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A Study on the Impact of Online Educational-Research Journals: The Case of the REDIE¹

Eduardo Backhoff

Rosalinda Renteria-Mendoza

Maricela Lopez-Ornelas

Gabriela Vidauri

Autonomous University of Baja California, Mexico

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Abstract: The main purpose of this study was to determine the academic impact the Online Journal of Educational Research (REDIE) has had in its first ten years of life (1999-2009) in terms of number, type and origin of the citations of its articles, well as the behavior of these citations over the years, both per volume and for each of the articles published during this period. Since the REDIE is not indexed in the Thomson Reuters Science Citation Index (SCI), the impact study was based on the citations of the open-access publications indexed on Google Scholar and Google. Citations from 161 articles were sought and found, and the results were analyzed in terms of the frequency with which the REDIE was cited, as well as the behavior of the citations over time. An annual citation index and an index equivalent to the impact factor were used. The study concludes with a summary

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of the findings, and a comparison of the REDIE's citation indicators with those of six Latin American journals of education and psychology.

Keywords: Online Journal of Educational Research, REDIE, impact factor, citation index, quality evaluation of scientific journals.

Un estudio sobre el impacto de las revistas de investigación educativa en línea: El caso de la REDIE

Resumen: El propósito central de este trabajo fue conocer el impacto académico que ha tenido la Revista Electrónica de Investigación Educativa (REDIE) en sus primeros diez años de vida (1999-2009) en términos del número, tipo y procedencia de las citas a sus artículos, así como del comportamiento de dichas citas a través de los años, tanto por volumen como para cada uno de los artículos publicados en este periodo. Dado que la REDIE no se encuentra indizada en las bases del *Web of Science* de la empresa Thomson Reuters (ISI, siglas en inglés), el estudio de impacto se basó en las citas de las publicaciones de acceso abierto indexadas en Google Académico y Google. Se buscaron y localizaron las citas de 161 artículos, y los resultados se analizan en términos de la frecuencia con que se cita a la REDIE, el tipo de documentos que lo hace, los países de origen de las fuentes que citan, así como del comportamiento de las citas a lo largo del tiempo. Se utilizó un índice de citación anual y un índice equivalente al *factor de impacto*. Se concluye con una síntesis de los hallazgos y con una comparación de los indicadores de citación de la REDIE y seis revistas latinoamericanas de educación y psicología.

Palabras Clave: Revista Electrónica de Investigación Educativa; REDIE, factor de impacto; índice de citación; evaluación de la calidad de revistas científicas.

Impacto da Revistas de Pesquisas Educacionais online: o caso da REDIE

Resumo: O objetivo principal deste estudo foi determinar o impacto acadêmico da Revista Eletrônica de Pesquisas Educacionais (REDIE) em seus primeiros dez anos de vida (1999-2009), em termos de tipo, número e origem de citações dos artigos, bem como o comportamento dessas consultas, tanto por volume como para cada um dos artigos publicados neste período. Dado que a REDIE não é indexada no Web of Science da Thomson Reuters (ISI, por sua sigla em Inglês), o estudo do seu impacto com base em citações para publicações de Acesso Abertos em Google Scholar e Google. Foram pesquisados e localizados 161 citações de artigos, e os resultados são analisados em termos de quantas vezes cita a REDIE, o tipo de documentos que citam, os países de origem da fonte citada, bem como de comportamento compromissos ao longo do tempo. Nós usamos um índice de citações anuais e um índice equivalente ao fator de impacto. O artigo conclui com uma síntese dos resultados e uma comparação dos indicadores de citação da REDIE e de seis revistas em educação e psicologia da América Latina.

Palavras-chave: Revista Eletrônica de Pesquisas Educacionais; REDIE; fator de impacto; índice de citações; avaliação da qualidade das revistas científicas.

Introduction²

This bibliometric work is written in the context of the use of the new information technologies to disseminate scientific knowledge freely among nations. Specifically, it seeks to find

² For ease of reference, where the names of organizations have been translated from the Spanish, their acronyms have been retained as given in that language. In the case of international organizations which have commonly-used acronyms in English, those acronyms have been used.

evidence of the academic impact of electronic journals distributed without charge on the Internet in developing countries. For this, we studied the case of the Online Journal of Educational Research (REDIE) in terms of the number and origin of the citations its articles receive in other academic publications. In this introductory paragraph, in addition to the purposes of the study, three issues are addressed: 1) the importance of science and its dissemination in the knowledge society, its problems and a possible solution in Latin America; 2) evaluation of the impact of using the new information tools; and 3) the case of the REDIE, a Latin American open-access journal published on the Internet, and seeking to understand its impact on the scientific community.

Importance of Scientific Research and its Dissemination in the Knowledge Society

In the contemporary world the development of science and technology is a central aspect of what is today known as the *knowledge society*. For this reason, in most countries each day further increases the importance of the generation and distribution of information, due to the fact that it is essential to improving their production processes, the quality of services they offer, and the growth of their economies (Guerra, Fornet, Llauro, and Rodriguez, 2010; Aguiar, 2007).

However, the issue of science requires special treatment when it comes to developing countries. According to Sebastian (2007), the conditions of these countries, also called peripheral nations, is not the most suitable, since usually their scientific communities are very small; their investment in science and development is insufficient; and their dissemination of science is limited and of little relevance to the developed countries (National Science Board, 2008).

This is the case of Latin America and the Caribbean, representing 8.6% of the world's population, 13.7% of its area and 4.7% of its Gross Domestic Product (Lemarchand, 2010). In contrast, according to the Organization of the United Nations Educational, Scientific and Cultural Organization (UNESCO), this region represents on a worldwide scale: 2.4% of the spending on research and development, 2% of the scientists and 0.2% of the patents registered (Guarda, 2002, cited in Fischman, Alperin, and Willinsky, 2010). Comparing the per capita investment in science and development with that of the United States, the expenditure of that nation is about 29 times greater than that of Latin America and the Caribbean (Lemarchand, op. Cit.). As well, the case of the popularization of science is no different, since according to the same UNESCO source, Latin America and the Caribbean region contributes only 2.9% of the world's scientific publications.

In addition to the dearth of scientific production, part of the problem of the dissemination of science in developing countries is due to: 1) the poor distribution of academic journals, 2) the target population's unawareness of them, and 3) the fact that these journals are barely consulted by university researchers and academics (Ochoa, 2004). However, after three centuries of printed scientific publications, the emergence of electronic publications broadcast on the Internet has come to change the current scene. Given the need to make available efficiently the information required by scientists, academics and professionals, many agencies and public institutions in virtually all parts of the world have implemented a policy of open access for publishing research articles online. This condition is very important for strengthening scientific research and communication in countries with low economic resources, such as Latin American nations (Vieyra, 2007).

Furthermore, this partly explains why the few journals developing and surviving in Latin America represent projects designed, funded and operated primarily by public higher-education institutions, and why the great majority of them are published in a electronic format, free of charge (Fischman, Alperin, and Willinsky, 2010). However, it is not yet clear what impact these magazines will have in the academic community toward which they are directed. To answer this question we need to evaluate the impact of electronic journals in terms of the number of times they are cited.

If the impact of online journals published free of charge in Latin America is important, we can say that this way of distributing science information is a viable means of improving the

dissemination of knowledge, since it is through the citation that we can identify the extent to which it enters into the research being done around the world (Porcel, Castilian, Valderrama, Aleixandrey, and Choren, 2003).

Assessing the Impact of Academic Journals

For over eighty years there has been sought a way to assess the quality of scientific research (Gross and Gross, 1927), although the criterion for measuring the impact of academic publications was suggested in 1955 by Eugene Garfield, founder and member of the Institute for Scientific Information (ISI) (Buela-Casal, 2003). However, the use and application of metric indicators to study the performance of scientific literature through the production of documents was circulated with the 1963 publication of Solla Price's book *Big Science, Little Science* (Michan, Russell, Sanchez, Llorens, and Lopez, 2008). That same year, ISI (now Thomson Reuters) first used the impact factor (IF) as a bibliometric indicator of quality in scientific journals (Laborde, 2009).

