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Highly cited articles in the Education and Educational Research category in the Social Science Citation Index: a bibliometric analysis

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ABSTRACT

This paper presents a bibliometric analysis of highly cited articles published in the Web of Science category “Education and Educational Research” in the Social Science Citation Index (SSCI). A total of 2091 journal articles published in this category and cited more than 100 times up to the end of the year 2016 were retrieved as highly cited articles. Distributions of highly cited articles per publication year, journals, institutions and countries were analysed, as well as the citation life cycle of the top-cited articles. The USA, its institutions and researchers are the absolute leaders in the category of Education and Educational Research according to the results of the conducted analysis.

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KEYWORDS

Education and Educational Research category; highly cited articles; SSCI; USA

Introduction

Bibliometric analysis is an approach to researching the publication data within some scientific category or scientific community, in a country or region. While some commentators argue that bibliometric analysis fails adequately to assess the quality and significance of published work (Furlan and Fehlings 2006; Baltussen and Kindler 2004), others are more sanguine about its potential benefits. Abt (1993) stated that the numbers of published research papers and reviews can be used to evaluate the quantity of science in a particular category or community, while Brace (1992) argued that numbers of citations can effectively evaluate the quality of the science. Levitt and Thelwall (2009) also claimed highly cited articles are associated with high-quality research. Kostoff, Barth, and Lau (2008) measured the quality of science of a country as the ratio of highly cited papers to total papers produced in sequential time frames by researchers from that country. Moreover, highly cited papers can reveal the profile of scientific advancement and give a historic perspective of scientific progress (Baltussen and Kindler 2004; Ohba et al. 2007).

Web of Science is a citation database that indexes scientific results and classifies them into a few sub-databases including the Social Science Citation Index (SSCI). Also, the results are further classified into Web of Science categories. Education and Educational Research

(E&ER) is one of 57 Web of Science categories indexed into the SSCI sub-database. The E&ER category is expanding in terms of the number of journals listed in this category: there were 224 journals listed in the E&ER category in the Journal Citation Reports (JCR) for the year 2014, exactly twice as many as the number of journals listed in JCR for the year 2008. This paper presents a bibliometric analysis of highly cited articles published in journals belonging to the SSCI scientific category of Education and Educational Research.

Several papers have analysed highly cited articles belonging to other scientific categories. Blessinger and Hrycaj (2010), Levitt and Thelwall (2009), and Ivanović and Ho (2016), for example, analysed highly cited articles in the category of Information Science & Library Science. Ho also analysed characteristics of classic articles published in the Web of Science Social Work subject category (Ho 2014a), the characteristics of the top-cited articles published in the Science Citation Index Expanded database (Ho 2013), as well as the top-cited articles published in the Chemical Engineering subject category (Ho 2012). Using the Essential Science Indicators (ESI) database, both a bibliometric evaluation of highly cited papers published by Chinese researchers with high-level representation was conducted (Fu et al. 2011), as well as an analysis of trends and characteristics of papers in the subject category of Water Resources (Chuang, Wang, and Ho 2011). Using the Web of Science database, the top-cited articles published in the environmental and material science journals listed therein were analysed (Khan and Ho 2012; Ho 2014b), the top cited articles in adsorption research (Fu, Wang, and Ho 2012; Fu and Ho 2014), pain-related research (Chuang and Ho 2014), and thermodynamic research (Fu and Ho 2015a). The characteristics of highly cited biomass articles in the Science Citation Index Expanded were presented in Chen and Ho (2015).

While such bibliometric analyses of papers in various scientific categories have been published in these areas, no analyses have been published of articles in the Education and Educational Research (E&ER) scientific category, the subject of the current paper.

Research data-set and indicators

Our analysis considered the distribution of highly cited articles by publication years, journals, source institutions and countries. An invariant parameter, the bibliometric indicator TC_{2016} (Wang, Hui-Zhen, and Ho 2011), was also used, thus ensuring repeatability of analysis. The Web of Science citation index is not time-invariant and has been updated from time to time (Fu, Wang, and Ho 2012).

