Studying Engagement in Educational Settings: A Bibliometrics on High-Impact Academic Engagement Research

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Article

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Abstract: Academic engagement provides opportunities and resources for students to engage in socio-educational interactions and academic learning. Our study provides an overview of high-impact research in academic engagement and the potential causes of its high valuation in the scientific community based on a bibliometric analysis of 4667 articles indexed in Web of Science, processed mainly by VOSviewer software. In terms of results, the publication of selected articles grows exponentially year by year, presenting concentration levels of 1% in authorship, 49% in a single country, and 5% of the journals. As well as 6% in highly cited articles, which in this case is associated with authors with high levels of publication. The most cited current topics are those relating academic engagement with motivation and emotional aspects.

Keywords: engagement; educational research; behavioral studies; prolific author; h-index

1. Introduction

Engagement is a persistent, pervasive, positive, and satisfying affective-cognitive mental state with work, characterized by vigor, dedication, and absorption [1], As an adaptation of engagement, academic engagement is reconceptualized to the academic and social environment of education, with characteristics that provide opportunities and resources for students to engage in academic learning and social interactions [2]. This academic engagement with learning processes allows for the optimization of academic performance, as well as being an important construct promoting interest, enjoyment, and psychological well-being among students [3].

Thus, academic engagement is of interest to higher education institutions, in relation to student dropout and the possibilities of being a significant predictor of early student dropout intentions [4]. In this line Ketonen et al [5] identify four latent student profiles (engaged, disengaged, undecided and alienated) according to: engagement with the study, burnout related to study, lack of interest, lack of self-regulation and uncertainty in career choice. Concluding that engaged students received the highest scores, while disengaged and undecided students scored the worst. Which reinforces the conclusions of the Casuso-Holgado et al. study [6] between academic engagement and performance, in which, despite gender differences, grade point average is the academic index most strongly associated with academic engagement. One variable that does not appear to be innocuous for academic engagement is ethno-racial identity, for which fostering parental cultural socialization, in relation to ethno-racial pride, may promote academic engagement [7].

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It has also been shown that students who feel higher levels of psychological resources are more academically engaged, which has a positive impact on their academic performance [8]. Thus, in the case of positive emotions, these build psychological capital and academic engagement in students, improving academic performance [9]. Also, fostering the skills to understand and consider others' perspectives, known as social perspective-taking (SPT), is crucial for academic and social development of students [10]. Although according to temporal perspective theory, how people value the past, present, and future influences their actions. In the case of students, it was found that only future temporal perspective (the importance people place on the future) uniquely predicted academic engagement intention and academic performance [11]. Thus, it is key to reinforce students' psychological security, understood as a mental state of feeling safe and supported in the educational environment, given that it is a positive predictor of academic performance [12]. In addition, students with high emotional self-efficacy, i.e., those who were confident in their abilities to manage emotions in the context of learning in the digital society, obtained better academic results [13].

Regarding the measurement of academic engagement, although the Utrecht Work Engagement Scale (UWES) and its three factors: vigor, dedication and absorption are commonly used [1,16–18]. In contrast, the study by Wefald et al. [19], did not confirm a trifactorial structure, and found that engagement and satisfaction are closely related constructs. Thus the discrepancies in the number and nature of the dimensions that make up academic engagement [20], give openness to other psychometric measurement instruments such as the University Student Engagement Inventory (USEI), also trifactorial (behavioral, emotional and cognitive) [21–23], and the relationship of academic engagement with a number of other constructs: stress and burnout [24], positive emotions, autonomy and self-efficacy [25], teacher work engagement [26], satisfaction and frustration [27], self-esteem and motivation [28].

Therefore, our study aims to provide a panoramic view of academic engagement research and to identify high-impact research on this type of behavior in educational environments. It answers how certain variables are related to high citation, depending on: the age of the documents, characteristics of their authors and national authorship ascriptions, journals of publication and open access to these documents.

2. Methods

Based on a dataset extracted from the Core Collection of Web of Science (WoS) on July 15, 2024, with the thematic search vector on Academic Engagement {TS=(academic NEAR/0 engagement)}, refined by Web of Science Index: Social Sciences Citation Index (SSCI) or Science Citation Index Expanded (SCI-EXPANDED), and Document Types: Article. T the thematic search tag TS (performs a simultaneous search on the following fields: title, keywords, author, abstract and Keywords Plus® and the word proximity operator (NEAR) and simultaneously incorporates both words [29]. Then, based on the "Guidelines for advancing theory and practice through bibliometric research" by Mukherjee et al. [30], both performance analysis and science mapping are performed. For performance analysis, the bibliometric laws [31] of Price [32], Lotka [33], Bradford, Zipf [34] and Hirsch's index [35] are used, and science mapping focuses on co-authorship analysis using VOSviewer software for co-authorship and co-occurrence analysis discovering social relationships of both authors, organizations or countries, and thematic relationships between keywords [36].

1) Price's Law allows to analyze the exponential growth of science (exponential growth adjustment of the annual publications number) as an expression of critical mass of knowledge interesting to be studied [32,37].

