Premium e-Journal of Social Sciences

Premium Sosyal Bilimler E-Dergisi
Uluslararası Hakemli Dergi- International Refereed Journal
ISSN: 2687-5640

Received / Makale Geliş Tarihi 08.02.2025
Published / Yayınlanma Tarihi 31.03.2025
Volume (Issue) Cilt (Sayı) 9 (52)
pp / ss 250-275

Araştırma Makalesi
10.5281/zenodo.15164637
Mail: editor@pejoss.com

Arş. Gör. Dr. Aydın Bulut
https://orcid.org/0000-0003-3139-4367
Kastamonu Üniversitesi, Eğitim Fakültesi, Kastamonu / TÜRKİYE
ROR Id: https://ror.org/015scty35

Reading Fluency from Past to Present: Bibliometric Analysis[1]

Geçmişten Günümüze Akıcı Okuma: Bibliyometrik Analiz

ABSTRACT

Reading fluency constitutes a fundamental component of reading proficiency, with research findings indicating a significant correlation between fluency and reading comprehension. In contemporary times, the significance of fluent reading remains unabated. The primary objective of this study is to analyse and map all studies on 'reading fluency' published in Web of Science (WoS) from a bibliometric perspective. The bibliometric mapping technique was employed from an international perspective to assess trends in the 'fluent reading' research field by identifying author, publication, keyword, journal, country and citation factors. A bibliometric analysis of 3584 articles on 'fluent reading' published in the WoS database since 1965 was conducted in this study, and the results obtained are presented in all aspects. Between 1965 and 2024, 3584 articles on fluent reading were published from 458 sources, with an average of 43.79 articles published per year. The average number of citations per document for these articles is 18.91, and the total number of references is 110,608. The number of Keywords Plus for these articles is 3,105, and the number of Author's Keywords is 7,297. The number of authors of single-author documents is 790, and the number of authors of multi-author documents is 6,815. The number of single-authored documents is 879, while the number of multi-authored articles is 2705. The average number of co-authors per article is 2.75, and the percentage of international co-authorship is 17.33%.
Keywords: Reading fluency, bibliometric analysis, mapping

ÖZET

Akıcı okuma, okuma yeterliliğinin temel bir bileşenini oluşturmaktadır ve araştırma bulguları akıcılık ile okuduğunu anlama arasında önemli bir ilişki olduğunu göstermektedir. Bu çalışmanın temel amacı, Web of Science'ta (WoS) yayınlanan 'akıcı okuma' konulu tüm çalışmaları bibliyometrik bir bakış açısıyla analiz etmek ve haritalamaktır. Bibliyometrik haritalama tekniği, yazar, yayın, anahtar kelime, dergi, ülke ve atıf faktörlerini belirleyerek 'akıcı okuma' araştırma alanındaki eğilimleri değerlendirmek için uluslararası bir perspektiften kullanılmıştır. Bu çalışmada 1965 yılından bu yana WoS veri tabanında yayınlanan 'akıcı okuma' konulu 3584 makalenin bibliyometrik analizi yapılmış ve elde edilen sonuçlar tüm yönleriyle sunulmuştur.1965-2024 yılları arasında akıcı okuma konusunda 458 kaynaktan 3584 makale yayınlanmış ve yılda ortalama 43,79 makale yayınlanmıştır. Bu makaleler için belge başına ortalama atıf sayısı 18,91 ve toplam referans sayısı 110.608'dir. Bu makaleler için Artı Anahtar Kelimeler sayısı 3.105, Yazarın Anahtar Kelimeler sayısı ise 7.297'dir. Tek yazarlı belgelerin yazar sayısı 790, çok yazarlı belgelerin yazar sayısı ise 6.815'tir. Tek yazarlı doküman sayısı 879 iken çok yazarlı makale sayısı 2705'tir. Makale başına ortalama ortak yazar sayısı 2,75 ve uluslararası ortak yazarlık yüzdesi %17,33'tür.
Anahtar Kelimeler: Akıcı okuma, bibliyometrik analiz, haritalama

[1] This article was presented as an oral presentation at the '8th International Tigris Scientific Research and Innovation Congress' (March, 2025)

1. INTRODUCTION

Reading is a fundamental skill that has been utilised in both academic and daily life contexts since time immemorial. Reading plays a pivotal role in the learning process and is considered one of the cornerstones of academic success. Consequently, it is of paramount importance to acquire functional and effective reading skills from an early age. Reading skills encompass not only the comprehension of written texts but also various cognitive processes such as critical thinking, problem solving and information access. In this process, a range of teaching strategies should be employed to assist students in cultivating reading habits and comprehending texts.Specifically, reading aloud, texts supported by visual cues, interactive reading activities and digital reading tools can contribute to the development of students' reading skills.Furthermore, taking into account the individual differences of each student, determining methods suitable for their learning speed and style can support the reading process to become more efficient and effective.

