et al., (2011), who in a literature review study during the period between 1999 and 2009 found, in the set of studies analyzed (46 in total), that research with a quantitive and correlational approach prevails.

Table 4. Authors of publications on the subject matter.

Author	Number of Articles
Chin-Chung Tsai	11
Omar López-Vargas	4
Geraldine Clarebout	3
Jyh-Chong Liang	3
Chia-Pin Kao	2
Ching-Chin Chern	2
Donata Francescato	2
Hatice Odacı	2
Houn-Gee Chen	2
Jan Elen	2
Jiun-Yu Wu	2
Li-Yueh Chen	2
Marina Papastergiou	2
Norma A. Juarez-Collazo	2
Regina Juchun Chu	2
Rita Porcelli	2
Shih-Chyueh Chuang	2
Ying-Tien Wu	2
Yu-Chun Kuo	2
Anastasia Kitsantas	2

Table 5. Coauthorship index per year.

Year	Coauthorship Index
2006	2.6
2007	2.8
2008	2.4
2009	2.0
2010	2.2
2011	2.7
2012	2.0
2013	2.8
2014	2.5
2015	2.0

Table 6. Research methods employed.

Method Employed	Number of Publications
Quasi-experiment	7
Correlational Study	51
Case Study	1
Descriptive Study	3
Documentary Study	3
Exploratory Study	2
Experiment	14

Table 7. Instruments with the highest frequency of use in the studies.

Instrument Name and Author(s)	Number of Uses
CSES (Compeau & Higgins, 1995)	4
ISES (Tsai & Tsai, 2003)	9
Internet Self-efficacy Scale (Joo, Bong, & Choi, 2000)	2
Educational Internet Use Self-efficacy Beliefs Scale (Sahin, 2009)	2
Escala de Autoeficacia-Internet (Torkzadeh & Van Dyke, 2001)	2
Escala Autoeficacia-Internet (Eastin & LaRose, 2000)	2
Self-efficacy Subscale of MSLQ (Pintrich, et al. 1991)	14
Academic Self-efficacy Scale (Jerusalén & Schwarzer, 1981)	3

4.4. Use of Instruments

In regard to the instruments used in the studies, a significant and important number of scales and questionnaires were found, which are used and elaborated by the authors themselves; in some cases, as information gathering sources. A total of 62 questionnaires to measure self-efficacy were counted, which are characterized for being self-reporting, Likert-type scale, whose purpose is to evaluate participants' perception with respect to their self-efficacy in different domains. Among the latter, those mainly associated with self-efficacy with the use of a computer, with the use of Internet and Web or online learning environments, and academic self-efficacy, were identified.

Table 7 shows the most frequently used instruments in the studies considered. Those that stand out because of their use in research are: the Self-efficacy subscale of the MSLQ (Pintrich, Smith, Garcia, & McKeachie, 1991), which is used in 14 studies, followed by the Internet Self-efficacy Scale (ISES) and the Web-based Learning Self-Efficacy Scale (WBLSES) (Tsai & Tsai, 2003), used in 9 studies, and the Computer Self-efficacy Scale (CSES) (Compeau & Higgins, 1995), used in 4 studies.

5. Discussion and Conclusion

The bibliometric study of the published articles on the role of individuals' self-efficacy

when they interact in computational environments in refereed journals and extracted from the Science Direct, Scopus, and SciELO databases, period 2006-2015, allows evidencing some charactersitics of the research developed globally in this field: its diverse position, methodologically plural, supported in the design and use of different instruments to evaluate self-efficacy, and strongly based on the theoretical constructs elaborated by Bandura (1986, 1997). In addition to this study's quantitative results already presented, it was possible to discern qualitative trends, which need to be mentioned in this section.

In the first place, the interest of the subject matter has aroused in other geographical lattitudes is noteworthy. Tsai, Chuang, Liang & Tsai (2011), in the results of their literature review study, discussed the lack of papers originating in Europe; additionally, no result is reported as proceeding from South America. In contrast, the findings indicate that these data have changed during the last five years: even though Asian countries continue leading the scientific production, the progress made by European and South American countries, which together reported 30% of total papers analyzed in the present study, is noticeable.