2) Lotka's Law, allows segregating authors of high production in a specific subject from those who have an ephemeral step in a particular area of scientific knowledge (high percentage of authors who only present one or a relatively small number of published papers), to estimate the concentration of authors the square root is applied on the total number of authors, which is then adjusted according to a discrete number of publications, the resulting set of authors is known as prolific authors [33,38,39].

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3) Bradford's law, his study concentrates on the journals, mainly in what is known as Bradford's core, the smallest subset of journals that manages to concentrate one third of the total number of documents studied. The subsets that manage to concentrate the other thirds of documents according to their increasing order in number of journals are known as zones 1 and 2. Although all the attention is focused on the Bradford core for being the production environment that tends to congregate the most specialized authors, reviewers, and editors in a specific topic of study [40,41].

4) Hirsch index, which allows to determine the relative impact of scientific productivity on a corpus of selected articles. And it is expressed as a value n of documents, implying that these n documents have obtained n or more citations on a common counting basis for all these [35,42]. For which, additionally, we have studied the relationship between the age of publication with the number of citations, and the inclusion of an article in the h-index, in relation to: (1) the authorship of one or more prolific authors, (2) the affiliation of one or more authors to a prolific country, (3) the publication in a journal specialized in the subject (belonging to the Bradford core), or (4) some form of open access to the article.

Regarding these last four items, a nonparametric descriptive statistical analysis was used with the SPSS program, using the nonparametric Chi-square correlation coefficient ($\chi 2$), whose correlation is significant for a p-value at the 0.05 level (ideally 0.01), a case in which a degree of association between two variables is statistically evident [43,44].

5) Zipf's Law, refers to the concentration of word usage in the language, in this case the keywords assigned as metadata by Web of Science or Keywords plus© are used as a basis to study this concentration, highlighting the most used keywords in the set of articles, using as an estimate the square root over the set of keywords, which is then adjusted according to a discrete number of keywords, the resulting set of keywords plus© is known as outstanding keyword plus [34,45].

Table 1. This is a table. Tables should be placed in the main text near to the first time they are cited.

Variable	Value (or Sample, n)	Unit	Subsampling criterion
Time	1982 – 2024	Year	Period without blanks
Authors	4,667	Person	Lotka´s Law
Place (Affiliation)	87	Country / Territory	
Journals	522	Journal	Bradford's Law
Documents	1,607	Article	Hirsch's index (h-index)
Keywords Plus	2,649	Words	Zipf's Law

3. Results

3.1. Results of Scientific Production on Academic Engagement

The articles extracted from the WoS Core Collection cover the period 1982 to 2024, but only present a continuous full-year record (without years with blank data) between 1992 and 2023. For this period, where it is possible to analyze a possible exponential growth, the R^2 is 98%. Thus, according to Price's Law [32], there is a scientific production that shows a critical mass of interesting knowledge to be studied.

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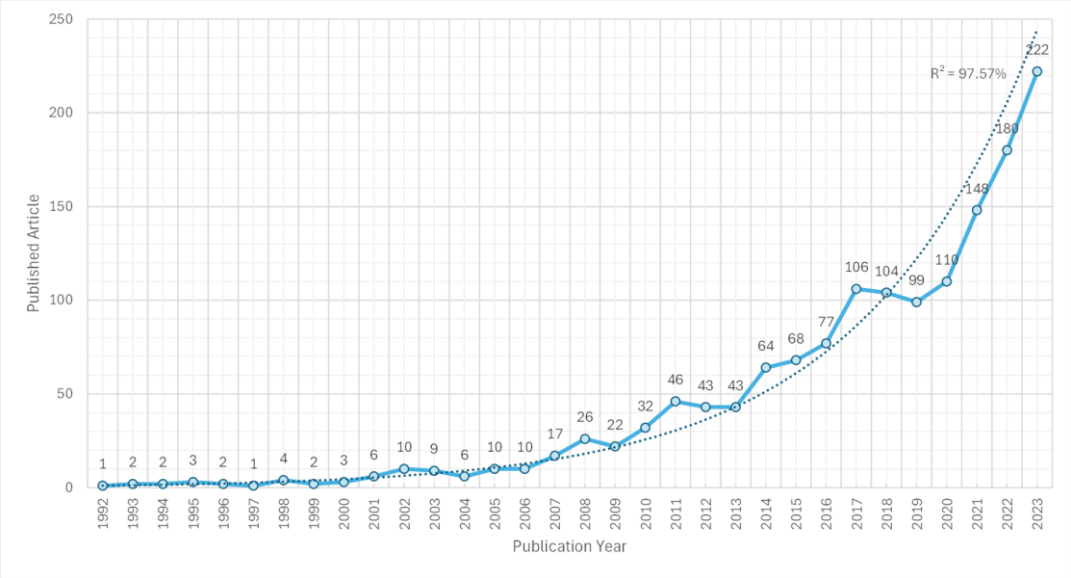

Figure 1. Time series and trend of publications on academic engagement. Blue line is time series and dotted lines is an exponential trend.

