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Identification and research groups study in Learning, Teaching and Education Leadership

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Abstract

Bibliometrical indicators, based on the statistical analysis of quantitative data from scientific literature, are an essential tool in studying the acitivities of current researchers. In recent years, the use of bibliometrical indicators as a complement to other scientific indicators to analyse the research situation of a country, its evolution in time and its position in the international context, has been extended. The objective of this study is to analyse scientific productivity in Learning, Teaching and Education Leadership throughout communications presented at the World Conference on Learning, Teaching and Education Leadership (WCLTA), and which were included in the database Web of Science (WoS). The process includes three basic phases: recovery, download and normalization of the bibliographical data to study; construction of a file with the authors' productivity; and group delimitation by means of co-authorship frequencies. The last phase of this process consists of the characterization of the process through bibliometrical indicators: size of the group, production, productivity, collaboration rates and thematic specialization. A total of 1,115 works, signed by a total of 2,619 authors, compose the sample. The data indicates that the proportionate average of signatures by authors per work is 2.35%. A total of 27% of the works have been signed by a single author, while 73% have been done by 2 or more authors. Works of co-authorship range from 404 works with two authors per work, up to a work signed by 16 authors. Out of all the works analysed only 17.13% (191) have been cited, and 82.87% (924) have never been cited. Nevertheless, no significant differences have been observed in the number of works signed or signing institutions and the number of citations received by the works. While analysing the authors' geographical provenance, it is observed that the greater number of contributions come from Turkey, Iran, Malaysia, Romania, Spain, Italy and the Czech Republic.

Keywords: Learning, Productivity, Research Groups, Teaching and Education Leadership, Web of Science

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1. Introduction

Among the most common methods used to evaluate different aspects of research activity we must highlight the fundamental role of bibliometrical analysis in scientific production, which adds to the traditional input indicators as the total number of researchers, research and development resources, or the number of items of equipment available. Bibliometrical studies are considered interesting for the analysis of the mainly quantitative aspects of scientific activity, as well as for the study of their temporary usage and evolution, which allows an objective approximation to the complex and multi-faced reality of research.

Bibliometrical indicators, based on the analysis of quantitative data in scientific literature, nowadays constitute an essential tool for the study of a research activity (López, 1972). The interest in these types of studies resides in that they allow a general vision of the scientific activity of a country, centre or area to be obtained, to realize comparisons and to follow-up through time. Among the plaintiffs of these analyses are researchers wishing to understand a "map" of scientific activity done in their area, but also political managers of science who base their decisions on the information extracted from these objective data (Zulueta et al., 1999).

Nevertheless, we should not forget that bibliometric indicators present some limitations that we must be aware of when them (López Piñero y Terrada, 1992; Camí, 1997; Osca-Lluch et al., 2003; Alfonso et al., 2005). For instance, the quantity of knowledge cannot be measured as the channels and habitual systems of formal communication have not yet published it. Besides, many of the results of applied research, and for the vast majority of experimental development, are not published in scientific journals, but in other types of documents such as patents and technical reports.

Bibliometry, understood as the combination of methods used in the study or measurement of texts and information, establishes the co-authorship of scientific documents as a quantifiable manifestation of the collaboration between researchers, institutions and countries. By analysing the bibliographical elements of co-authorship in scientific articles (composed by names and institutional affiliations), we identify networks of scientific collaboration at very different levels: local, regional or international (Russell et al., 2009). It also allows us to establish meaningful indicators based on influence structures, at least as perceived by the authors themselves (Molina et al., 2002).

Scientific collaboration between authors and institutions is a differentiated trait of current research, which has witnessed an enormous increase in recent decades, reaching a point where research groups have become the minimum unit of a research system in many areas. Increasingly frequently, research works are signed by a greater number of authors and institutions. This, which until relatively recently was restricted to the Exact Sciences, Experimental Sciences and Engineering, is extending, although with less intensity, to the Social Sciences and Humanities.