Data-set

Data used in this research were taken from the Social Science Citation Index (SSCI) sub-database of the Web of Science (updated on 19 September 2017). According to Journal Citation Reports (JCR) for the year 2016, there were 3236 journals indexed in 57 Web of Science categories in the SSCI. There were 235 journals listed in the category of Education and Educational Research (E&ER) in the JCR for 2016. The schematic for the searching process for highly cited articles is shown in Figure 1. There were 8,546,348 documents from 1900 to 2016 found in SSCI, and 464,230 documents in the E&ER category. Total citations up to the end of 2016 (TC_{2016}) higher than 100 was used as a filter to extract the highly cited documents (2455 documents). Using this criterion, 0.53% of the total documents published in the Web

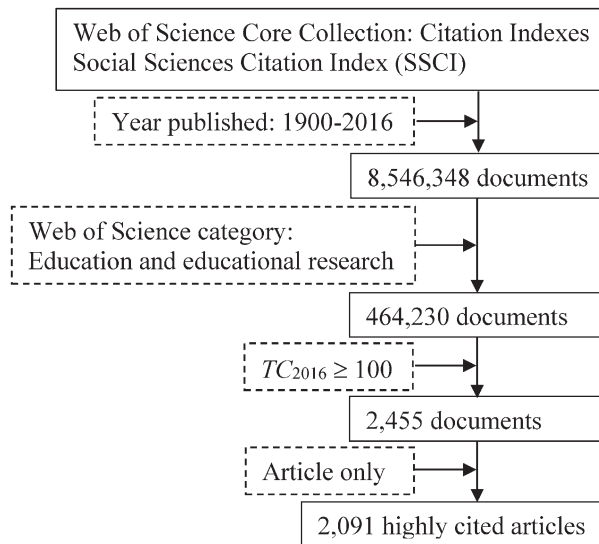


Figure 1. Schematic for searching the highly cited articles in E&ER.

of Science category of E&ER are regarded as highly cited publications; these include articles (2091; 85% of the 2455 highly-cited documents), reviews (319; 13%), proceedings papers (162; 6.6%), editorial materials (36, 1.5%), notes (4; 0.16%), book chapters (3; 0.12%), book reviews (2; 0.081%), letters (2; 0.081%), and reprints (1; 0.041%).

The 2091 articles with $TC_{2016} \geq 100$ were used for further analysis. Consolidation of country affiliation data was performed. Articles originating from England, Scotland, Northern Ireland and Wales were classified as being from the United Kingdom (UK). Articles from Hong Kong were included under the heading of China. Federal Republic of Germany (Fed Rep Ger) and Germany were reclassified as being from Germany (Ho 2012).

Indicators

All indicators used in the presented analysis were manually calculated by self-designed algorithms and built-in functions and graphed using Microsoft Excel 2013 for visual representation (Li and Ho 2008). These included:

- (1) *Total number of articles (TP)* – total number of analysed highly cited articles:
 - that were published in a certain period (Figure 2 – Total highly cited articles),
 - that were published in a certain journal (Table 1),
 - had at least one author affiliated with a certain institution (Table 2),
 - had at least one author affiliated to a certain country (Table 3).
- (2) *Number of first author articles (FP)* – total number of analysed articles in which:
 - the first co-author or the only author was affiliated with a certain institution (Table 2),
 - the first co-author or the only author was affiliated to a certain country (Table 3).
- (3) *Number of corresponding author articles (RP)* – total number of analysed articles in which:
 - the corresponding author or the only author was affiliated with a certain institution (Table 2),