According to many experts, the FI is the world's most widely used bibliometric index by which to assess the quality of scientific journals. Its great strength is that it is very simple to calculate,³ its interpretation is intuitive, and it permits a comparison to journals around the world according to their "productivity" (Aleixandre and Porcel, 2000; Moed, 2005). However, the calculation of this indicator also suffers from several important limitations (see Amin and Mabe, 2000; Buela-Casal, 2002; Sternberg, 2001), one of which is that the citations can be found only in the journals indexed by Thomson Reuters in its database Science Citation Index (SCI). In the case of many Latin American journals, this limitation is the most important of all, since because they are not in the SCI, it is impossible for them to obtain the FI used by this private company.

Another very important bibliographic database is Scopus (officially SciVerse Scopus), which contains abstracts and citations from scientific-journal articles. It covers a great number of refereed journals in different disciplines, from the technical and medical sciences to the social sciences (including the arts and humanities). Scopus is the property of the Elsevier company, and offers its services online; these searches include Internet science pages and patent databases (information obtained from the website <http://www.scopus.com/home.url>). However, (Michan, Russell Sanchez, Llorens and Lopez, 2008) mention:

"... Neither of (these) two databases (SCI and Scopus) is sufficiently representative in the case of Latin American journals since geographical origin and language of publication brings about an uneven registration of the works...because in the inclusion criteria priority is given to English "(p. 755).

Fortunately, for the journals published on the Internet there are new electronic tools that allow different types of bibliometric studies, among which are those focusing on the study of scientific information distributed in digital documents and on web pages (Martinez, 2006). One of the tools outstanding for this kind of study is the search engine Google Scholar, which allows indexing scientific literature found in refereed journals published on the Internet.

Investigation of the literature points to this as the most efficient of the open-access web browsers, because of the following characteristics: it is fast and easy to use; it finds all types of literature; it is particularly useful in disciplines that do not use the specialized journals as a means of communication (Humanities, Social Sciences, Engineering); it finds citations in books and papers published in secondary journals, not incorporated into the so-called "mainstream science"; and it is

³ To calculate the IF: 1) we selected the year or volume of a journal to be evaluated, 2) added the citations received by articles in that volume during the two years following publication, and 3) divided the number of citations found between the number of articles published in that volume.

not restricted to finding citations only in English and in scientific journals (Torres-Salinas, Ruiz-Perez, and Delgado Lopez Cozar, 2009).

Online Journal of Educational Research (REDIE)

The Online Journal of Educational Research (REDIE) was designed and put into operation in 1999 by academics of the Autonomous University of Baja California (UABC), and is considered to be the first electronic journal published in Mexico, as well as one of the first in the Spanish-speaking world in the area of education. The REDIE was created with the purpose of disseminating theoretical proposals, results of empirical research, and technological innovation in the field of education. It was designed to be published exclusively in electronic format in order to reach greater national and international audiences. It was also conceived as a partially bilingual journal, with abstracts in Spanish and English, and texts in both languages. (Cordero, Lopez-Ornelas, Nishikawa and McAnally, 2009). However, over time, this journal has increased its degree of bilingualism, so that now most of its articles are published in both languages.

The REDIE offers its content on the Internet free of charge, is attached to the Budapest Open Access Initiative (BOAI), and follows a copyright policy proposed by the organization *Creative Commons*. This feature of the journal allows any of its contents to be used freely for noncommercial purposes, provided proper credit is given to authors and to the REDIE itself (McAnally, 2005).

This journal publishes research articles, book reviews, and interviews with renowned academics, as well as lectures given by outstanding scholars. The materials published address educational issues from different fields of knowledge (pedagogy, psychology, sociology, philosophy, economics, etc.), as well as from diverse theoretical and methodological perspectives. The works submitted for publication must be unpublished and refereed (Organista and Cordero, 2001).

Nearly 53% of the REDIE's authors are Mexican, while 47% come from other countries, and of the total number of peer-reviewed articles, a third are essays and theoretical proposals, while two-thirds report empirical research (Backhoff, Lopez-Ornelas, Vidauri, Antillon, and Bonilla, 2010).

Since its inception, the journal has without interruption published two issues a year: Number 1 in May, and Number 2 in November. Additionally, there have been two special issues (one in 2007 and another in 2009). Up to the year 2010, the REDIE had had 12 volumes, 25 issues, and 161 refereed, published articles (plus various reviews, interviews and scientific papers). (Ibid.)

Surely, because it is both online and free, as well as because of some other features that distinguish it (persistence, regularity, quality of its publications and prestige of its authors), the REDIE is one of the educational-research journals most widely read in Latin America: in 2010, it was visited by approximately 572,000 users from 154 countries (statistics obtained from the journal's web page [<http://redie.uabc.mx/vol12no2/contenido-contenido.html>]). And yet, up to now the academic impact of this means of spreading scientific knowledge has been unknown, in terms of the number of times its articles have been cited, since it is not presently part of the Thomson Reuters database.

Purpose and Methodology

The central purpose of this study was to determine the academic impact REDIE has had in its first ten years of life (1999-2009), in terms of the number, type and origin of the citations of its articles. We also proposed to understand the behavior over time of the citations of different volumes, numbers, and articles published. The impact study of the REDIE was aimed at citations in open publications found in cyberspace.

The study is descriptive and transverse, and is basically limited to identifying the citations of articles published in the REDIE during the period 1999-2009, and which are searchable using

Internet search engines. Once these citations were found, they were registered, classified, quantified and analyzed.

The study’s universe consisted of 161 refereed articles published by the REDIE from November, 1999, to November, 2009, and contained in 11 volumes and 22 numbers. These articles represent all the publications considered to be research articles, a classification that also includes theoretical essays and reviews. Other types of writings published in the journal, such as interviews, lectures and book reviews were not considered to be the object of this work.

The method used to find the sources that quote the research papers and theoretical essays published by the REDIE was basically to search on the Internet for the writings—any kind, published by any electronic means, and from any country—in whose references are found any of the 161 articles considered in this work. Criteria and search engines were defined for this, as well as journals, databases and websites where citations could presumably be found.

The procedure consisted of four phases, which in turn comprised several stages and different steps, which were defined and specified by the Editorial Board of the REDIE collegially. Figure 1 shows schematically the complete search process, which is described following the diagram.

