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# Citation patterns in Educational Science theses at the University of Córdoba

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## **Abstract:**

This paper analyses citation patterns in 30 doctoral theses in the field of Education Sciences, submitted at the University of Córdoba (Spain) between 1997 and 2010. A preference was found for citing books as opposed to articles. The most widely-cited journal was a Spanish education-specific publication, *Enseñanza de las ciencias*. Only a small number of journals from the stock of periodical publications held and managed by the Faculty of Education Sciences Library were cited.

**Keywords:** doctoral thesis, citation, education, Spain, academic libraries.

## **Introduction**

The origins of the Faculty of Education Sciences Library can be traced back to the nineteenth century. This was a time of cultural and scientific renaissance, marked by the emergence of such centres as the Escuela Normal de Maestros (Teacher Training College) in 1841; this period also saw the full development of the University of Córdoba, and the initial shaping of its library.

The library's archives and historical holdings therefore house all the documentation generated from the founding of the Teacher Training College to the present day, conserving them in excellent order: the collection is virtually complete from 1850, and some records date back as far as the eighteenth century and early nineteenth centuries.

The books that have come down to us clearly testify to the enormous interest shown by the teaching staff in their Library, particularly at the time of the First Spanish Republic – in the late nineteenth century – and later during the Second Spanish Republic. During these periods, the Teacher Training College played a major role in the city's cultural, social and educational life, and indeed became the true driving force of local culture (Rodríguez and Morillo-Velarde, 1994).

In 1995, the old Córdoba Teacher Training College became the Faculty of Education Sciences; since then, it has trained future infant and primary teachers, as well as producing graduates in educational psychology. The faculty's teaching staff were organised into 18 departments, and three doctoral programmes were launched. The library was continually expanded to support this new academic initiative, and its holdings now comprise 121,200 modern books and 6,000 old volumes dating from the eighteenth century to the mid-twentieth century, as well as some 2,000 journal titles, more than 6,000 special media items (DVDs, CDs, maps etc.) and a history archive holding almost a million documents generated since 1850.

The Faculty library is one of eight 'service points' which together make up the University of Córdoba Library. Like the other University libraries, it uses the "Millennium" Integrated Library Management System (Spanish initials: SIGB) comprising circulation, cataloguing and serially-arranged modules, as well as a large number of information and electronic resources accessible through the website.

The faculty library manages journal subscriptions and digital access independently through the EBSCO information agency. In addition, a number of electronic journals are included in packages purchased by the Andalusian University Libraries Consortium (Spanish initials: CBUA) and others found in Open Access (OA), which are centrally managed by the Electronic Resources and Projects Service and are accessed from the

university library via the appropriate portal.

In the fifteen years since then, the doctoral programmes have led to the production of numerous doctoral theses, which have served to consolidate research in the field of education at the University of Córdoba. Analysis of the citations in these theses gives a clear idea of the references used by researchers in a whole range of scientific fields, belonging to various departments and faculties. This information is useful in enabling librarians to manage their journal subscriptions and bibliographical holdings. PhD students also benefit because these data provide a starting point for their bibliographical surveys of specific topics and subject areas (Chaparro-Martínez & Marzal, 2008; Pillai & Dileep, 2010).

### **Review of related literature**

A number of studies have shown that citation analysis is a powerful tool in identifying the publications that lend theoretical and empirical support to scientific progress (Garfield, 1978). The social sciences, and specifically Education, are no exception to this.

Recent research has highlighted the importance of identifying resource requirements for doctoral theses in university library collections (Edwards, 1999; Haycock, 2004; Omoba & Ayodeli, 2010). With regard to theses in the field of education, certain findings of interest have been published: for example, among theses on Educational Psychology at the University of Texas, 56% of citations relate to journals and 37% to books (Fuchs, Thompsen, Bias & Davis, 2006); Haycock (2004) reported that 44% of citations related to journals in the field of education sciences. In Nigeria, Okiy (2003) found that 60% of citations refer to books and 24% to journals; similar results are reported by Iya (1996) in an examination of education theses at the University of Maiduguri in Nigeria. No studies have yet been conducted in Spain on education theses produced at one specific university, although there has been research addressing the country as a whole, and focussing on particular areas of knowledge. In Spanish theses on the teaching of mathematics, for example, the average number of citations referring to books is 115, while the average referring to journals is 73 (Vallejo, Fernández, & Torralbo, 2006).