- the corresponding author or the only author was affiliated to a certain country (Table 3).
- (4) *Number of single author articles (SP)* – total number of single author articles in which:
 - the only author was affiliated with a certain institution (Table 2),
 - the only author was affiliated to a certain country (Table 3).
- (5) *Number of independent publications (IP)* – total number of analysed articles in which:
 - all authors were only affiliated with a certain institution (Table 2),
 - the authors were only affiliated to a certain country (Table 3).
- (6) *Number of collaborative publications (CP)* – total number of analysed articles in which:
 - at least one author was affiliated with a certain institution and at least one author was not affiliated with the same institution (Table 2),
 - at least one author was affiliated to a certain country and at least one author was not affiliated to the same country (Table 3).
- (7) *Total citation up to the end of 2016 (TC_{2016})* – total citations from the Web of Science Core Collection since the year of an article publication up to the end of 2016 (Chuang, Wang, and Ho 2011) – Figures 1 and 3.
- (8) *Total citation in the year 2016 (C_{2016})* – total citations from the Web of Science Core Collection in the year 2016 (Section *Top-cited articles*).
- (9) *Citations per publications up to the end of 2016 (CPP_{2016})* – this indicator is calculated using formula TC_{2016}/TP (Ho and Ho 2015) – Figure 2 (citations per publication).
- (10) *Impact factor for 2016 (IF_{2016})* – impact factor of a journal, according to JCR for the year 2016 (Table 1).

Findings and discussion

This section presents findings of the bibliometric analysis and a discussion of those findings. The section is split into three sub-sections:

- Publication years – presents the distribution of analysed highly cited articles per publication year.
- Top-cited articles – presents the citation life cycles of top-cited articles.
- Journals, Institutions and Countries – presents the distribution of analysed highly cited articles per journals, institutions and countries.

Publication years

This section presents the distribution of analysed highly cited articles per publication year. As noted above, a total of 2091 highly cited articles in the Web of Science E&ER category in the SSCI sub-database were published from 1926 to 2013. Precedents for such analyses exist in the work of Ho and colleagues, who analysed the relationship between number of articles and citations per publication by publication year and country (Monge-Nájera and Ho 2015), research field (Ho and Ho 2015), journal (Fu and Ho 2015b), and the top-cited research publications in the SCI-EXPANDED (Ho 2013). Figure 2 depicts the distribution of analysed highly cited articles per decade. In total, 1531 highly cited articles (73% of 2091 articles) were