This number of articles generated is the work product of 4667 researchers, but of these authors 4099 only contribute one article. Thus, Figure 2 shows the contribution levels of these 4667 authors from 1 to 26 articles with a power fit of 99.5%, and according to Lotka's Law [33] the number of prolific authors can be estimated at 68 authors (SQRT(4667)=68).

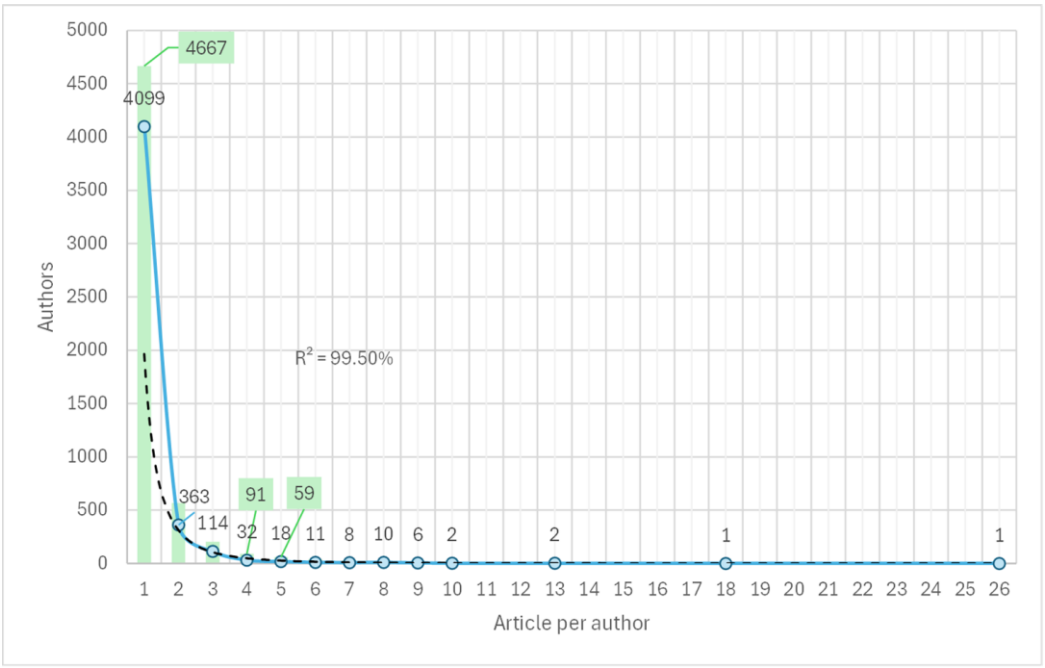

Figure 2. Relationship between authorship and the scientific production level. Blue line is time series and dotted lines is a power fit trend.

From Figure 2, it can be observed that 91 authors have 4 or more published articles, and 59 authors have 5 or more published articles and academic engagement, therefore, the prolific authors have been estimated at 59. This small group of authors with a high level of production in the subject studied (5 or more articles), maintains co-authorship relationships as shown in Figure 3. The most prolific author is Dr. Jesús Alfonso D. Datu, academic of the Faculty of Education, The University of Hong Kong (ORCID/0000-0002-8790-1113).

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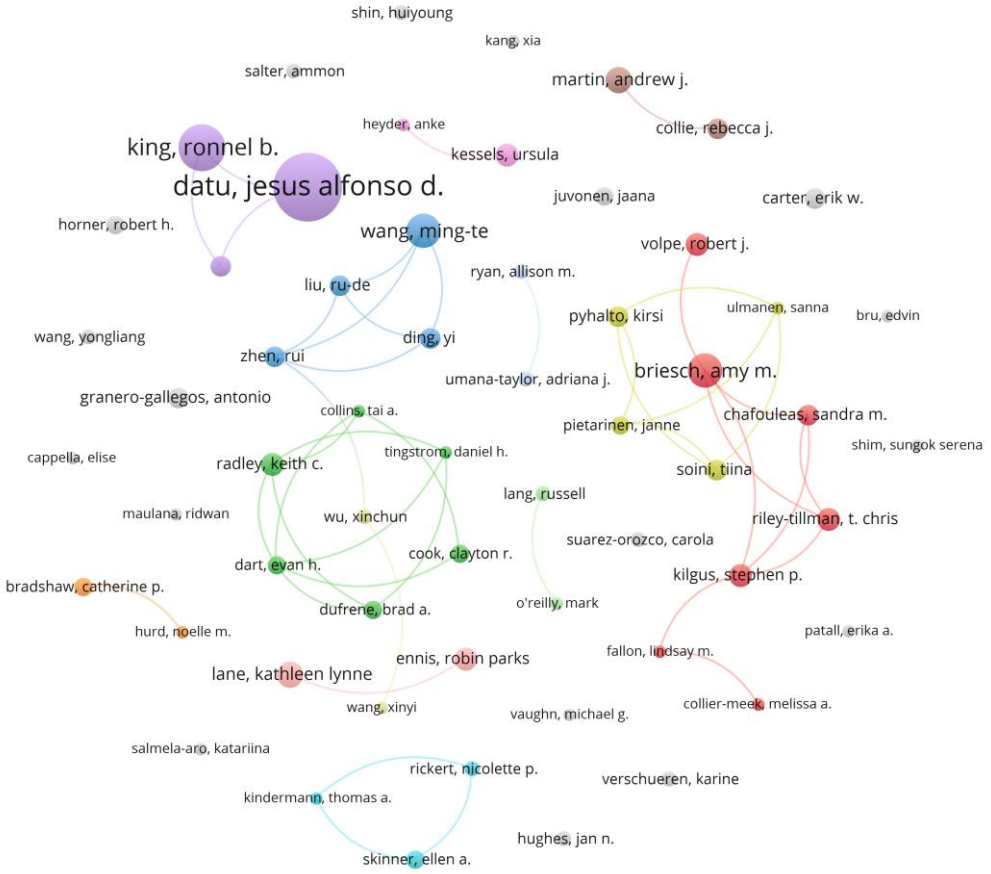