Given that one of the major tasks of any university library is to evaluate its own impact in terms of usage and loans to users (Iivonen, Nygrén, Valtari & Heikkilä, 2009), this study sought to analyse citations in doctoral theses in the field of education at a single Spanish institution, the University of Córdoba, with the aim of establishing which documentary sources are commonly used and of ascertaining the degree of correspondence between the journals cited and the journals held and managed at the university's Education Faculty library.

### **Methodology**

This study used bibliometric methods commonly applied in this type of research. Thirty theses were examined, all submitted to the University of Córdoba Faculty of Education Sciences between 1997 and 2010 and deposited in the university library.

The covers of all theses were photocopied, as were as the pages containing bibliographical references. All the information obtained was entered into an *ad hoc* database with the following fields: a) author b) title c) date d) department; the following data were collected regarding citations: e) number of citations per thesis, f) number of citations per source-type g) frequency of journal titles cited.

All references were listed and grouped by document type: journal articles, books, proceedings, government documents, online resources, theses and other resources. These were subsequently ranked by citation frequency and by source language. The cited journals were classified in descending order according to the number of times they had been cited. The country of publication for the most cited journals was then established in order to determine which region was the most influential. The findings were collated in tables and diagrams.

### **Results and discussion**

The 30 dissertations yielded a total of 8,771 bibliographical references, with an average

of 292.4 per thesis. Monographs, chapters of books and published books were grouped generically as citations of books. Book citations accounted for 56% of the total, while journal citations accounted for 34%; there was thus a clear preference among doctoral students towards citing books rather than journals, despite the fact that the faculty library has access to electronic scientific journals in addition to subscriptions to printed journals. Other type of bibliographical source accounted for only 9.6% of total citations (Table 1).

Table 1. Number of citations by source type

Type of citation	No. of citations	Percentage of citations
Books	4,914	56.03
Journals	3,014	34.36
Proceedings	212	2.42
Online resources	163	1.86
Government documents	141	1.61
Theses	119	1.36
Other resources	208	2.37
<b>Total</b>	<b>8,771</b>	<b>100.00</b>

Most of the cited documents were available in printed form. Online resources accounted for only 1.86%, a poor level of usage on the part of doctoral students. However, 65.6% of online citations came from 2009 and 2010, suggesting that this source may be starting to gain momentum in research programmes.

Overall, so-called 'grey literature', in other words unpublished or limited circulation documents not issued with an ISBN or ISSN, such as government documents, online resources, theses and other resources, accounted for 7.19% of the citations.

Comparison of these findings with other citation studies focusing on doctoral theses in education from around the world reveals that the percentage of articles cited lies midway between the figures reported for the USA and for Nigeria, while the book citation figure is much closer to that of Nigeria (Table 2). The average number of article citations per thesis was the highest of all (292.36), almost three times the average noted in Haycock's (2004) study, which had the second highest average (105.62).

Table 2. Comparison of findings with other studies

	<b>Haycock (2004)</b>	<b>Beile <i>et al.</i> (2004)</b>	<b>Tunon &amp; Brydges (2005)</b>	<b>Fuchs <i>et al.</i> (2006)</b>	<b>Okiy (2010)</b>	<b>Maz-Machado <i>et al.</i> (this paper)</b>
<b>Country</b>	USA	USA	USA	USA	Nigeria	Spain
<b>Area</b>	Education	Education	Education	Educational Psychology	Education	Education
<b>Period</b>	2000-2002	2000	*	1997-2002	1992-2002	1997-2010
<b>N° theses</b>	43	30	143	52	70	30
<b>N° citations</b>	4542	1842	10023	1560	4012	8771
<b>% articles</b>	44	45	67.58	56.41	24.5	34.36
<b>Books, book chapters</b>	56	33	18.51	27.9	60.3	56.03

\* Not available.

Analysis of the language of citations enabled the relative primacy of each to be determined. Spanish was found to be as the most cited language, accounting for 59.8% of the total, followed by English at 35.2% (Table 3). The presence of French and Portuguese was minimal, indicating that literature in these languages plays a very secondary reference role. Other languages involved in citations tended to be European or local in scope, e.g. Catalan and Galician.