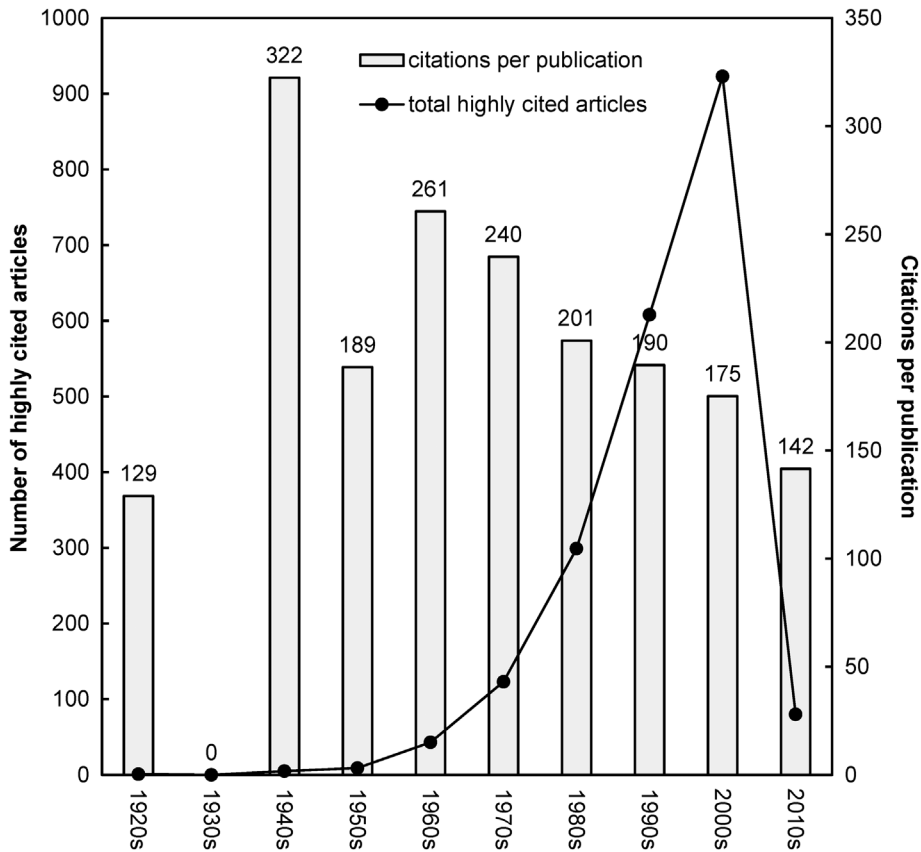


Figure 2. Distribution of highly cited articles per decade.

published in the 1990s and the 2000s. On the other hand, citations per publication (CPP_{2016}) in these two decades were lower than CPP_{2016} for articles published in the previous decades. In addition, the number of highly cited articles published in the 2010s probably will change more in the future than numbers of highly cited articles published in previous decades.

Top-cited articles

Figure 3 shows the eight most-cited articles according to TC_{2016} with $TC_{2016} \geq 1200$. Five of the eight shown articles were published by a single author and each of the rest of the three articles is a result of the collaboration of three co-authors. There are two articles published in the 1970s and three articles published in the 1990s. Taking into account citation life cycle total citation in the year 2016 (the C_{2016} indicator), one can expect that the article by Preacher, Curran, and Bauer (2006) could overtake the other articles in the future (C_{2016} for this article is 289). The main reason for this article's popularity appears to be the fact that the article lays out the groundwork for a suite of online utilities that are widely applicable across a variety of research applications. Because of that, we assume there will be many new citations for this article in the future.

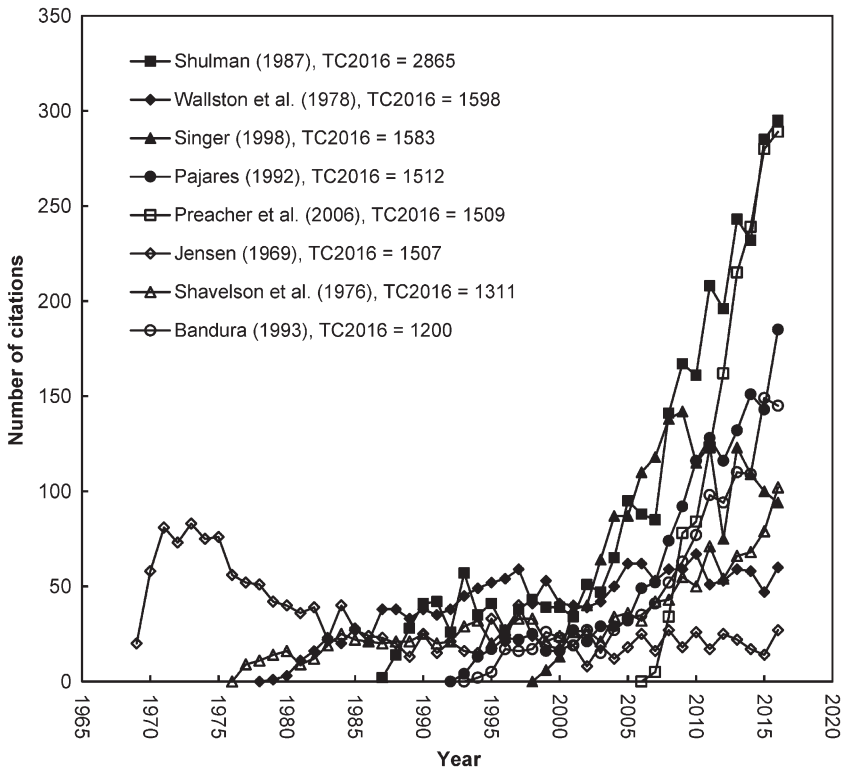


Figure 3. Eight top-cited articles according to TC2016 (TC2016 ≥ 1200).