In the analysis of research communities it is potentiated and studied into depth the collaboration between scientists from the same country or different ones, when we observe the beneficial effects in multiple aspects of their scientific activity, from scientists' formation to the visibility of their results (Russell et al., 2006, 2007). The structure of research groups is related to their origin and evolution. From those originated with a consolidated researcher and a conjunction of researchers in training; the ones originated by consolidated researchers associated in order to work a common research path. In these cases, group composition is related to the researchers' mobility culture (Rey-Rocha, Martin-Sempere and Sebastian, 2008). It is undeniable that the actual work practices and strategy of scientists have changed over the last ten or twenty years. This fact is reflected in the increasing number of collaborative works done by authors from different latitudes or development and research centres.

In literature related to this topic, the increase of scientific collaboration is explained by diverse reasons, including the necessity to have access to highly technical equipment, for research to make much more efficient use of financial resources, and even an interest in collaborating with named specialists (Russell et al., 2006).

In recent years, the method of application and the study of different social networks has changed from a tool used exclusively by a reduced nucleus of specialists in social science studies (López, 1972), to an instrument used more often by documentation specialists who may apply complementary network analysis to bibliometrical techniques to study scientific production in co-authorship ambits, to the collaboration of authors, institutions and citation guidelines (Molina, 2001; Molina et al., 2002; Delgado et al., 2006; Osca-Lluch, 2010, 2012). Different studies about co-authorship or scientific collaboration coincide in affirming that Medical and Experimental Sciences, as well as some disciplines that are integrated in social sciences, such as Psychology or Economics, manifest the highest percentage of collaborative works. According to a study about scientific collaboration in Spanish universities, six out of ten published articles were written collaboratively, and three out of ten rely on international collaborators (Olmeda-Goméz et al., 2009).

Currently, the quantification of scientific collaboration is based fundamentally on the usage of bibliometric indicators and the analysis of scientific networks that generates co-publication of scientific work done by investigators (Crane, 1972; Price, 1965; Newman, 2004). The co-authorship of works published between researchers provides useful information about the collaboration structures in the scientific community. These constitute "collaboration-networks", in which the nodes represent authors who are connected by a line if they have signed one or more works together. From the collaboration between authors and institutions emerges a relational-structure that may allow us to understand, manage and predict the results of scientific production generated by groups of co-authors. The analysis of social networks analyses the way in which individuals or organizations connect themselves; it defines the position they occupy in the network, their groups and global structure, flows of knowledge and information, and the relationships of reciprocal influence. One of the distinctive characteristics of science since the 20th century is that it produced a jump from work by individual scientists to work in a research group framework (Etzowitz, 1992). Since science is a collective labour, done mainly by research groups in most disciplines, it is mandatory to pay attention to the relationships established at this level.

The objective of this paper is to establish patterns of international scientific collaboration, and the visibility that co-authorship generates in works about Learning, Teaching and Education Leadership collected in the Social Science Citation Index (SSCI) database during the period 2010-2014.

2. Material and methods

The bibliographical research was done using the Social Science Citation Index (SSCI) and Science Citation Index (SCI) databases, from the platform Web of Science (WoS), produced by Thomson Reuters. Research was done in the field "Congress", and the strategy followed was "Learning teaching and education leadership" or "WCLTA". These databases were accessed through the platform WoS on June 17th, 2015.

For every work gathered, the following variables were registered: publication year, title, authors, institutional affiliation, congress data, language, thematic category and number of citations received. In each of the research strategy phases, the registers obtained and selected were included in a unique relational database, with the aim to facilitate the treatment and normalization of the different variants of the authors' denominations. The criteria that followed the normalization of two or more variables in persons of the same name, was to check the coincidence in the working places. Institutions' websites were also visited to resolve possible doubts.