Figure 3. Prolific co-authorship graph (colors indicate same author cluster).

Figure 3 shows that 41 of these 59 authors are grouped in co-authorship teams, with 13 clusters at this level of scientific production, including 2 triads and 7 dyads. All the nodes in gray are authors who at this level of production can be considered solitary authors.

Table 2. Prolific author clusters and national affiliations.

Cluster	Co-authors (articles)	N	Countries of authors
1	Briesch (13), Chafouleas (8), Collier-Meek (5), Fallon (5), Kilgus (9), Riley-Tillman (9), Volpe (9).	7	USA
2	Collins (5), Cook (7), Dart (7), Dufrene (7), Radley (9), Tingstrom (5).	6	USA
3	Ding Y (8), Liu RD (8), Wang MT (13), Zhen (8).	4	China, USA
4	Pietarinen (7), Pyhältö (8), Soini (8), Ulmanen (5).	4	Finland
5	Datu (26), King (18), Valdez (8).	3	China (HK), Philippines
6	Kindermann (5), Rickert (6), Skinner (7).	3	USA
7	Bradshaw (7), Hurd (5).	2	USA
8	Collie (8), Martin (10).	2	Australia
9	Heyder (5), Kessels (9).	2	Germany
10	Ennis (9), Lane (10).	2	USA
11	Lang (6), O'Reilly (5).	2	USA
12	Ryan (6), Umaña-Taylor (6).	2	USA
13	Wang X (5), Wu (6).	2	China

Under the same level of stringency (5 or more published articles), Figure 4 shows co-authorship at the country level. The size of the frames represents the volume of production, the arcs represent the co-authorship relationships between countries, and the seven colors divide the countries by their degree of association in terms of co-authorship: red (13 countries), green (10 countries), blue (6

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countries), yellow (5 countries), violet (triad), light blue (dyad), and orange (one country only). The level of contribution to world knowledge production in academic engagement of the USA (red, 788 articles), China (red, 239 articles), and Spain (yellow, 108 articles) stands out, as well as the high relationship between the two (red edges).

Table 3. Prolific countries according to their contribution to scientific production.

Prolific Country	Articles	Citations	Cit. per Art.	% Contribution at 1607
USA	788	31746	40	49.0%
China	239	3865	16	14.9%
Spain	108	1943	18	6.7%
Australia	98	2260	23	6.1%
England	94	3131	33	5.8%