Table 1. Distribution of highly cited articles per journal.

Journal	Country	TP (%)	IF ₂₀₁₆ (rank)
American Educational Research Journal	USA	137 (6.6)	2.931 (13)
Review of Educational Research	USA	119 (5.7)	5.263 (2)
Computers & Education	UK	99 (4.7)	3.819 (7)
Sociology of Education	USA	79 (3.8)	2.697 (14)
Journal of Research in Science Teaching	USA	78 (3.7)	3.179 (9)
Harvard Educational Review	USA	77 (3.7)	2.674 (15)
Educational Psychologist	USA	75 (3.6)	6.257 (1)
Reading Research Quarterly	USA	68 (3.3)	1.596 (55)
Health Education Research	USA	56 (2.7)	1.816 (43)
Teaching and Teacher Education	UK	54 (2.6)	2.183 (30)
Science Education	USA	48 (2.3)	2.506 (16)
Language Learning	USA	46 (2.2)	2.079 (33)
Tesol Quarterly	USA	44 (2.1)	2.056 (34)
Journal of Higher Education	USA	39 (1.9)	1.883 (40)
Higher Education	NL	37 (1.8)	1.571 (62)
Journal of School Health	USA	36 (1.7)	1.749 (44)
Elementary School Journal	USA	34 (1.6)	1.151 (111)
Journal of American College Health	USA	34 (1.6)	1.556 (64)
Journal of the Learning Sciences	USA	34 (1.6)	2.297 (25)
Journal for Research in Mathematics Education	USA	33 (1.6)	1.906 (38)
Learning and Instruction	UK	32 (1.5)	3.983 (4)
Modern Language Journal	USA	32 (1.5)	1.745 (45)
Studies in Higher Education	UK	31 (1.5)	1.527 (65)
Teachers College Record	USA	31 (1.5)	1.262 (97)

TP: the total number of included highly cited articles; IF₂₀₁₆: impact factor of a journal according to JCR for the year 2016.

Journals, institutions and countries

This section describes the distribution of analysed highly cited articles per journal, institution and country. Table 1 shows the top 24 journals with $TP > 30$ in the Web of Science category of E&ER. The journal *American Educational Research Journal* took first place by number of published highly cited articles, followed by *Review of Educational Research* and *Computers & Education*. Although the journal *American Educational Research Journal* took first place, it was placed thirteenth in the JCR list of E&ER category for the year 2016. However, this journal was placed much higher in the past, and it took first place in impact factor in the Web of Science category of E&ER for the year 1997, second for the year 2003, and third for the years 1998, 2002 and 2012. Moreover, this journal did not publish any of the eight top-cited articles shown in Figure 3. On the other side, the journal *Journal of Educational and Behavioral Statistics* (formerly *Journal of Educational Statistics*), which is not ranked in the top 24 journals by number of published highly cited articles, published two of the top five cited articles in the analysed field (namely, Singer 1998; Preacher, Curran, and Bauer 2006). The 13 leading journals in Table 1 published 47% of all analysed highly cited articles. A total of 19 of 24 top journals are issued in the USA, while 4 journals were issued in the UK and 1 journal in the Netherlands. In Figure 3, all of the top-cited articles were published in journals published in the USA.

Six indicators, total publications (TP), independent publications (IP), collaborative publications (CP), first author publications (FP), corresponding author publications (RP), and single author publications (SP), were proposed to evaluate publication of institutions and countries (Ho and Kahn 2014). Of the 2047 highly cited articles having affiliation information in the Web of Science, 1269 (62% of 2047 articles) were institutionally independent articles (IP) and 778 (38%) were inter-institutionally collaborative articles.

Table 2. Characteristics of the 20 most productive institutions.