After normalization of the list of authors, we proceeded to obtain different indicators of productivity and collaboration. Active research groups that habitually worked collaboratively during the study period were identified**.** The global characterization of authors' collaboration was determined from the collaboration index or co-authorships, and this identified the number of works signed in collaboration. By identifying the main collaborative relationships we built different networks or visual representations of authors' collaborations. The networks and graphical representations were done

using the Pajek and Ucinet programs. The size of the nodes represents the weight each author has in the network, and the thickness of the lines indicates the intensity of the relationship. For a better visualization of the authors' network structure, only authors who have done the most collaborative works have been represented since a network with an excessive amount of nodes and relationships presents serious difficulties of interpretation.

The scientific production of each author and authors' collaboration is analysed and measured throughout the signature index (average of the number of signatures per article). To obtain the indicators we have used a total re-count system, assigning the same value to each of the authors who participated in the article.

For each single elected work we identified the total number of authors and proceeded to unify the different variables of their co-authorship, with the aim to obtain information about the scientific productivity done by each of them. From the signed works of several authors we located the collaboration indexes and identified the research groups. The co-authorship of works published in journals provides useful information about collaboration structures in the scientific community that configure collaborative networks. In these networks, nodes represent authors, and the vincule between them, the co-authorships. Two authors are connected if together they have signed one or two articles. The structure of these networks reveals important characteristics of a determined scientific community. The bibliometrical indicators, as well as social network analysis applied to the analysis of scientific publishing collaboration, allow us to identify the main groups and working networks that are generating active scientific production in a specific knowledge area, beyond formal existing cooperative structures, which possibly characterizes the scientific activity.

Understanding the methodology used requires the assumption of a certain series of basic premises: research groups are defined in terms of co-authorship; this means authors who sign an important percentage of their production together, but it does not necessarily correspond to a determined administrative or institutional structure. Collaboration networks were built based upon the most productive authors in the period and area studied, but this does not necessarily mean that they coincide with the real group leader.

3. Results

The total number of works presented to the World Conference on Learning, Teaching & Educational Leadership (WCLTA) that were included in the databases of the ISI Web of Science (WoS) until June 2014, was 1115. The number of works presented at the different WCLTA congresses, and which are included in the WoS databases varies a great deal (see figure 1). The greatest number of works included in the WoS databases was presented during the 3rd World Conference on Learning, Teaching and Educational Leadership (WCLTA) celebrated in Brussels (Belgium), published in year 2013 (373 works). The second largest number of works included in the databases was presented in 2010 at the 1st World Conference on Learning, Teaching and Administration (WCLTA) in Cairo (Egypt) with 345 works. And in third position, with 231 works presented, is the 4th World Conference on Learning, Teaching and Educational Leadership (WCLTA) celebrated in Barcelona (Spain).

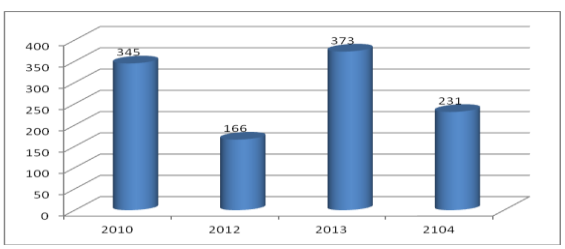

Figure 1. Evolution of the number of works presented at WCLTA per publishing year.

3.1. The authors

To determine the characteristics of work authorship, it is convenient to know the total number of authors who have published works, the number of works that each author has published, and the distribution of number of authors per work.

In this case, the 1,115 works presented during different WCLTA congresses gathered in the WoS databases was done by a total of 1,929 authors, with a total average of 1,73 authors per work.

In table 1, the authors are distributed according to the number of works published. More than 79% of the authors have published one single work, and nearly 21% have published between 2 and 9 items of work. Only 0.21% have published 10 or more articles throughout the period studied.