Table 3. Citations by language

<b>Language</b>	<b>N° of citations</b>	<b>%</b>
Spanish	5249	59.8
English	3098	35.2
French	214	2.4
Portuguese	113	1.4
Other	97	1.2

Bradford's Law (Brookes, 2006) claims that a majority of articles are published in a limited number of journals. That law was applied to determine the nucleus and successive Bradford zones for the most cited journals, using a procedure previously tested by various researchers (Ruiz de Osma, 2006; Gorbea, 1996) to identify the nucleus and zones. Table 4 was drawn up on the basis of the number of journals and the number of citations relating to each journal.

Table 4. Distribution of scientific journals in descending order of number of citations (following the Bradford model)

A # Journals	B # Citations	C Total citations A*B	D Accumulated journals	E Accumulated citations R(r)	F log ( r )	G Accumulated citations calculated Rc(r)	H = E - G Residues R( r )-Rc( r )	I % Residues H/E	Zone
1	110	110	1	110	0.0000	-1173.1545	1283.1545	1166.50%	0
1	63	63	2	173	0.3010	-769.8648	942.8648	545.01%	0
1	61	61	3	234	0.4771	-533.9555	767.9555	328.19%	0
1	60	60	4	294	0.6021	-366.5752	660.5752	224.69%	0
1	53	53	5	347	0.6990	-236.7449	583.7449	168.23%	0
1	44	44	6	391	0.7782	-130.6658	521.6658	133.42%	0
1	37	37	7	428	0.8451	-40.9773	468.9773	109.57%	0
2	34	68	9	496	0.9542	105.2435	390.7565	78.78%	0
3	28	84	12	580	1.0792	272.6239	307.3761	53.00%	0
1	27	27	13	607	1.1139	319.1946	287.8054	47.41%	0
1	24	24	14	631	1.1461	362.3124	268.6876	42.58%	0
1	23	23	15	654	1.1761	402.4541	251.5459	38.46%	0
2	21	42	17	696	1.2304	475.2771	220.7229	31.71%	0
1	20	20	18	716	1.2553	508.5332	207.4668	28.98%	0
2	19	38	20	754	1.3010	569.8345	184.1655	24.43%	0
2	18	36	22	790	1.3424	625.2882	164.7118	20.85%	0
1	17	17	23	807	1.3617	651.1513	155.8487	19.31%	0
2	16	32	25	839	1.3979	699.6648	139.3352	16.61%	0
2	15	30	27	869	1.4314	744.4426	124.5574	14.33%	0
5	14	70	32	939	1.5051	843.2939	95.7061	10.19%	0
3	13	39	35	978	1.5441	895.4324	82.5676	8.44%	0
3	12	36	<b>38</b>	<b>1014</b>	1.5798	943.2805	70.7195	6.97%	0
7	11	77	45	1091	1.6532	1041.6532	49.3468	4.52%	1
2	10	20	47	1111	1.6721	1066.9539	44.0461	3.96%	1
5	9	45	52	1156	1.7160	1125.7740	30.2260	2.61%	1
13	8	104	65	1260	1.8129	1255.6043	4.3957	0.35%	1
13	7	91	78	1351	1.8921	1361.6833	-10.6833	-0.79%	1
17	6	102	95	1453	1.9777	1476.4005	-23.4005	-1.61%	1
26	5	130	121	1583	2.0828	1617.1516	-34.1516	-2.16%	1
28	4	112	149	1695	2.1732	1738.2617	-43.2617	-2.55%	1
69	3	207	218	1902	2.3385	1959.6741	-57.6741	-3.03%	1
172	2	344	390	2246	2.5911	2298.0930	-52.0930	-2.32%	2
789	1	789	<u>1179</u>	<u>3035</u>	3.0715	2941.7505	93.2495	3.07%	2

Columns A and B are input fields to calculate Bradford. The remaining columns are calculated as set forth:

A \* B = Total number of citations.

R = accumulated number of journals.

R (r) = accumulated number of citations.

Log (r) = the decimal logarithm of r.