Institution	Rank (TP)	Rank (IP)	Rank (CP)	Rank (FP)	Rank (RP)	Rank (SP)
University of Michigan, USA	1 (103)	1 (50)	1 (53)	1 (73)	1 (71)	5 (16)
University of Illinois, USA	2 (73)	3 (33)	2 (40)	2 (51)	2 (49)	5 (16)
University of Wisconsin, USA	3 (65)	4 (31)	3 (34)	2 (51)	2 (49)	4 (17)
Harvard University, USA	4 (64)	2 (34)	6 (30)	4 (49)	2 (49)	1 (29)
Stanford University, USA	5 (61)	5 (27)	3 (34)	5 (44)	5 (40)	2 (21)
Michigan State University, USA	6 (49)	5 (27)	9 (22)	6 (35)	7 (34)	3 (18)
University of California, Los Angeles, USA	6 (49)	11 (17)	5 (32)	7 (34)	6 (35)	16 (8)
Indiana University, USA	8 (39)	18 (12)	7 (27)	9 (26)	9 (26)	27 (6)
University of North Carolina, USA	8 (39)	16 (14)	8 (25)	15 (21)	15 (21)	16 (8)
University of Minnesota, USA	10 (36)	15 (15)	12 (21)	8 (29)	8 (29)	31 (5)
University of Washington, USA	10 (36)	9 (18)	16 (18)	10 (25)	12 (22)	10 (10)
Johns Hopkins University, USA	12 (34)	7 (22)	26 (12)	10 (25)	10 (24)	10 (10)
University of California, Berkeley, USA	12 (34)	8 (19)	20 (15)	12 (24)	12 (22)	7 (15)
University of Texas, USA	12 (34)	18 (12)	9 (22)	16 (20)	16 (19)	16 (8)
Northwestern University, USA	15 (31)	18 (12)	14 (19)	21 (18)	20 (18)	13 (9)
University of Maryland, USA	15 (31)	18 (12)	14 (19)	13 (23)	11 (23)	31 (5)
Pennsylvania State University, USA	17 (28)	13 (16)	26 (12)	17 (19)	16 (19)	10 (10)
Vanderbilt University, USA	17 (28)	41 (6)	9 (22)	17 (19)	16 (19)	76 (2)
University of Chicago, USA	19 (27)	27 (9)	16 (18)	27 (13)	26 (13)	16 (8)
University of Pennsylvania, USA	19 (27)	9 (18)	35 (9)	13 (23)	12 (22)	9 (12)

TP : total number of analysed highly cited articles; IP : number of analysed single institute articles; CP : number of analysed inter-institutionally collaborative articles; FP : number of analysed first author articles; RP : number of analysed corresponding author articles; SP : number of analysed single author articles.

Table 3. Characteristics of the 20 contributing countries.

Country	Rank (<i>TP</i>)	Rank (<i>IP</i>)	Rank (<i>CP</i>)	Rank (<i>FP</i>)	Rank (<i>RP</i>)	Rank (<i>SP</i>)
USA	1 (1437)	1 (1347)	1 (90)	1 (1399)	1 (1365)	1 (516)
UK	2 (200)	2 (168)	3 (32)	2 (177)	2 (177)	2 (72)
Canada	3 (122)	3 (88)	2 (34)	3 (104)	3 (103)	4 (41)
Australia	4 (111)	4 (86)	4 (25)	4 (96)	4 (95)	3 (43)
Netherlands	5 (67)	5 (54)	5 (13)	5 (62)	5 (62)	5 (18)
Germany	6 (30)	7 (18)	6 (12)	6 (26)	7 (26)	8 (7)
Taiwan	7 (29)	6 (23)	9 (6)	7 (25)	8 (25)	8 (7)
China	8 (26)	8 (15)	7 (11)	8 (20)	9 (20)	6 (8)
Israel	9 (23)	8 (15)	8 (8)	9 (18)	10 (18)	8 (7)
New Zealand	10 (17)	10 (14)	17 (3)	10 (15)	11 (14)	6 (8)
Spain	11 (13)	11 (9)	14 (4)	11 (11)	12 (11)	12 (2)
Finland	12 (12)	12 (8)	14 (4)	12 (10)	13 (10)	18 (1)
Belgium	13 (11)	12 (8)	17 (3)	13 (9)	14 (9)	11 (3)
Singapore	14 (10)	14 (4)	9 (6)	13 (9)	14 (9)	18 (1)
South Korea	14 (10)	14 (4)	9 (6)	15 (6)	16 (6)	18 (1)
Switzerland	16 (9)	18 (3)	9 (6)	18 (4)	19 (4)	12 (2)
Sweden	17 (7)	18 (3)	14 (4)	16 (5)	17 (5)	18 (1)
France	18 (6)	18 (3)	17 (3)	16 (5)	17 (5)	N/A
Hungary	18 (6)	30 (1)	13 (5)	18 (4)	19 (4)	12 (2)
South Africa	18 (6)	18 (3)	17 (3)	24 (3)	27 (2)	N/A