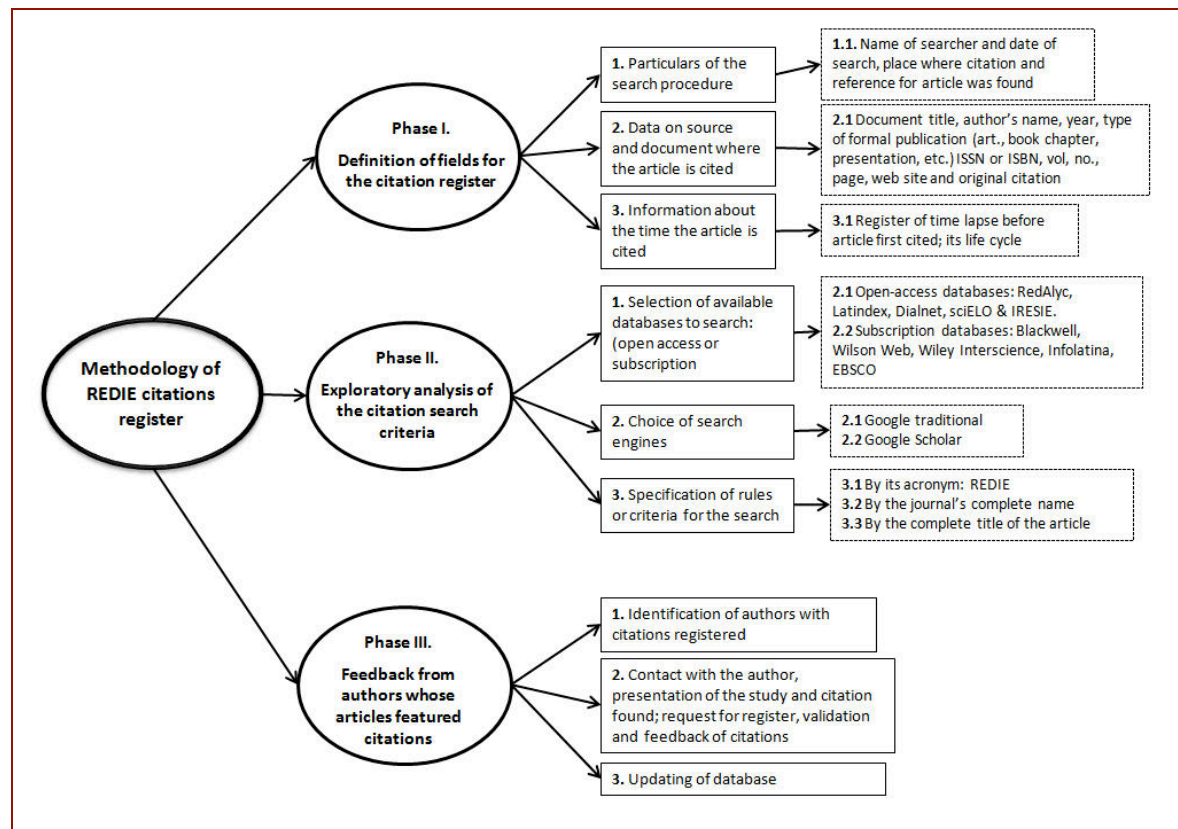


Figure 1. Process of seeking quotations from the REDIE: 1999-2009.

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Phase 1. Definition of Fields for the Citation Register

The purpose of this phase was to define the basic elements of the citation search, such as the specific information we intended to collect, the data concerning the source citing the relevant article,

and when the same article was cited by one or more sources. Once these elements were defined, they were integrated into a spreadsheet and were classified into three categories:

1. **Particulars of the search procedure:** name of search, date of search, database, where the citation was found, and reference of the article cited (title, author(s), year, volume, number and online link).
2. **Data regarding source and document where the article is cited:** document title; name of author(s); year of publication; name of the source (journal, book, thesis, etc.); document type (formal publications, research papers, lectures and papers presented at conferences, theses, educational materials, interactive websites, and so on); International Standard Serial Number (ISSN) or International Standard Book Number (ISBN); volume number of the publication, page numbers Web address where the citation was found, and verbatim transcript of the original citation.
3. **Information about the time the article was cited:** years it took for an article to be cited for the first time after its publication, and life cycle of the article (understood as the period elapsed between the first and last times it was cited).

Phase II. Exploratory Analysis of the Citation Search Criteria

After defining the various fields and elements for recording each item, we proceeded to explore the best way to find articles citations on the Internet. This phase consisted of three stages:

1. **Selection of databases available for search:** open access (Latindex, RedALyC, Dialnet, SciELO, and IRESIE) and subscription databases (Blackwell, Wilson Web, WileyInterscience, Infolatina, EBSCO).
2. **Choice of search engines:** Google Scholar and traditional Google.
3. **Specification of rules or criteria for the search:** by the initials of the journal (REDIE), by the name of the journal (Online Journal of Educational Research), and by the full title of each article.

Phase III. Feedback From Authors Whose Articles Featured Citations

Having exhausted the search for quotes from each article, we proceeded to communicate with the authors of those articles, in order to solicit their collaboration and to complement the citations with those that the author himself or herself had identified. This phase consisted of the following stages.

1. E-mail contact with the REDIE authors to inform them of the study in process, to share the information collected and to ask for their assistance for the registration, validation and submission of their complement of citations.
2. Updating the databases with the citations provided by the authors.

Procedure

In Phase II of the study (exploratory phase) it was found that the best way to look up citations was by using the Google search engine, both the academic (<http://scholar.google.com.mx>) and the traditional (<http://google.com.mx>). Consequently these search engines were used in two ways: 1) by putting in the full title of each article in quotes, since quotation marks reduce the search and help to filter out information that is not required, and 2) after exhausting the search option using quotation marks, we chose to search the same article without quotation marks.

The use of quotation marks also included links to the REDIE itself, so these links were discarded, along with the Web addresses generated by personal Web sites or databases—such as RedALyC, SciELO Dialnet, to name a few—that repeat the text article in full or in part. Once the citation had been registered, the Excel program was used to identify whether or not the citation had

been previously recorded. This speeded up the recognition of new citations and avoided duplication of citations already recorded.

Results

The data were analyzed as follows: a) we calculated the frequency with which the 161 article published in the REDIE (1999-2009) were cited, individually, and added by volume and number; 2) we analyzed the behavior of citations over time, after the articles had been published; 3) we classified the documents that cite articles of the REDIE, according to the type of document and its country of origin; 4) we calculated the length of time between the article's publication and the time it was first cited, and the frequency with which articles were cited over time; and 5) we analyzed the behavior of the articles with the highest number of citations in terms of their persistence in the scientific literature. Finally, we calculated the index of the impact of the different REDIE volumes, using a procedure similar to that used by Thomson Reuters for the FI.

Frequency With Which the REDIE Was Cited

The Internet search for citations took approximately four months (May to August, 2010). In total, there were found 767 full citations of the 161 articles in 11 volumes and 22 issues of the REDIE. Of the total articles, 66% (111) had been cited once or more, while the remaining 34% (55) had not been cited. The range of citations per article ranged from 0 to 44, the median was 2 citations, and the mean was 4.8 citations per article.

Figure 2 shows the frequency of items that were not cited, as well as those that had been cited one or more times. The graph shows that: 50 articles were not cited; 22 articles were cited only once; 15, twice; 11, three times, and so on. One article was cited 32 times; another, 38 times; and one article was found to have been cited 44 times.