Table 1. Distribution of the number of authors based on the number of works

No. of works	No. of authors	Percentage of authors
1	1,526	79.11
2	279	14.46
3	72	3.73
4	20	1.04
5	11	0.57
6	6	0.31
7	2	0.10
8	3	0.16
9	6	0.31
10	1	0.05
15	2	0.10
16	1	0.05
Total	1,929	100.00

According to the previous distribution, authors can be regrouped in three levels of productivity: great producers (with ten or more works), medium producers (between two and nine works) and **eventual I DO NOT UNDERSTAND THIS** or occasional producers (one single work). Table 2 shows that only 4 authors fall into the category of great producers and that the greatest percentage (79.11%) corresponds to occasional and transitory authors, this means that they have only collaborated in one single work.

Table 2. Distribution of the number of works per author

Productivity Level	No. of authors	Percentage of authors
Great producers	4	0.21
Medium producers	399	20.68
Occasional producers	1,526	79.11
Total	1,929	100.00

3.2. Scientific collaboration

Another important indicator related to authorship that measures the level of collaboration between authors is the signature or work index. This is calculated by determining the average of number of authors who sign each work published. When we analyse scientific collaboration presented at the different WCLTA congresses gathered in the WoS databases, it is observed that works done in collaboration predominate (73%), versus ones done individually (27%). As shown in table 3, works done in collaboration oscillate in a range that goes from 404 works signed by two authors to one work

signed by 16 authors. Among the works done in collaboration, works signed by 2 or 3 authors predominate, corresponding to 36.23% and 21.43%, respectively.

Table 3. Distribution of number of authors per work

No. of authors	No. of works	% sign./work
1	301	27.00
2	404	36.23
3	239	21.43
4	107	9.60
5	41	3.68
6	14	1.26
7	5	0.45
8	2	0.18
9	1	0.09
16	1	0.09
Total	1,115	100

Scientific collaboration between authors was analysed to identify all the existent combinations of paired authors in each of their works (co-authorships), and to obtain the groups of authors who normally sign their work collaboratively. Figure 2 represents the collaboration network between authors. The nodes represent the authors and the lines that link the different nodes represent the collaboration done between them. The thickness of the nodes indicates a greater or lesser number of works that have been done by an author. In order to facilitate data interpretation, and a willingness to make more legible the relationships between different authors, the network construction and graphical representation was done by choosing authors who have presented 5 or more works to WCLTA congresses included in the WoS databases. It also represents all of those authors who collaborate with selected authors, even if their productivity level is lower. The node display is closely linked to the amount and intensity of the associations that each of them have with each other.

When applying the threshold or collaboration intensity of 6 or more works signed in co-authorship, we have identified 20 clusters of authors with a high collaboration intensity that are composed by 167 authors, in which the 32 most productive are included. Some of these authors stand out, not only by occupying the highest positions in the productivity ranking, but also are characterized by having a highly intense collaboration with other authors.