TP: total number of analysed highly cited articles; *IP*: number of analysed single country articles; *CP*: number of analysed internationally collaborative articles; *FP*: number of analysed first author articles; *RP*: number of analysed corresponding author articles; *SP*: number of analysed single author articles; N/A: not available.

Table 2 shows the top 20 productive institutions, which were all located in the USA. The University of Michigan took first place in five indicators such as *TP*, *IP*, *CP*, *FP* and *RP*, while Harvard University published the most single-author highly cited articles. D.L. Ball and V.E. Lee from the University of Michigan were the most important contributors for the highly cited articles. Lee published 11 highly cited articles in E&ER, including 10 first author and 10 corresponding author articles. Ball published 10 highly cited articles including five first author, five corresponding author and four single-author articles. The most productive non-USA institutions were King's College London in the UK and Ontario Institute for Studies in Education in Canada, both ranked 27th with 20 highly cited articles.

There were 44 articles without any author affiliation information on the Web of Science, while the rest of the 2047 analysed articles were published by researchers from 42 countries taking into account author affiliations. In total, 1905 (93% of 2047) were single-country articles published by researchers from 35 countries while only 142 (6.9%) were internationally collaborative articles. These involved researchers from 36 countries. Table 3 shows the top 20 countries ranked according to their number of total articles. This includes the number and percentage of total articles, single country articles, internationally collaborative articles, first author articles, corresponding author articles and single-author articles. Researchers from the USA were involved in publishing 70% of the 2047 articles, followed by researchers from the UK, Canada and Australia, who were involved in publishing 9.8, 6.0, and 5.4% of the articles, respectively. The official language in the four leading countries shown in Table 3 is English. The USA dominated in all six indicators.

Limitations

Some indicators based on citation number are time-dependent indicators and can change over time. Because of that, we used some citation-based indicators such as TC_{2016} and C_{2016} which are time-invariant indicators.

We analysed only articles indexed in the SSCI database, because we believe this data-set currently represents the “industry standard”, though other data-sets are emerging.

Conclusions

This paper presents a bibliometric analysis of 2091 highly cited journal articles published in Web of Science category of Education and Educational Research in the SSCI. We discovered the most productive journals, institutions and countries as assessed by the number of highly cited articles. We concluded that the USA, its institutions and journals, are the absolute leaders in the category of Education and Educational Research. Moreover, researchers affiliated with USA institutions were involved in publishing 70% of all highly cited articles. Interestingly, given the significance of international collaboration in research (Aksnes 2003), only 6.9% of the highly cited articles were the results of international collaborations. The most productive decade was the 2000s, and 44% of analysed highly cited articles were published in that decade. However, our definition of highly cited articles is based on TC_{2016} and we expect that the 2010s, once the decade is complete, will produce higher citation counts than the 2000s.

Disclosure statement

No potential conflict of interest was reported by the authors.

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