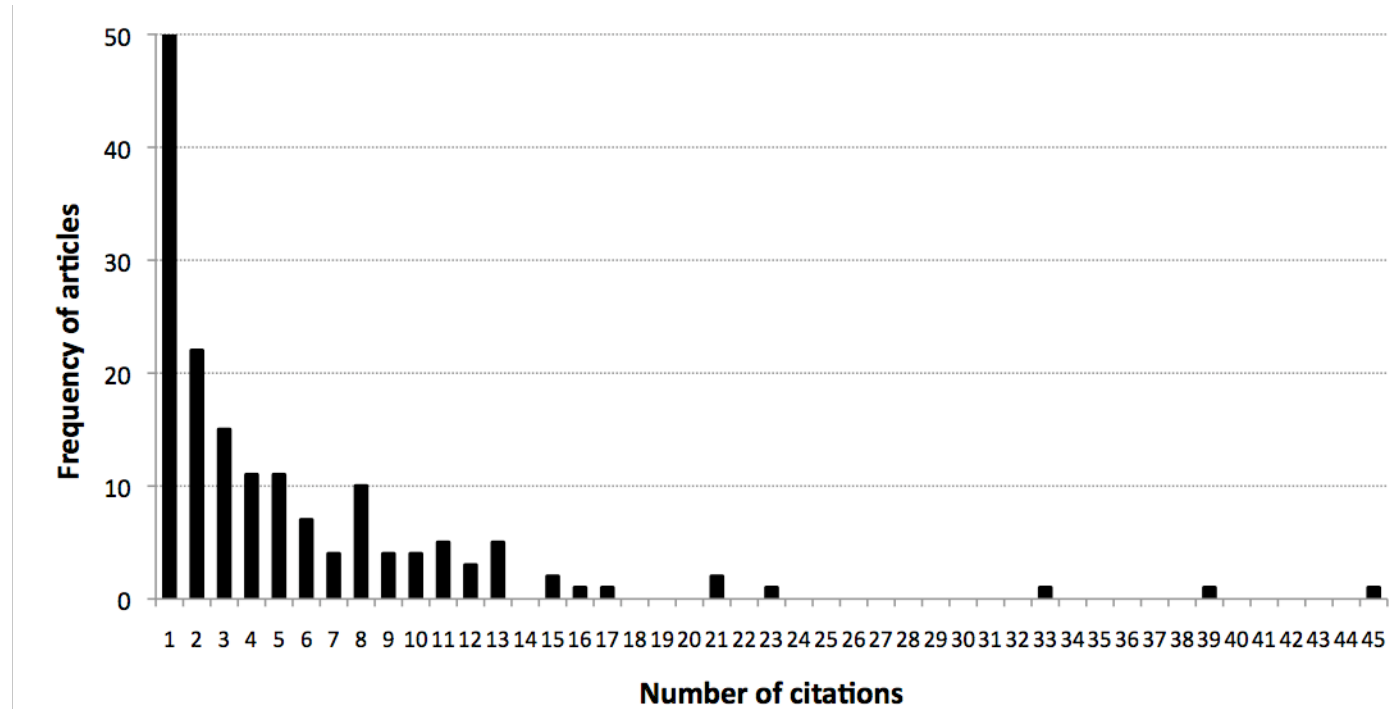


Figure 2. Frequency of articles by number of citations

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

In terms of citations of articles by year, volume and number published, Figure 3 shows the frequency of citations of REDIE Vol1_no1's five articles during the period from 1999 to 2009. This figure shows that all the articles had been cited at least once; two were mentioned 9 times, and the total citations among the five items numbered 29. If we divide the number of citations by the number of articles in this issue, we have an average of 6 citations per article; then, if the average number of citations per paper (6) is divided by the number of years, the mean for citations by article and by year is 0.6. Since the Thomson Reuters FI is calculated based on a period of two years, an approximation of this indicator for the first issue of the REDIE would be 1.2.

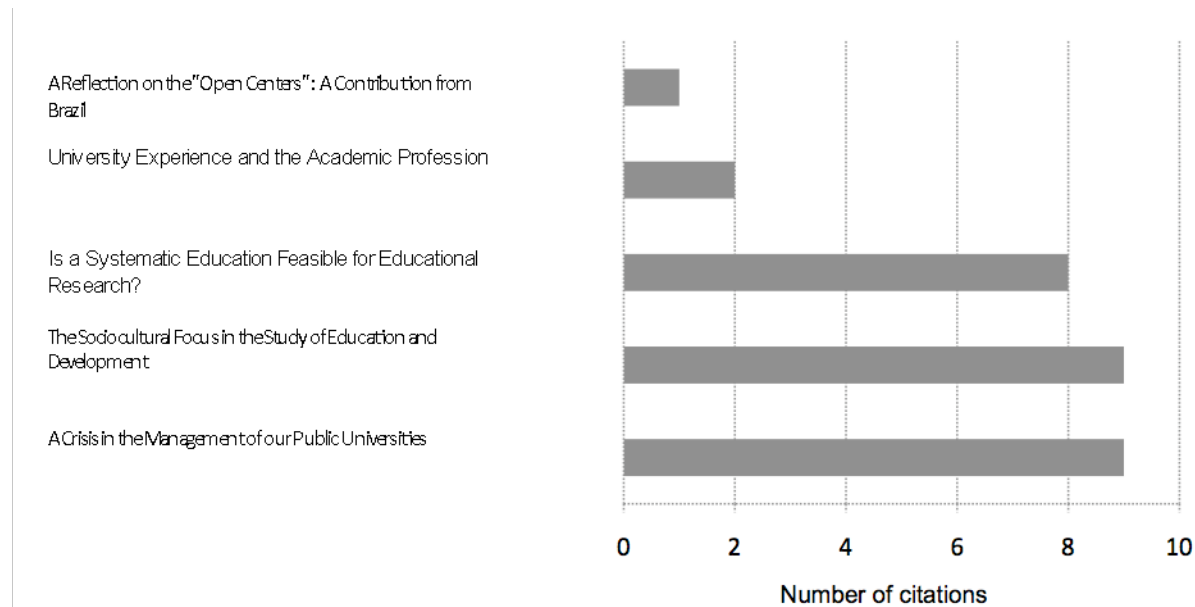


Figure 3. Frequency of citations of articles from REDIE Vol1_No1 (1999)
 Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Table 1 summarizes the citations recorded in 10 volumes and 20 issues of the REDIE. Omitted are the two issues of Volume 11 (2009), because they did not have at least two years in publication. This table presents the following information: number of articles published; number of articles without citations; average citations per article; rate of citations per year; and a measurement that approximates the FI, and which we call the Impact Index⁴.

In this table we can see that there were published from 4 to 10 articles per number, with an average of 7 articles. The number of articles that were not cited ranges from 0 to 8, with an average of 1.5 per number. The total number of citations per number runs from 4 to 98, with an average of 37.5. The mean for citations per article and number varies between 0.4 and 16.3, with an average of 6. The index of citations per year varies between 0.4 and 2.8, averaging 1.3. Finally, the "Impact Index" of the 20 numbers varies between 0.8 and 5.6, with an mean of 2.57.

⁴ The impact factor used by Thomson Reuters is calculated with the average citations per article a journal has in the two years following its publication. In this case, the impact index is calculated in the same way, but excluding the citations from the REDIE itself

Table 1
Number of Citations of the 22 Issues of the REDIE

Year	Volume/number	Articles published	Articles not cited	Total citations	Average citations per article	Average citations per year	Impact Index*
1999	Vol1_No1	5	0	29	5.8	0.6	1.2
2000	Vol2_No1	5	0	57	11.4	1.3	2.6
	Vol2_No2	6	0	37	6.2	0.7	1.4
2001	Vol3_No1	4	1	22	5.5	0.7	1.4
	Vol3_No2	5	0	34	6.8	0.9	1.8
2002	Vol4_No1	6	0	98	16.3	2.3	4.6
	Vol4_No2	6	0	32	5.3	0.8	1.6
2003	Vol5_No1	6	1	47	7.8	1.3	2.3
	Vol5_No2	5	3	12	2.4	0.4	0.8
2004	Vol6_No1	5	0	44	8.8	1.8	3.6
	Vol6_No2	6	1	67	11.2	2.2	4.4
2005	Vol7_No1	6	1	46	7.7	1.9	3.8
	Vol7_No2	9	0	48	5.3	1.3	2.6
2006	Vol8_No1	9	0	59	6.6	2.2	4.4
	Vol8_No2	9	2	44	4.9	1.6	3.2
2007	Vol9_No1	9	0	18	2.0	1.0	2.0
	Vol9_No2	10	3	17	1.7	0.9	1.8
2008	Vol10_No1	10	4	28	2.8	2.8	5.6
	Vol10_No2	10	6	4	0.4	0.4	0.8
	Special	10	8	7	0.7	0.7	1.4

* This index represents the average number of citations received over a two-year period.

Because the citations are highly dependent on the time that an article is available to the public, we present Figure 4, which shows the rate of citations per year for the first 20 numbers of the REDIE. In order to observe the behavior of this indicator over time, there was added to Figure 4 a regression line that marks the direction in which this change was taking place.

It can be observed that there is a tendency for the REDIE articles to be cited more often as the years pass. Of course, the articles of the last numbers are cited less because, among other reasons, they have been published for a shorter period of time. However, we must also recognize that there are journal numbers cited more often than others. In this regard, Vol10_No1 (2008) is dramatically outstanding, having, despite its short life (two years) the highest yearly citation rate in the entire REDIE (2.8). However, it also should be noted that other numbers have a low yearly citation index even though they have been in publication for seven years, as in the case of Vol5_No2 (2003), with an average of 0.4 annual citations. These differences may be due to a combination of factors, among which are: relevance and quality of the publications, and prestige of the authors.