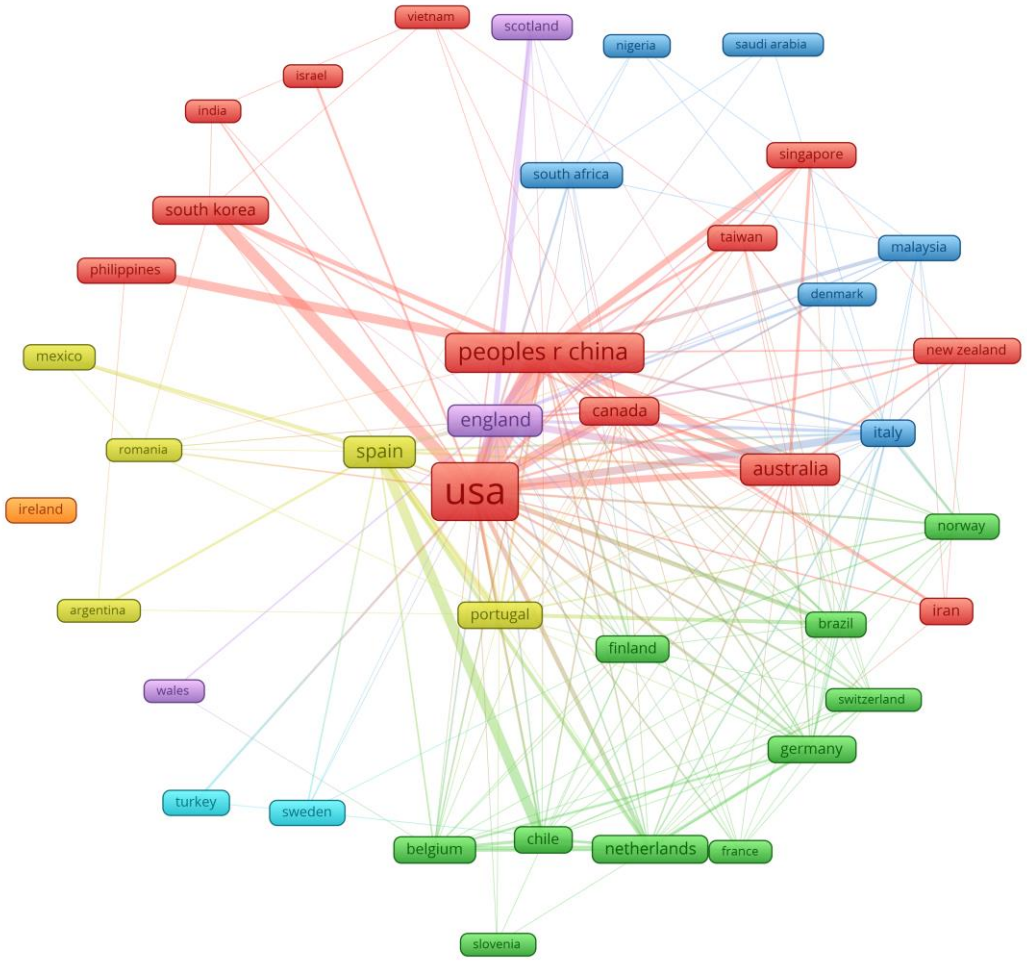

Figure 4. National co-authorship graph (colors indicate same author cluster).

Finally, in relation to the scientific production on academic engagement, it is necessary to indicate that 24 out of 522 journals account for approximately one third of the 1,607 articles published on this subject between 1982 and 2024.

Table 4. Bradford Nucleus Journals and their WoS impact characteristics.

Journal on Nucleus of Bradford	Art.	JIF - WoS (2023)	Best Qx (2023)
Frontiers in Psychology	70	2.6	Q2

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Journal of School Psychology	37	3.8	Q1
Journal of Youth and Adolescence	31	3.7	Q1
Psychology in The Schools	30	1.8	Q3
Current Psychology	30	2.5	Q2
Journal of Positive Behavior Interventions	29	1.4	Q3
Educational Psychology	23	3.6	Q1
Learning and Individual Differences	22	3.8	Q1
Behavioral Disorders	22	2.1	Q1
Studies in Higher Education	21	3.7	Q1
Social Psychology of Education	20	3.2	Q1
Children and Youth Services Review	19	2.4	Q1
School Psychology Review	16	3.9	Q1
Journal of Educational Psychology	15	5.6	Q1
Sustainability	15	3.3	Q2
Journal of Applied Developmental Psychology	15	2.2	Q2
Education and Information Technologies	15	4.8	Q1
Contemporary Educational Psychology	14	3.9	Q1
Developmental Psychology	14	3.1	Q2
Journal of Technology Transfer	13	4.6	Q1
Revista de Psicodidactica	12	3.8	Q1
Plos One	12	2.9	Q1
International Journal of Environmental Research and Public Health	12	N.A.	N.A.
Journal of Adolescence	12	3.0	Q2

3.2. Scientific Production Impact

In reference to the impact of scientific production, it is possible to determine according to the Hirsch index (h-index) a subset of 92 documents (5.7%), represented by the intercept shown in Figure 5. One article by Furrer and Skinner [46] stands out, with 1310 citations in the WoS Core Collection at the date of extraction of these data.

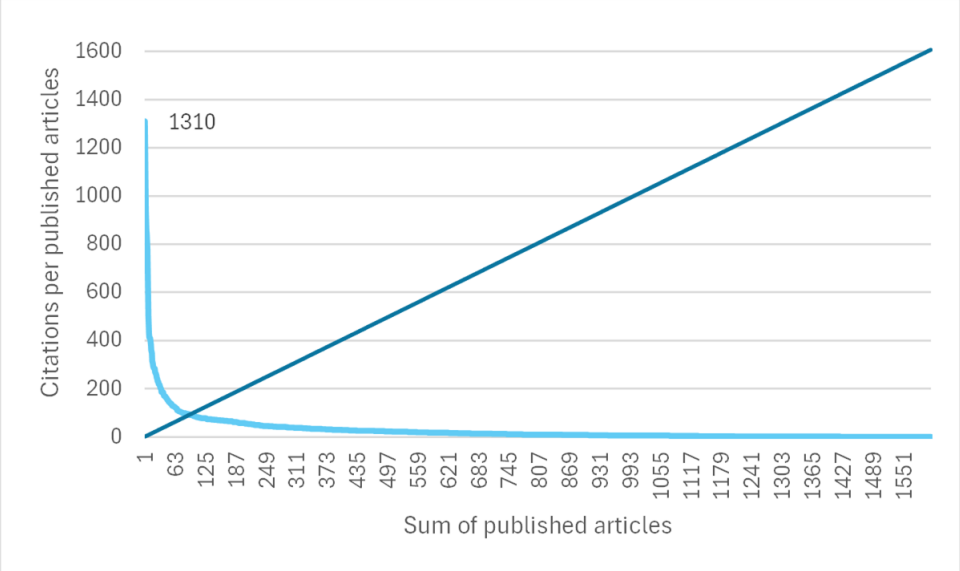

Figure 5. h-Index estimation. Light blue line is time series and blue line is a counting of articles.