$R_c(r)$  = accumulated number of citations, calculated as set by Bradford model:  
 $Y=a+bX$ , where  $Y = R_c(r)$ , " $a$ " is the intercept, " $b$ " is the slope of the line; " $X$ " is the decimal logarithm of the accumulated number of journals:  $\text{Log}(r)$ .

$H = E - G$  = remainder, difference between actual and calculated number of accumulated citations.

$H / E$  = Percentage of the remainder compared to the actual number.

For graphical representation, the decimal logarithm of the number of journals was plotted on the X axis and the accumulated number of citations on the Y axis. In terms of Bradford's Law, the graph displayed a curved area corresponding to the nucleus and a linear area corresponding to the successive Bradford zones (Figure 1).

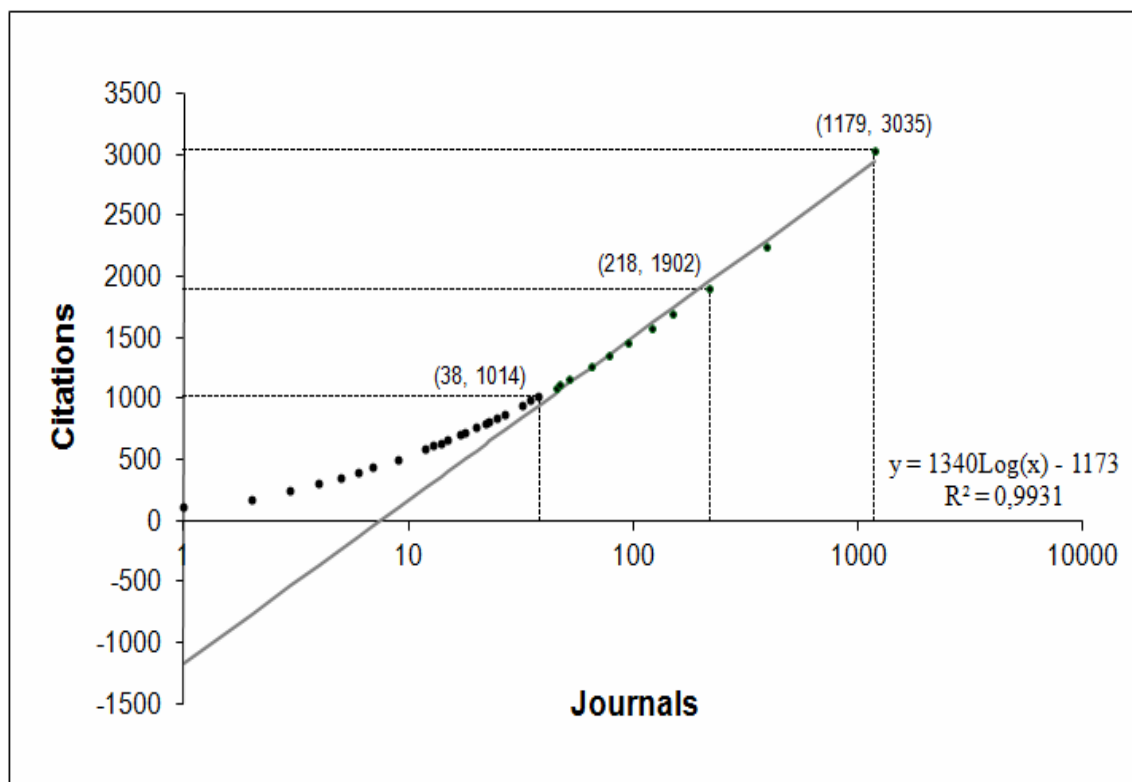


Figure1. Bradford distribution of cited journals

The Bradford distribution shows an initial zone or nucleus followed by a straight section. Sometimes a further zone may be detected beyond this straight line, where the number of articles increases more slowly (Gross, 1967). By clustering the data to the right of the nucleus into groups with numbers of citations similar to the total found in the nucleus, Bradford zones can be identified.