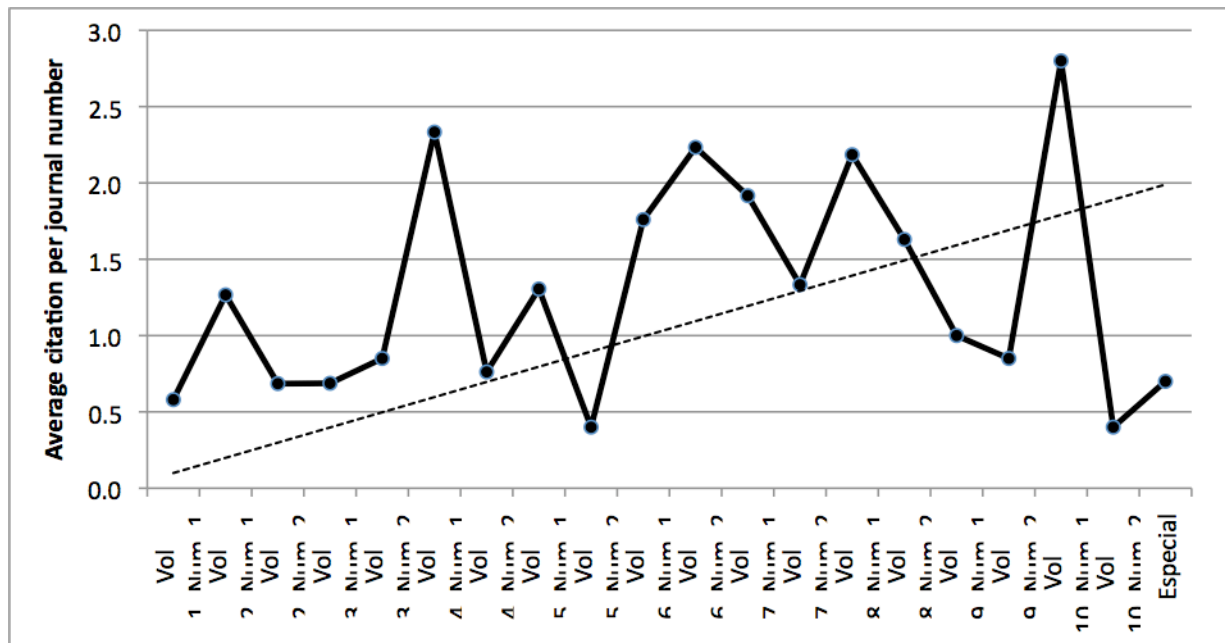


Figure 4. Index of annual citation of 20 issues of the REDIE (1999-2008)

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Types of Documents Quoting the REDIE

Another interest of this study was the determination of the type of documents that quote the REDIE, for which these documents were classified into seven broad categories, described below:

- Formal Publications. Papers in scientific and popular journals, as well as in books and chapters, which have a formal registration (ISSN or ISBN).
- Research papers. Formal technical reports and projects submitted for funding.
- Presentations and papers at conferences. This includes lectures, participation in round tables and panels, PowerPoint presentations, etc.
- Theses. Completed theses for college and graduate work.
- Educational material. This category includes courses, plans and curriculums, teaching materials, course lectures.
- Web pages. Information contained on websites and documents published on them.
- Miscellaneous. Various materials which cannot be classified in any of the above categories.

Figure 5 shows the frequency of REDIE citations according to the type of documents in which they were cited. Here one can see that the greatest number of citations appears in formal publications (mostly journals). The number of citations in this category was 435, which represents 57% of the total (767). Thus, on the average, each of the REDIE articles has been cited in formal publications 2.7 times.

The two following categories with the greatest number of citations were research papers and presentations at conferences. In each case there were 96 citations, representing 12.5%. Also, there were 66 citations from theses (8.6%), while from all the remaining categories (teaching materials, websites and others) there were 74 citations (9.6%). In summary, we can say that formal publications, research papers and conference presentations registered more than 80% of the citations of REDIE works.

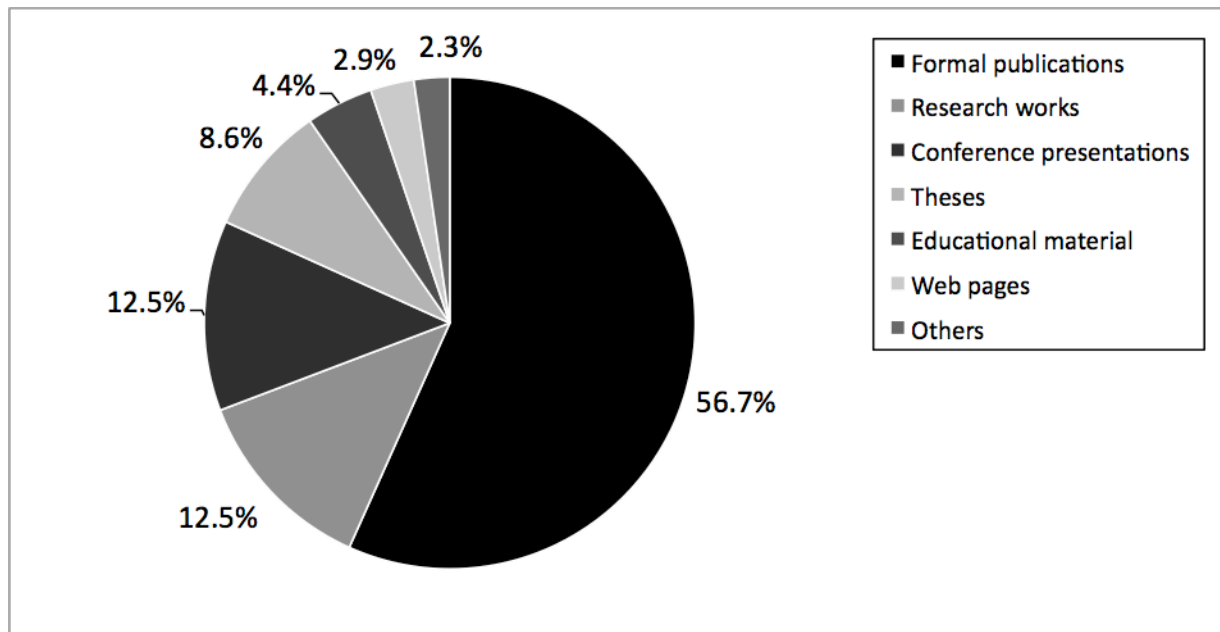


Figure 5. Citations of the REDIE according to the type of document (1999 - 2009)

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Citations' Countries of Origin

One of the quality factors of scientific journals is that referring to their internationalization; in other words, the geographic diversity of their users. Of course, this indicator is delimited by the language in which the research is published, which in the REDIE's case is primarily Spanish (with English abstracts), although most of its articles are currently being translated into English, in order to give them greater visibility in the world.

The results of this study show that the journal is cited both in Mexico and abroad. At the moment, the REDIE's work is cited in 20 countries, classified into five geographical areas: Mexico, Europe, Latin America, North America and Other Countries. To this classification is added one more, for those citations whose origin is unknown. Figure 6 shows that 310 citations come from Mexican documents, representing 40.4% of the total; 403, or 53% of the citations are recorded as coming from international sources; and finally, 54 citations (7%) have an unknown geographical origin. The foreign countries which cite the REDIE most often are in Europe, with 26% of the citations; and in Latin America, with 25%. In the countries of North America (U.S. and Canada) the REDIE is virtually unquoted; only 11 citations were found, making up 1.4% of the total. In the category of Other Countries are China, Korea and South Africa, with one citation each. These results indicate that the REDIE is mainly cited in Spanish-speaking countries, since the European country that uses the journal most is Spain (information not presented in the graph).