In search of an explanation for this high level of citation, a relationship has been established between the year of publication and the number of citations within these 92 publications. As shown in Figure 6, the percentage of adjustment (R^2) is less than 5%, therefore, we can indicate that the

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volume of citations received is not dependent on the age of publication of the document. In addition to the article by Furrer and Skinner [46] (1310 citations), another paper by Skinner et al. [47] also stands out, which also exceeds 1000 citations..

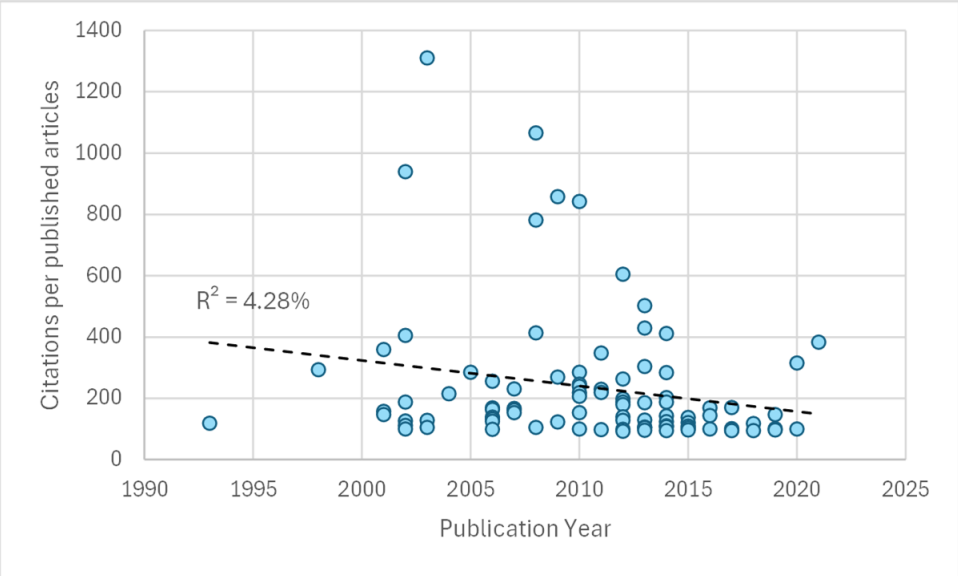

Figure 6. Time of publication and citations of articles in the h-index.

We have also explored the possible associations between the inclusion of an article in the h-index with: (1) authorship by one or more prolific authors, (2) affiliation of one or more authors with a prolific country, (3) publication in a journal specializing in the subject (belonging to the Bradford nucleus), or (4) some form of open access to the article. Relationships whose degree of association are reported in Table 5.

Table 5. This is a table. Tables should be placed in the main text near to the first time they are cited.

Variables	Asymptotic significance (2-sided)	Degree of freedom	Significant relationship between variables
Prolific Authors	6.948	1	0.008**
Prolific Country	1.541	1	0.214
Journal on Nucleus of Bradford	0.969	1	0.325
Open Access article	1.591	1	0.207

* (p-value ≤ 0.050), ** (p-value ≤ 0.010).

Thus, there is no evidence to determine a degree of association between the articles included in the h-index and the affiliation of one or more authors to a prolific country, publication in a journal specialized in the subject, or any form of open access to the article. On the contrary, there is evidence of a degree of association between an article in the h-index and authorship by one or more prolific authors. Figure 7 shows that the percentage of articles in the h-index doubles from 5% to 10% when they are self-authored by one or more prolific authors.