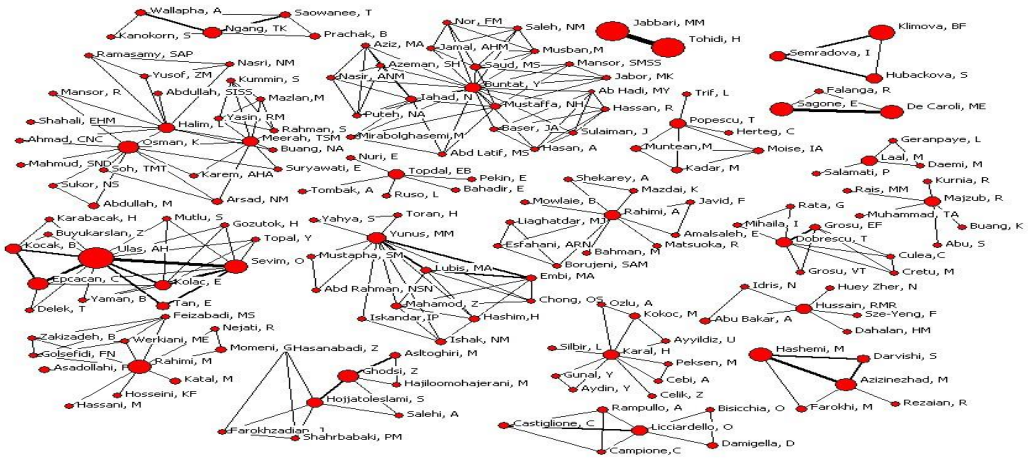

Figure 2. Collaboration network of the most productive authors and their collaborators

The cluster with the most authors is led by the 3 greatest producers (Osman, K., Halim, L. and Meerah, TSM.) and it is composed of 22 authors, followed by the cluster of Buntat, Y., which is combined of 21 authors, and Ulas, A.H., integrated by 13 authors.

It is observed that the size of the clusters varies very much, with a range that goes from 22 authors, to one formed by 2 authors. Nevertheless, the most common size range in these clusters is the one formed by 6 authors (5 clusters).

As mentioned before, more than 79% of authors have collaborated in the realization of a unique work. It is interesting to study the presence of these eventual authors and their contribution to the most productive groups of authors. To do this, those authors who have only collaborated by working in one single article have been eliminated from the authors' network (see figure 3). In this case, it is observed that the network is formed by a total of 17 clusters, which includes a total of 66 authors. In this case, the cluster with the most authors is Ulas, A.H., who is the author who occupies first position in number of works published, which is a combination of 7 authors. Second position is occupied by a cluster led by Yunus, M.M., with 6 authors, and third position is occupied by three clusters formed by 5 authors, each one led by Buntat, Y., Popescu, T. and Halim, L., Meerah, T.S.M. and Osman, K. In this case it is observed that the size of clusters is much smaller, with a range that goes from the ones created by 7 authors to the one done by 3 authors. In this case, the most frequent cluster-size is the one formed by 2 authors (5 clusters). In this network, some isolated node networks appeared (Hussain, R.M.R., Laal, M., and Topdal, E.B.), which corresponds to authors who have been very relevant in terms of productivity but in this case have done a single work with different authors.