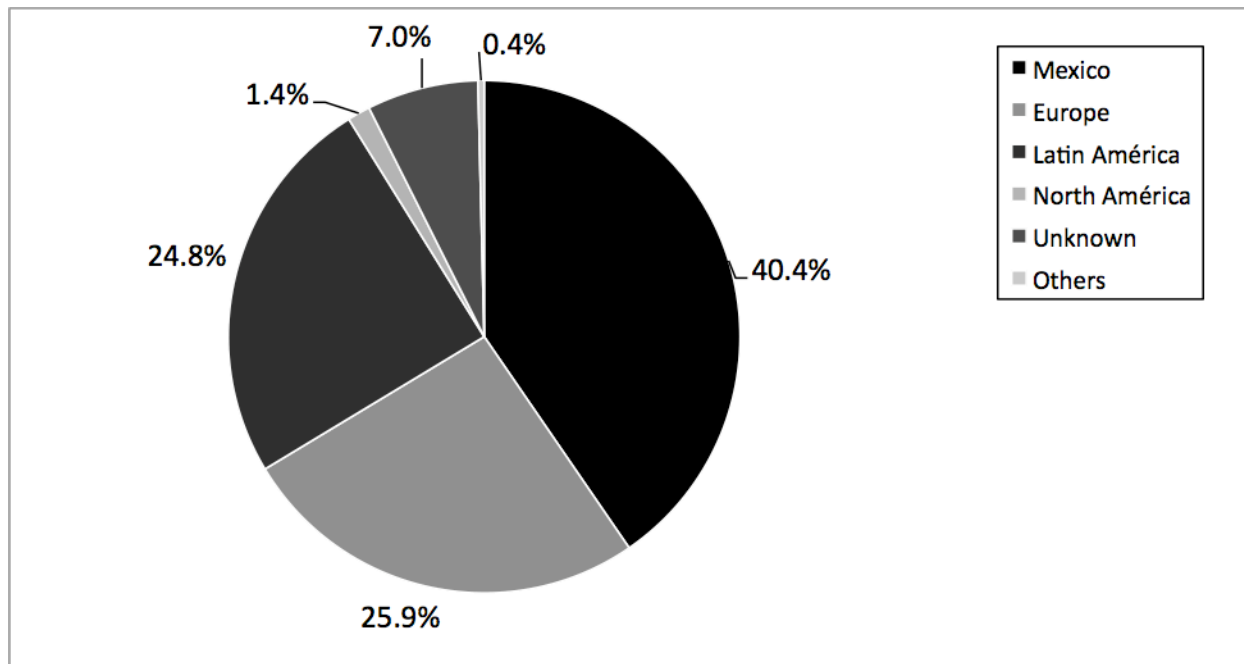


Figure 6. Geographical zones of the documents quoting the REDIE

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Temporal Behavior of the Citations

The behavior of a publication's citations over time is an important measure of the impact it can have on the academic community. A commonly-used indicator in this regard is the Immediacy Index, defined as the average rapidity with which the articles published in a journal are cited during their first year of publication. In addition to using this index, in this work we considered it important to know how fast a work is cited for the first time, and the persistence of citations over time.

Figure 7 shows the number of citations REDIE articles received in their first year of publication, for each of the ten volumes analyzed (excluding the special issue). There can be seen a very marked growth in the number of citations received by the more recent volumes, which is summarized in the trend line (dotted line). At one extreme we find that in the 1999 volume, only two citations were recorded, while in the 2008 volume, 21 citations were received in the first year. This behavior can be explained by the fact that as time passes, the REDIE is becoming better known, and is used by a growing number of researchers. It is also important to note that the 2007 volume showed a decrease in the number of citations. Although there is no documented explanation of the case, we assume that the above may be due, among other things, to the contents of the articles published in that year and the prestige of their authors.

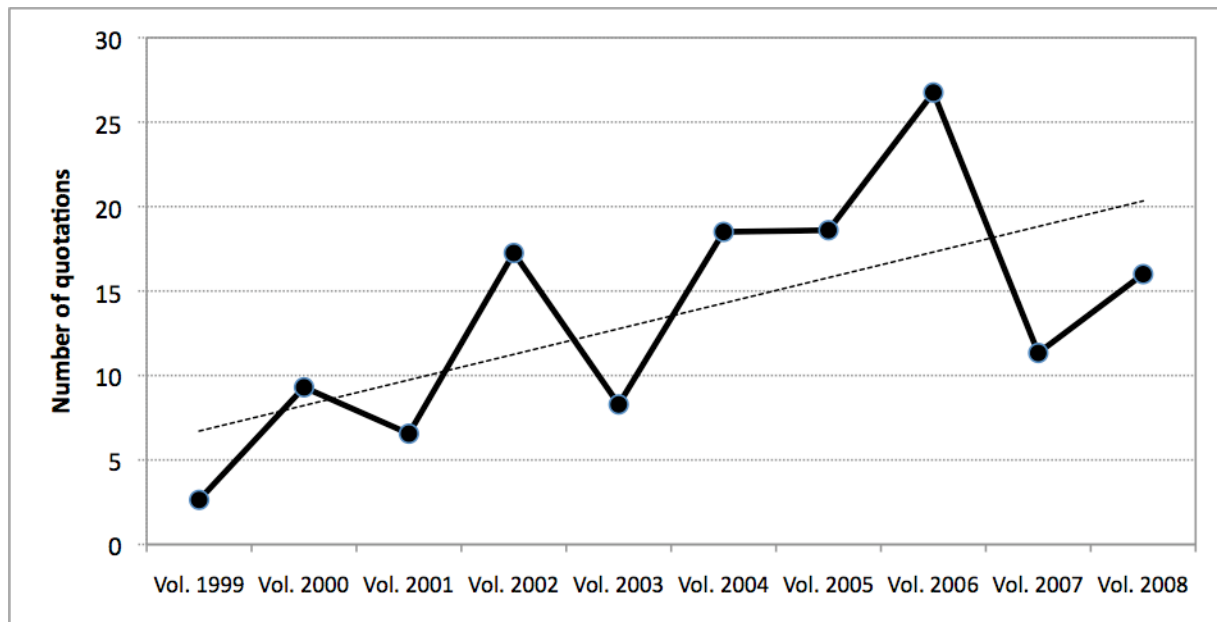


Figure 7. Temporal behavior of REDIE articles during the first year of their publication
 Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

On the other hand, Figure 8 shows the temporal behavior of the 111 citations from the REDIE articles that were cited at least once. It is important to note that in the graph are shown only the 543 citations whose documents have a publication date, for which reason 211 were not considered in this analysis. It is also important to point out that this analysis excluded the special issue published by the journal in 2008.

To compensate for the fact that not all the articles included in this study had the same opportunity to be cited, this graph shows the average of the citations of the first ten REDIE volumes (1999-2008) according to the number of years since the articles' publication. To calculate this average, there were added up the number of citations each volume received, and the result was divided by the number of volumes involved in the calculation. Therefore, while all the volumes were involved in estimating the average number of citations for the first year, only one (Vol. 1999) was part of the calculation of the articles cited for the eleven years of publication.

That said, we can see in this graph that the average number of citations received by articles increased, reaching its peak at year 4; and that beginning with year 5, there can be seen a progressive decrease in the number of citations received by works, up to year 11, during which there were no citations; although, as noted, this is true only for the volume published in 1999. Therefore, we must wait a few years more to have a greater number of articles published, so as to know more precisely the temporal behavior of the REDIE citations.