In the second place, a discernable trend is the development of studies with higher education students. Of the 81 analyzed articles, 48 studies were identified as having been developed within universities. The samples' demographic characteristics reveal that university students turn out to be the preferred subjects for these studies. Additionally, it was possible to recognize a favorable trend, in recent years, to mobilize this type of papers towards initial levels of education, such as basic and middle education, which accounted for 20 studies, of which eight were conducted in basic primary education (Aesaert & Van Braak, 2014; Barak, Ashkar, & Dori, 2011; Kao & Tsai, 2009; Kao, Wu, & Tsai, 2011; López, Sanabria, & Sanabria, 2014; López & Triana, 2013; Meluso, Zheng, Spires, & Lester, 2012; Shank & Cotten, 2014).

In this regard, a growing interest to analyze the subject matter in students enrolled in Education or Bachelor's programs in higher education was observed. An important group of publications refers to papers conducted in this context. With respect to the latter, research was found that inquires into the beliefs of self-efficacy of pre-service teachers associated with: the use of a computer (Bustos, 2012; Ekizoglu & Ozcinar, 2010), the use of Internet (Ekizoglu & Ozcinar, 2010; Gürol & Akti, 2010; Kaya & Durmus, 2010; Liang & Tsai, 2008; Sirakaya, Başarmak, & Baltaci, 2015), learning in Web environments (Kao & Tsai, 2009; Kao et al., 2011; Liang & Tsai, 2008), and ICT teaching (Bustos, 2012), for which a specific instrument was used (Wang, 2004).

In the third place, the finding of a great diversity of instruments (questionnaires-scales) used to measure participants' self-efficacy. As shown in **Table 7**, researchers tend to use reliable and valid instruments in different contexts. Noteworthy, among these, are the scales elaborated by Compeau & Higgins, 1995; Pintrich et al., 1991; and Tsai & Tsai, 2003. The former was designed to measure self-efficacy in the use of a computer, the second to measure academic self-efficacy, and the latter to measure self-efficacy in the use of Internet and learning Web environments. Results evidenced

that these scales are translated and adjusted to contexts where they are applicable and validated for their subsequent use.

The fourth aspect worth mentioning refers to the research methods. The results evidenced a large part of the studies to be of a correlational nature and that use self-reporting surveys and questionnaires as a predominant source of information gathering. These methods are oriented towards identifying what the behavior or what the degree of relationship of the self-efficacy variable is with respect to other educational variables in the same population group. The manner to do this, generally, is through descriptive and correlational studies, which are supported on the application of different statistical tests to approve or reject the proposed hypotheses.

Following this type of studies are the experimental and quasi-experimental studies of a quantitative approach that, in contrast to the foregoing, are characterized by the creation of population groups, whether randomly or previously established, as the case may be. The objective of this type of studies, in most cases, is to verify the effect of the implementation of pedagogical strategies and/or computational scaffolding on other variables involved in educational processes (López, Sanabria et al., 2014; López & Triana, 2013; López & Valencia, 2012; Moos & Azevedo, 2008; Papastergiou, Gerodimos, & Antoniou, 2011; Plant, Baylor, Doerr, & Rosenberg-Kima, 2009; Schuyten & Dekeyser, 2007; Sins, van Joolingen, Savelsbergh, & van Hout-Wolters, 2008).

Finally, another finding worth emphasizing refers to the type of digital technologies that are used in the studies. As presented in **Figure 4**, e-learning technologies are the basis for the research and are used to validate an important number of papers related to the subject matter. It is important to highlight the implementation of LMS platforms like Moodle and Blackboard, which currently drive most of the virtual education and distance education programs. The research conducted by Chen & Tseng, (2012); Lee & Lee (2008), and Tang & Tseng (2013) stand out, whose findings indicate the importance of individuals' self-efficacy for successful performance in these educational environments, which in turn, influences other factors that enable better attitudes in students' learning. Hence, self-efficacy constitutes itself as a current topic of interest, which e-learning designers and educators need to take into account in order to put into practice the contributions derived from the research.

Thus, in this spectrum of publications, it is feasible to establish which studies allow gathering sufficient evidence to confront the different theoretical approaches and that may be put into practice, in such a way that teachers and researchers can depend on empirical data that promote the efficient design and development of scenarios and computational scaffolding that contribute to students' cognitive, behavioral, and motivational components and, consequently, to the achievement of better academic performances.

6. Limitations and Forecasts

Open to the possibility of having the present study's findings confirmed when extending the analysis towards a broader framework that covers papers published in other in-

ternational databases, such as Web of Science, EBSCO host Research Data, or ERIC, among others. Additionally, it is important to keep in mind that this study focused exclusively on journal publications in the Social Sciences and Humanities areas.

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