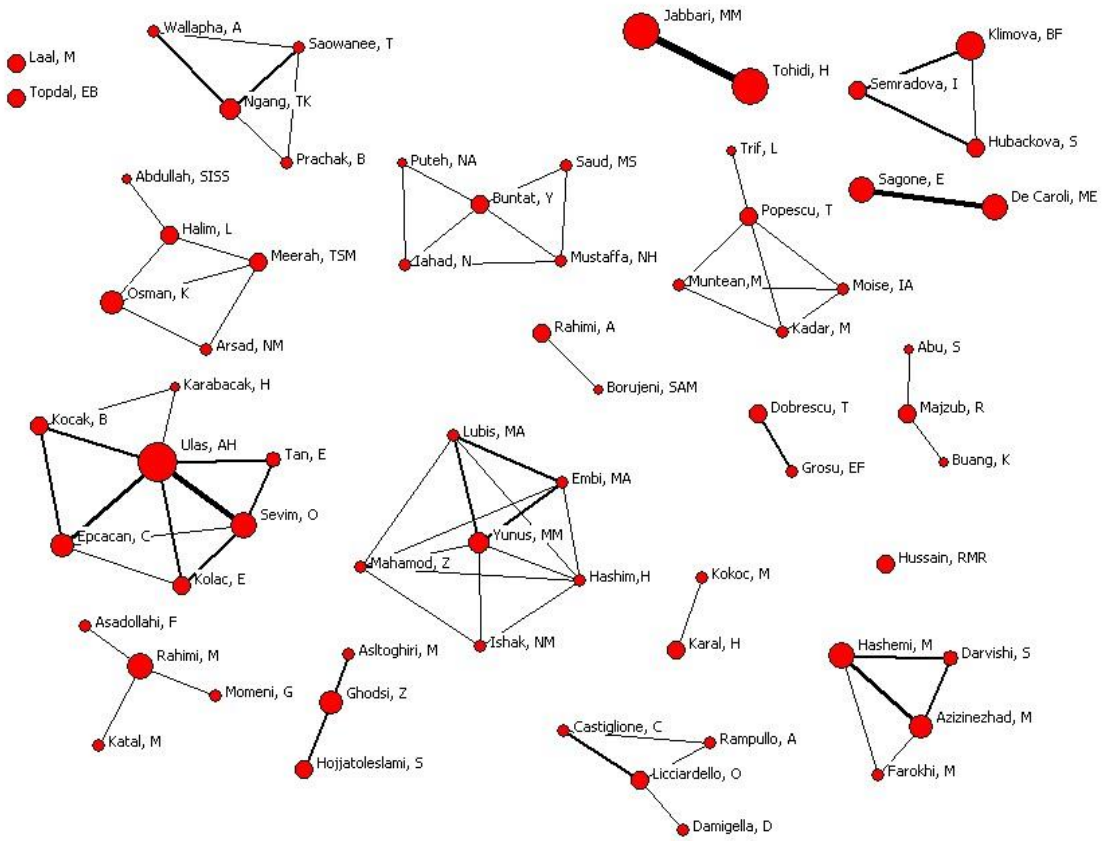

Figure 3. Collaboration network of the most productive authors and collaborators in 2 or more works.

3.3. Repercussion

The total number of citations in the 1,115 works presented in the World Conference on Learning, Teaching & Educational Leadership editions gathered in the Web of Science databases was 329. The distribution of the number of works analysed with the number of citations received per work are collected in table 4. Here, we can observe that 82.87% of the works have not been cited and only 17.13% of the works (191) have ever been cited. We should highlight that only 4 works have received more than 5 citations in each of them.

The works that have been cited on most occasions up to the realization of this study are Hatice Odice's *"Academic self-efficacy and academic procrastination as predictors of problematic internet use in university students"*, which received 16 citations, and Bridget Roberts-Pittman's *"Cyberbullying among college students: prevalence and demographic differences"* with 14 citations. Both works were presented to the 1st World Conference on Learning, Teaching and Administration (WCLTA).

Table 4. Distribution of number of citations received per work

Citations received	No. of works	%
0	924	82.87
1	125	11.21
2	39	3.49
3	12	1.07
4	10	0.89
5	1	0.09
7	1	0.09
8	1	0.09
14	1	0.090
16	1	0.09
Total	1,115	100.00

4. Conclusions

The complementary usage of bibliometrical techniques added to social network analysis has been proved to be very convenient, since graphical networks allow the objectifying of working groups that would otherwise be very difficult to discover (Osca-Lluch et al., 2013).

The application of this methodology to the analysis of works presented at the World Conference on Learning, Teaching & Educational Leadership, are an excellent source of information in identifying authors who are working on these topics. This way, we have managed to understand the authors and research groups that are currently working in Learning, Teaching and Education Leadership.

Taking into account the results, the most productive authors are those who have the greatest number of collaborators in their work. As in other scientific disciplines, a high percentage of authors have only collaborated by doing one work.

Regarding the limitations of this study, it should be mentioned that this work exclusively analyses patterns of collaboration in authors who publish about Learning, Teaching and Education Leadership and who have presented their work at WCLTA Congresses, and which have been also been included in the Web of Science (Wos) databases. Future research lines should identify the evolution of networks and research groups. Also, due to the dynamic character of the science and the research groups, it would be very interesting to observe a temporary evolution and analyse their variations (growth or decrease in the number of groups, and their members), as well as their visibility and scientific impact, and to research thematic areas of the identified groups and the quality or excellence of the published works.

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