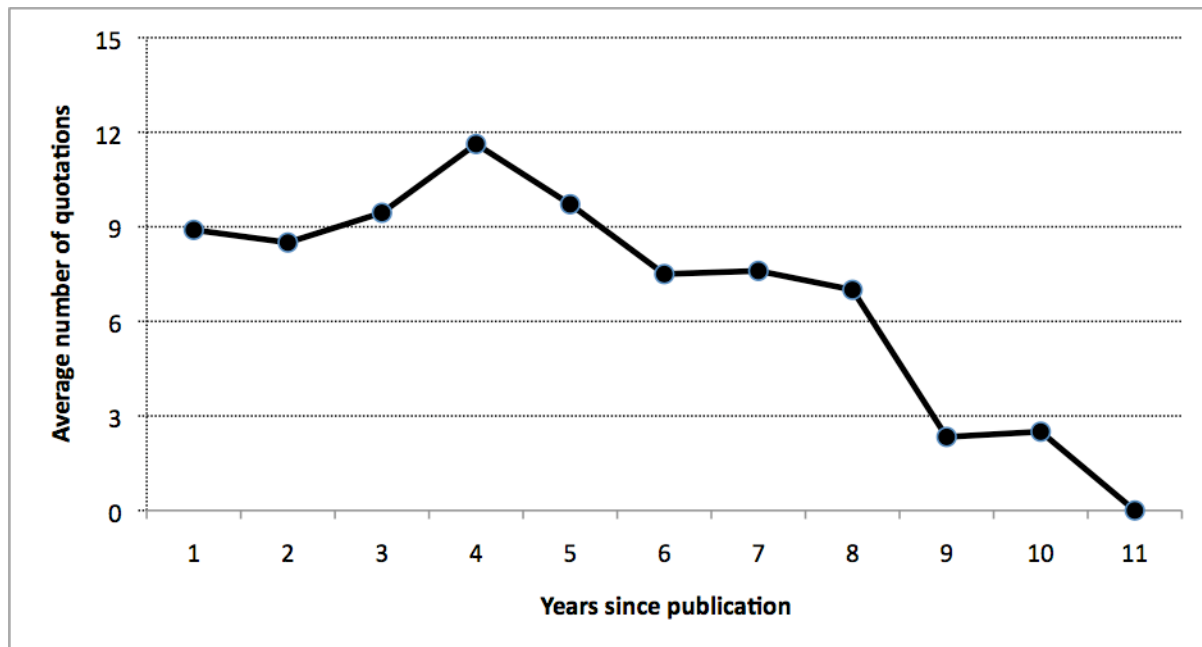


Figure 8. Temporal behavior of REDIE article citations

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Then again, to understand the behavior of the citations of the articles published, they must be individually analyzed. For obvious reasons, one might expect that the number and behavior of citations would differ in some respects from one article to another. To observe these differences the three most cited REDIE articles were analyzed: 1) *De nobis ipsis silemus?* Epistemology of Biographical-narrative Research in Education (Bolivar, 2002), which was referenced 44 times; 2) *The Role of Student's Emotional Intelligence: Empirical Evidence* (Extremera and Fernandez-Berrocal, 2004), which had 38 citations, and 3) *Quantitative Analysis of Complex Multiple-Choice Items in Science Technology and Society: Item Scaling* (Alonso, Manassero and Acevedo, 2005), which was referenced 32 times.

Figure 9 shows the behavior of the citations of the three articles; it can be seen that in both cases the citations exhibit a curve similar to the normal; in other words, there is a greater number of citations in the intermediate years and fewer citations in the first and recent years. However, the third article shows a very different behavior: in the first three years it was much cited, but abruptly stopped being cited in subsequent years. Also, the longevity or validity of the articles, as measured by the years in which they are cited, is very different for the three articles: the 2005 article lasted for three years; the 2004, for six; and the 2002, for eight years. The reasons for these differences are not known, but can also be found in the importance and quality of content and the prestige of the authors. It is also important to recognize that there are many ways to "inflate" the citations of an article, for example with self-citations, or agreements between academics to quote one another (Buela-Casal, 2003).

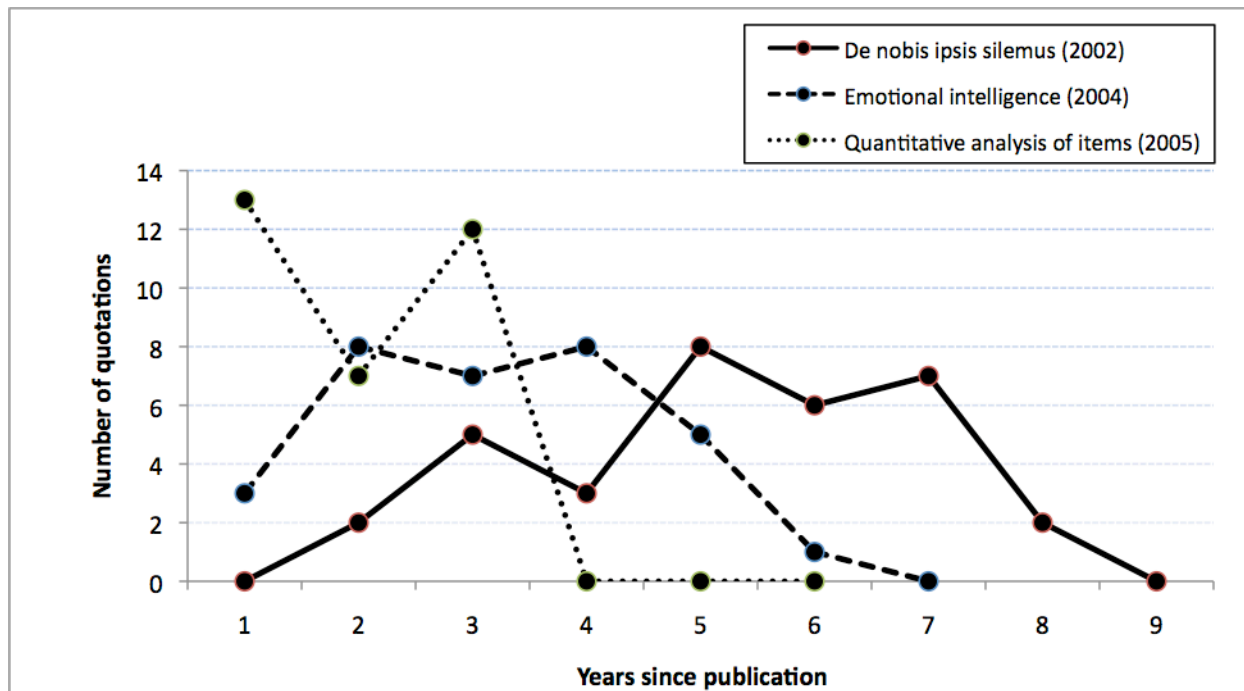


Figure 9. Behavior of citations of the three most-cited REDIE articles over time

Source: Bachoff, Renteria-Mendoza, Lopez-Ornelas, & Vidauri (2011)

Discussion and Conclusions

With the advances of the international open-access movement and the use of several digital resources, there has been an improvement in the dissemination of science, and with it, there has been opened the possibility of reducing the information gap between researchers from industrialized nations and those countries in development (Chan, 2005). Despite this progress, many scientific journals from Latin America have a very short lifespan, because, among other reasons, neither can they be read by the target audiences, nor are they referenced by other researchers in the country, the region or other parts of the world (Cetto and Alonso, 1999).

In this context, the REDIE was born as a project designed to strengthen the free dissemination of science education in Mexico, in Spanish-speaking countries, and whenever possible, in other parts of the world where English is spoken. From the beginning, cybermetric indicators of the journal's use were very encouraging in terms of the number and geographical diversity of its readers (Organista and Cordero, 2001; Cordero, Lopez Ornelas, Nishikawa and McAnally, 2009). However, the ultimate purpose of an academic journal goes beyond mere reading, and what it is trying to achieve is to get its readers to use the information as a fundamental element in the construction process of scientific knowledge.

One way of knowing to what extent this goal is being achieved is through bibliometric studies of citation, which basically examines the number of times the articles are cited in other scientific papers. With a higher rate of citation, we can say that journals are more effectively achieving one of their fundamental objectives: to be used as a source of reliable information. This is so because the citations of the articles are a good measure of the publication's importance to other researchers (Porcel, Castilian, Valderrama, and Choren Aliexandre, 2003). Therefore, this work was intended to gauge the REDIE's citation level, using two Internet search engines: Google Scholar and the traditional Google. According to Aguillo, Granada, and Llamas (2005) and Laborde (2009), this

search engine has access to the most widely-read magazines in the scientific world, except those contained in the Thomson Reuters databases and some Scopus databases.

The results of this study show the REDIE's citation profile in its first ten years of life, as analyzed in three ways: 1) by the number and proportion of citations of the articles, 2) by the source and origin of the citation, and 3) by the temporal behavior of the citations. Regarding the frequency of citations of the REDIE articles, it was found that: 66% of its articles have been cited at least once; the range of citations of articles ranged from zero to 44; on the average, each article was cited 4.7 times; and the magazine as a whole has an annual citation index of 1.29 and an impact factor of 2.57.

These results are generally consistent with findings in other bibliometric studies of different scientific journals, which have shown that the distribution of articles according to the number of citations received is very uneven, and that it is usual for a few articles to be much cited, that a greater number of articles are cited moderately, that many articles are cited once or twice, and that a significant number of articles are never quoted (Bucla-Casal, 2003). In the same vein, Laborde (2009) describes this behavior figuratively as follows:

Analyses of the citation frequency of articles published by a given journal, from virtually any discipline, at any period after publication (at 2, 5, 10 years, etc.) indicate that the frequency distribution of "citations received vs. time", is a very asymmetrical inverted "J" (p. 689-690).*

As regarding the type of documents citing the REDIE and the nationality of the sources of origin, the findings of this study show that: 1) four out of six formal citations appeared in publications (magazines and books); and 2) nearly half (47%) the citations appeared in Mexico, and the remainder (53%) come from abroad. Not surprisingly, it is basically the Spanish-speaking countries which cite the REDIE—especially Spain, and to a lesser degree, Argentina, Colombia, Venezuela and Chile. As for the countries of North America and other continents, there is in them almost no mention of the REDIE, in spite of the great effort that has been made in recent years to make the REDIE a journal fully bilingual.