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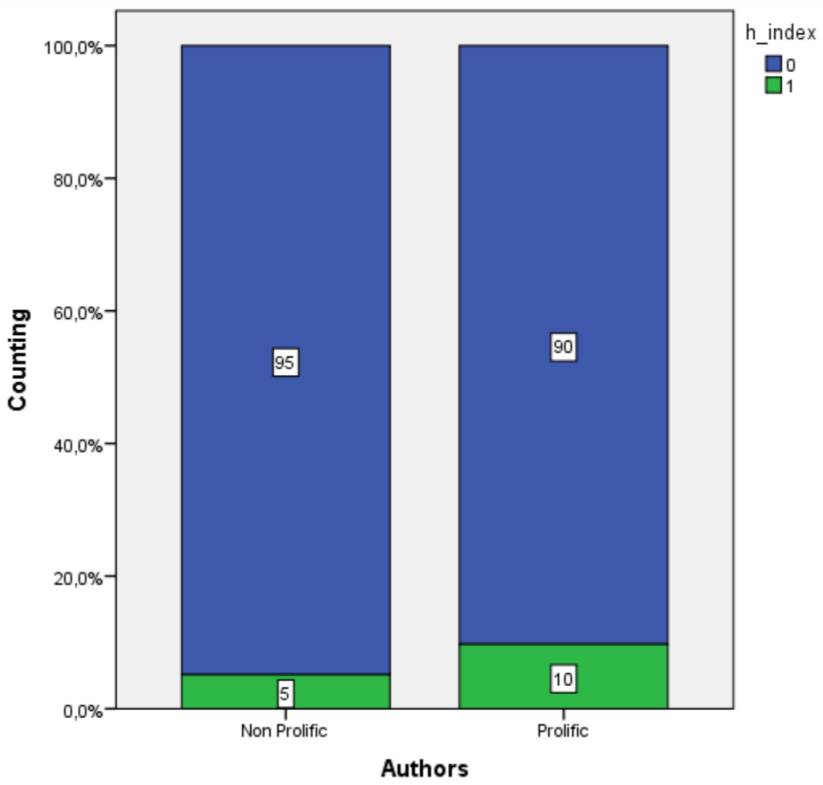
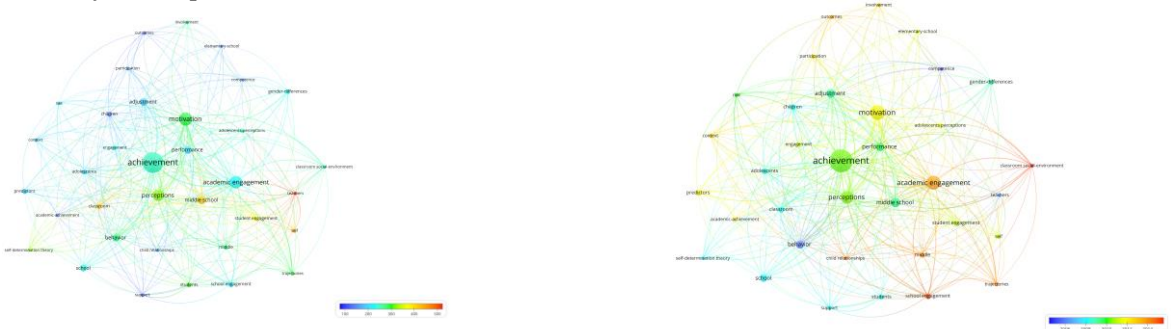


Figure 7. Relation between the proliferation level of authors and h-index inclusion.

Another interesting finding is the most cited topics associated with these 92 articles, which are represented based on the 35 Keywords plus® with the highest number of occurrences. The average citations are shown in Figure 8A. Keyword plus®, such as: teachers (530 avg. cit. in 5 art.) [47–51], self (424 avg. cit. in 6 art.) [47–51], classroom (411 avg. cit. in 8 art.) [46,55–61], and middle school (402 avg. cit. in 13 art.) [46,47,49,54,56,62–69] stand out. Additionally, the Keywords plus® with more recent average dates are: classroom social-environment (2015.00 avg. pub. year in 5 art.) [49,54,62,69,70], and school engagement (2014.62 avg. pub. year in 8 art.) [48,61,69,71–75]. Thus, the 6 articles intersecting the highest citation and topical issues are: Skinner et al. [48], Wang et al. [49], Pietarinen et al. [54], Engels et al. [61], Wang et al. [62], and Liu et al. [69], among which we manage to identify the importance of motivational [48,49,62], and emotional [54,69] aspects.



(a) **(b)**

Figure 8. Keyword plus co-occurrence graph: (a) colors indicate average citations, and (b) colors indicate average publication years.

4. Discussion

From a methodological point of view, our study uses fundamental bibliometric laws [31]. Thus, when presenting the temporal evolution of the sample of selected articles, unlike the bibliometric studies on behavior in the educational setting by López-Belmonte et al [76], Alcaraz-García et al [77]

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and García-Chivita [78], our work uses Price's Law [32] to account for the implications of the exponential growth of science. This set of selected articles has been obtained from WoS as well as other bibliometric research on behavioral studies in education [76,79,80], which have been analyzed with VOSviewer [36], a software commonly used by other similar studies [80–82].

Regarding our results, 1) the estimation of nucleus journals using Bradford's Law [40] has allowed us to identify Frontiers in Psychology, International Journal of Environmental Research and Public Health, Plos One, Sustainability as well as Tiberius et al [80] and Dong et al [81] as relevant journals, 2) the estimation of prolific authors has led us to consider 1.3% of our total authors (4,667) with 5 or more published articles, a comparable amount to the 1. 5% of the total authors (1,505) with 4 or more published articles used by Tiberius et al. [80], 3) In terms of territorial concentration, our results agree with Baek et al [79] in terms of USA, China and Spain, and with Dong et al [81] in terms of USA, China, Australia and United Kingdom (England), 4) Finally, unlike other articles that report prolific authors and results based on h-index [76,81,82], our work in addition identifies the correlation between both sets, by means of a chi-square test.