Table 5. Percentages of the number of journals and citations in each Bradford zone

	<b>Zone</b>	<b>N° of Journals</b>	<b>N° of Citations</b>	<b>% Journals</b>	<b>% Citations</b>
<b>Nucleus</b>	<b>0</b>	38	1014	3.22%	33.41%
	1	180	888	15.27%	29.26%
	2	961	1133	81.51%	37.33%
	<b>Total</b>	<b>1179</b>	<b>3035</b>	<b>100.00%</b>	<b>100.00%</b>

Table 6. Bradford nucleus of cited journals

<b>Journal</b>	<b>N°</b>	<b>Country of citation</b>
<i>Enseñanza de las Ciencias</i>	110	Spain
<i>International Journal of Science Education</i>	63	United Kingdom
<i>Cuadernos de Pedagogía</i>	61	Spain
<i>Revista de Escuelas Normales</i>	53	USA
<i>Bordón</i>	44	Spain
<i>Journal of Personality and Social Psychology</i>	37	Spain
<i>Infancia y Aprendizaje</i>	34	USA
<i>Science Education</i>	34	Spain
<i>European Journal of Science Education</i>	28	USA
<i>Journal of Research in Science Teaching</i>	28	USA
<i>Revista de Educación</i>	28	USA
<i>Cultura y Educación</i>	27	Spain
<i>Revista de Investigación Educativa: RIE</i>	23	USA
<i>Investigación en la Escuela</i>	21	Spain
<i>Psicothema</i>	21	Spain
<i>Revista de Psicología del Deporte</i>	20	Spain
<i>Revista de Pedagogía</i>	19	Spain
<i>Developmental Psychology</i>	18	USA
<i>Journal of Applied Behavior Analysis</i>	17	Spain
<i>Revista de Psicología Social</i>	16	Spain
<i>Aula de Innovación Educativa</i>	14	Spain
<i>Boletín de la Institución Libre de Enseñanza</i>	14	Spain
<i>Cuadernos de Literatura Infantil y Juvenil</i>	14	Spain
<i>Educational Research</i>	12	USA
<i>Revista Interuniversitaria de Formación del Profesorado</i>	12	Spain

<i>Apuntes de Psicología</i>	11	Spain
<i>Journal of Teacher Education</i>	11	USA
<i>Science</i>	11	USA
<i>Sex Roles</i>	11	USA
<i>Alambique</i>	9	Spain
<i>Revista Española de Pedagogía</i>	9	Spain
<i>International Journal for Educational and Vocational Guidance</i>	8	Netherlands
<i>Journal of Child Psychology and Psychiatry</i>	8	United Kingdom
<i>Revista de Ciencias de la Educación</i>	8	Spain
<i>Revista de Logopedia, Foniatría y Audiología</i>	8	Spain
<i>Cuadernos de Psicología del Deporte</i>	7	Spain
<i>Harvard Educational Review</i>	7	USA
<i>Journal of Educational Psychology</i>	7	USA

A total of 1179 journals were cited in the doctoral theses surveyed. The data show that the 38 journals contained in the nucleus accounted for 33.41% of all journal citations. Spanish journals accounted for 57.89 % of the nucleus and American journals for 34.21%, suggesting that doctoral theses at the University of Córdoba rely heavily on Spanish research. The most cited publication was the Spanish journal *Enseñanza de las ciencias*.

The Faculty of Education library stocks and manages 185 of the journals cited, which accounted for only 16.24% of the total, i.e. doctoral students have library access to only 16.24% of the journals cited in their. Of these 185, 122 are Spanish journals, meaning that home-grown publications account for 65.9% of the journals accessed through the library, while foreign publications account for only 34.1%.

## Conclusions

The literature cited in education-related theses at the University of Córdoba is written largely in Spanish. Most derives from books, and to a lesser extent from journals. The use of online resources is negligible. The percentages of article and book citations in education theses at the University of Córdoba do not match the figures obtained from

research carried out in the USA.

It is clear that the journal collections held and managed by the library are not cited by doctoral students. If journals report the findings of the most recent research and these are not being cited by the doctoral students it implies that the collections chosen do not meet the major needs of the students of the certain faculty This ought to induce a process of reflection on the advisability of persevering with these journals and instead trying to incorporate the journals that are predominantly cited in the theses.

This type of study is particularly valuable in times of crisis, such as the present, when economic resources start to become scarce and need to be optimised. This study in particular will enable library managers to make decisions on the basis of objective findings that will undoubtedly lead to benefits for both the library and its users.

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