As for the temporal behavior of the citations, the results show, first, that both the number of citations per article, and the citations made during the first year of publication, have been increasing gradually as time passes. This behavior is very encouraging since it shows that the REDIE over a decade has gradually, in the Latin American scientific community, assumed the position of a reliable source of information, a condition that helps it ensure a greater probability of survival for the common denominator of the Latin American journals (Guerra, Fonet, Llauro and Rodriguez, 2010).

In this same line, the study also showed that the greatest number of citations is received during the first four years after the articles' publication, reaching its climax in the fourth year, from which the quotes gradually dwindle until they reach their lowest level in the eleventh year, when citations are no longer received. This behavior tells us about the average "life cycle" of citations of all the magazine's articles. It is very interesting to compare these results with those reported by Laborde (2009), as consistent with what it is called the "idealized citation curve", and describes as follows:

* Translator's note: Since some of the original English versions of the works produced in that language, and cited in this work, were unavailable for use in this translation, it was necessary to employ the technique of back-translation, for which we offer our most humble apologies.

"...An article or good quality paper will receive an increasing number of citations within two years after publication; not long afterward reaching the peak of citation, to sink down later over time. (P. 691).

Another of the findings is that the citation behavior of individual articles is very different, one from the other, and that the citation curves do not have the same shape, which coincides with what is pointed out by Adler, Ewing and Taylor (2008) for different disciplines or fields of science.

Now, to get an idea of the REDIE's level of citation, we compared it with the citation level of other Mexican and Latin American journals. However, since this magazine is not yet in Thomson Reuters, a way to make this comparison was to use the Harzing program Publish or Perish (<http://www.harzing.com/pop.htm>), which also uses the Google Scholar search engine. This program is free, and calculates various citation indicators for journals (and authors), with the only restriction that their calculation is based on a maximum of one thousand records (which is what Google Scholar allows). Therefore, it is wise to keep this limitation in mind for those journals that exceed this limit—which are the majority.

That said, Table 3 shows the results of this analysis using three indicators, two of which are from Publish or Perish: 1) the FI, for those journals that are indexed in Thomson Reuters, 2) the relationship citations/articles, which is the ratio between the total number of citations and the articles published in a magazine, and 3) the AWCR (Age-Weighted Citation Rate), an indicator that measures the number of citations from an entire magazine, adjusting the "age" of each article published.

With these indicators, the REDIE was compared with six Spanish-language psychology and education journals: four Mexican and two Latin American (which can be identified by their names). As shown in the table, under Publish or Perish, the REDIE has an average of 2.77 citations per Article⁵ and a score of 253.7 on the AWCR indicator. On the first indicator, the journal is located in the middle of the table, while in the second it is the leader of the seven journals. This means that although the REDIE does not have the highest proportion of citations per article, it does have the best relationship between the number of citations and articles, when considering the age of the latter. For a young journal, only eleven years old, this indicator is very encouraging.

⁵ This result is lower than that obtained in this work (4.7), and can be explained by the use of two search engines instead of one, as well as the participation of the authors themselves in complementing citations that would not have been identified otherwise.

Table 3
Comparison Between FI and Other Citation Indicators

Journals	First year of publication	Impact Factor *	Publish or Perish (Harzing)	
			Citations/ articles	AWCR
Online Journal of Educational Research	1999	-	2.77	253.79
Journal of Higher Education	1972	-	3.03	236.46
Mexican Journal of Educational Research	1986	-	1.94	222.86
Latin American Journal of Psychology	1970	0.077	2.66	200.30
Inter-American Journal of Psychology	1967	0.075	2.85	160.75
Mexican Journal of Psychology	1984	0.109	3.49	134.15
Educational Profiles	1978	-	1.47	117.92

* *Source:* Buela-Casal, Carretero-Dios y Santos-Roig (2002)

However, we are left to wonder how the FI relates with the two Publish or Perish indicators. As one can see at a glance, this relationship is very poor. For example, the Mexican Journal of Psychology is the one with the highest IF (0.109) and the highest proportion of citations per article (3.49), but it is one of the journals with the lowest AWCR score (134). These results have a logical explanation, considering the sources where citations are sought and the calculation used to obtain each indicator. Therefore, to assess the impact of a journal it is desirable to have several citation indicators that complement each other.

On the other hand, like all studies of citation, the results of this study present some limitations that have to do with the restriction of access to certain journals. For instance, we did not have access to: 1) restricted databases that have not joined the Open Access Initiative; 2) printed journals that have not gone through a scanning process and are not found on the Internet; and 3) journal numbers that have not been updated in databases and repositories such as Latindex, SciELO, RedALyC, Clase and IRESIE.

In spite of these limitations, we believe that the methodology used shows a viable way to understand the impact of Latin American online journals, published in Spanish and read primarily in Spanish-speaking countries. Moreover, as suggested by Michan *et al.* (2008), the SCI and Scopus databases may not be the most appropriate for evaluating the true impact of the Latin American journals. To this assertion we would add that this is especially true for those publications not belonging to the hard sciences.

Note that the results of this study provide evidence that open-access electronic journals are a good tool for improving the distribution of scientific knowledge in Latin American countries, and consequently, boost their development. This is based on the following arguments: 1) online journals have an excellent means of free distribution—the Internet—so that they can reach anywhere in the world that has this service, and this can be quantified by the number of visits and downloads of which they are the object; 2) online peer-reviewed journals are gaining increased academic standing, and are frequently used as references necessary to support scientific work, which can be measured by the number of citations they receive, both in print and on the Internet; 3) although many online journals are not indexed in Thomson Reuters or Scopus, the search engine Google is a good option

for finding out the citation level of the publications in the "information cloud", which can be measured manually (as was done in this work) or with programs devoted to it (as is the case of Publish or Perish).

Finally, it is important that the open access electronic journals in Latin America be challenged to become known, read and cited, in principle, first in their country of origin, then in Latin American countries, and finally, in those that have attained a level of scientific maturity. To the extent that we attain this goal, which will involve time and effort, the dissemination of science in our countries will be consolidated.

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About the Authors

Eduardo Backhoff
Autonomous University of Baja California, México

Email: ebackhoff@gmail.com

Eduardo Backhoff is an educational researcher at the Institute of Educational Research and Development, Autonomous University of Baja California, Mexico. He has worked in the field of large-scale assessment, computer-assisted assessment, and the problems of international translation tests. He is currently Scientific Editor of the Online Journal of Educational Research (REDIE) and is technical advisor of international organizations conducting learning and teaching comparative studies.

Rosalinda Rentería-Mendoza
Autonomous University of Baja California, México

Email: rosalia_renteria@hotmail.com

Rosalinda Renteria-Mendoza studied Computer Science and have a Master's degree in Networks Computer Science and Technology, as well as in Administration. She currently teaches two college subjects: Administrative Computing subjects and foreign languages. She has worked as adviser on the formulation and evaluation of business plans. It is the first time she participates at the Institute of Educational Research and Development.

Maricela López Ornelas
Autonomous University of Baja California, México

Email: ornelas@uabc.edu.mx

Maricela Lopez-Ornelas studied her doctorate program at the University of La Laguna (Spain). She works as full-time at the Institute of Educational Research and Development. She teaches in the area of communication, and is responsible for the online edition of the Online Journal of Educational Research (REDIE). Her lines of research interest are: evaluation of Internet information, and criteria for quality and excellence of online journals. She is part of the drafting committee publications scientific communication area.

Gabriela Vidauri
Autonomous University of Baja California, México

Email: gvidauri@uabc.edu.mx

Gabriela Vidauri specialized in language and literature of Latin America countries and has been Editorial Director of politics and business magazines. She is currently the Production Editor of the Online Journal of Educational Research (REDIE), and works as academic technician at the Institute of Educational Research and Development.

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