5. Conclusions

This bibliometric study on high-impact research in academic engagement concludes that the scientific production of researchers has grown at an exponential rate (R2 ≈ 98%), which is a product of the contribution of 4667 authors, from 87 countries with a co-authorship from the USA of 49%. However, of the total number of authors, according to Lotka's law, only 59 authors were estimated as prolific (1.3%), contributing five or more publications on the topic studied, forming 13 co-authorship clusters (including triads and dyads), and highlighting the production level of a researcher affiliated with The University of Hong Kong. In addition, Bradford's law identified 24 out of 522 journals (4.6% of the journals), which accounted for one third of the published articles. The journal with the highest concentration being Frontiers in Psychology, with 70 papers indexed in the WOS Psychology, Multidisciplinary (JIF-Q2) category.

Regarding the impact of scientific production on academic engagement, the Hirsch index (h-index) as a citation impact weighting factor determined that 92 of 1607 articles (5.7% of the articles) were relevant within the set of articles studied. The citation level of these 92 articles does not depend on variables such as age of publication, affiliation of one or more authors with a prolific country, publication in a journal specializing in the subject (belonging to the Bradford core) or having some form of open access to the article. But it is associated with authorship by one or more prolific authors. In addition, the outstanding Keywords plus® of the articles in the h-index, show that the cross between the highest average citations and the most current average years of citation as relevant topics in the study of academic engagement are the motivational and emotional aspects.

Finally, as future lines of research, we recommend further empirical investigation of aspects of academic engagement and its relationship with achievement, motivation and emotional aspects.

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Table S1: AcadEngagem_data.xlsx (for Excel), 4 files in a pack for VOSviewer: AcadEngagem_data_1.txt, AcadEngagem_data_2.txt, AcadEngagem_data_3.txt, AcadEngagem_data_4.txt, and additionally the data h-index (92): AcadEngagem_data_hi92.txt (for VOSviewer).

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Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix A

WoS search vector for the 92 articles included in the h-index: UT=(WOS:000181365100013 OR WOS:000260724500004 OR WOS:000173989800002 OR WOS:000265902700009 OR WOS:000281046400005 OR WOS:000259267800003 OR WOS:000303441500011 OR WOS:000322943400002 OR WOS:000327286500002 OR WOS:000253337900001 OR WOS:000332847900026 OR WOS:000177918100001 OR WOS:000692316300001 OR WOS:000172008200003 OR WOS:000295708100001 OR WOS:000539161800012 OR WOS:000316530400009 OR WOS:000078903100001 OR WOS:000232310700003 OR WOS:000283611900001 OR WOS:000332847900018 OR WOS:000267681200018 OR WOS:000299960400005 OR WOS:000237064900007 OR WOS:000283089900003 OR WOS:000276572800003 OR WOS:000248524600010 OR WOS:000285707700007 OR WOS:000297523600001 OR WOS:000277977100018 OR WOS:000220726200002 OR WOS:000280675800004 OR WOS:000340493500007 OR WOS:000307906900002 OR WOS:000178448600004 OR WOS:000301995400006 OR WOS:000344781700004 OR WOS:000316805900021 OR WOS:000301903800005 OR WOS:000406611400006 OR WOS:000238632800007 OR WOS:000372230800015 OR WOS:000250642600003 OR WOS:000241851600012 OR WOS:000248171000004 OR WOS:000169048800022 OR WOS:000249784300012 OR WOS:000277105500005 OR WOS:000169846900016 OR WOS:000468754100012 OR WOS:000366341900001 OR WOS:000350830500005 OR WOS:000308636100019 OR WOS:000241281200002 OR WOS:000363256000005 OR WOS:000242371400004 OR WOS:000319918100003 OR WOS:000181061800003 OR WOS:000311546100004 OR WOS:000178448600006 OR WOS:000238176300012 OR WOS:000340807800006 OR WOS:000261748300006 OR WOS:000348747500001 OR WOS:A1993LP14300002 OR WOS:000427552500003 OR WOS:000177633400004 OR WOS:000330928800008 OR WOS:000349633500013 OR WOS:000339035800008 OR WOS:000322752200021 OR WOS:000180868100001 OR WOS:000260551000006 OR WOS:000315448400001 OR WOS:000359278300021 OR WOS:000401275500007 OR WOS:000472491000001 OR WOS:000176287800010 OR WOS:000286289300003 OR WOS:000375623700010 OR WOS:000492333300001 OR WOS:000236924800002 OR WOS:000303698500025 OR WOS:000291276800007 OR WOS:000356735700001 OR WOS:000404473000003 OR WOS:000475232200001 OR WOS:000319539800002 OR WOS:000335088800008 OR WOS:000393675800009 OR WOS:000441947600009 OR WOS:000305887100003).

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