Reading fluency is widely regarded as one of the fundamental components of reading proficiency. This skill, which has been shown to enhance reading speed, has also been demonstrated to play a pivotal role in comprehension, academic achievement and social development. By reducing the cognitive resources expended on word recognition, reading fluency enables individuals to direct their attention towards the text's meaning. The process of word recognition becoming automatic has been shown to facilitate a more profound understanding and interpretation of the text. Furthermore, the ability to read fluently fosters the establishment of connections between texts, thereby enabling the development of critical thinking skills. This skill facilitates accelerated access to information, which in turn enables in-depth analysis and strengthens problem-solving skills. Conversely, individuals who do not possess sufficiently developed reading fluency skills may encounter difficulties during the reading process, which may result in a loss of self-confidence and a negative attitude towards reading. Conversely, individuals with highly developed reading fluency skills find the reading process pleasurable and experience increased motivation, enabling them to read texts more easily and meaningfully. Furthermore, fluent reading enhances an individual's ability to articulate their thoughts, facilitates faster access to information from diverse sources, and supports their intellectual development. An effective reading process enhances an individual's learning efficiency and contributes to success in academic and professional contexts. Consequently, reading fluency is recognised as both a technical skill and a fundamental element that exerts a direct influence on an individual's academic, social and professional life. The development of fluent reading skills from an early age is, therefore, of paramount importance for both the academic and personal development of the individual. In this context, teachers and parents are encouraged to adopt a motivating and encouraging role in supporting children's fluent reading skills. Concurrently, experimental and theoretical studies on fluent reading should be conducted and disseminated to all relevant stakeholders, thereby ensuring that the concept of 'fluent reading' is continually enriched and refined through scientific advancement.

1.1. Fluency Reading

Reading is defined as an interactive and cognitive process in which symbols are transformed into sound and meaning, requiring intellectual effort (Coltheart, 2005). Reading is a dynamic meaning-making process that requires active and effective communication between the writer and the reader (Akyol, 2011). Reading is defined as an active process in which the individual creates new meanings by integrating their prior knowledge with the information in the text (Güneş, 2008). It is evident from the aforementioned definitions that reading can be considered a multidimensional process of meaning-making, characterised by an active interaction between the author and the reader. According to the National Reading Panel (NRP, 2000), one of the five fundamental components of reading instruction is fluency.

The notion of fluent reading was initially conceptualised by Catell in 1886, who defined it in terms of speed using the analogy of 'automatic' (Wolf & Katzir-Cohen, 2001). However, it has been asserted that the term 'fluency in reading' was first used by Edmund Burke Huey (Samuels, 2006). LaBerge and Samuels (1974) emphasised the importance of frequent repetitions and gaining experience in fluent reading with their 'Automaticisation Theory'. In addition, various definitions of fluent reading have been proposed by different researchers. Fluent reading is defined as the ability to read accurately with appropriate speed and expression (Kuhn & Stahl, 2003) and is a fundamental element of the process of becoming proficient in reading. The development of this skill is supported by two main factors: automaticity (fast and accurate word recognition) and prosodic features of language (e.g. stress, pausing) (Kuhn & Stahl, 2003; Kuhn et al., 2010; Rasinski et al., 2011). Fluent reading is defined as the ability to read a text accurately, at an

appropriate speed and prosodically (Houston & Torgesen, 2004; NRP, 2000; Pikulski & Chard, 2005; Rasinski, 2006; Richards, 2000).

The initial definitions of reading fluency were predicated exclusively on reading accuracy and speed (Samuels, 1979). However, subsequent studies have revealed that individuals who demonstrate accuracy and speed in reading do not necessarily possess the same level of reading comprehension skills. This has led to the integration of prosody as a component of fluent reading (Miller & Schwanenflugel, 2006; Rasinski, 2012; Rasinski et al., 2009; Wolters et al., 2022). Consequently, 'prosody' has begun to be regarded as a significant variable among the components of fluent reading for both researchers and practitioners.

The concept of reading fluency has been identified as a pivotal component in the reading process, as evidenced by extensive research in the field (Kuschel, 2022; Rasinski, 2012). Indeed, a comprehensive study by the NRP (2000) identified reading fluency as one of the five fundamental components of reading. The underlying rationale for considering fluency as a pivotal component in the reading process stems from its robust correlation with reading comprehension. Numerous studies in the extant literature have not only corroborated this intimate relationship, but also have demonstrated that fluency significantly predicts comprehension skills (Allington, 1983; Lazich, 2018; Rasinski, 2017). Consequently, students encountering challenges in developing fluency during the initial years of reading education are predisposed to encounter difficulties in reading comprehension in subsequent years. This phenomenon can be attributed to the fact that students with underdeveloped reading fluency skills process words in a manner akin to a transient visitor, as opposed to a detective meticulously analysing the words in a text and their semantic relationships (Acosta-Tello, 2019). In this regard, reading fluency emerges as a pivotal component within the broader reading comprehension process, necessitating meticulous attention, particularly during the initial years of reading instruction. Failure to do so may impede the development of reading comprehension, a prerequisite for academic success, potentially affecting the student's overall educational outcomes.

Students who do not reach the expected level academically encounter difficulties in fulfilling their homework and responsibilities in school life, which can result in challenges in their relationships with peers and educators. Over time, deficiencies in reading fluency skills may be superseded by behavioural problems (Nelson et al., 2004; Wehby et al., 2003). Consequently, students encountering challenges in adapting to the academic environment may encounter difficulties in their social lives post-graduation (McCardle & Chhabra, 2006). In light of these challenges, it is evident that fluent reading skills are of paramount importance not only in the context of the reading process but also in terms of students' academic and social development.

In light of the preceding explanations, it is imperative to emphasise the cultivation of reading fluency from the outset. A substantial body of research in the relevant literature has substantiated that strategies such as choral reading, reading theatre, repeated reading and paired reading, among guided repeated reading methods, contribute to the development of reading fluency (Blum & Koskinen, 1991; Griffith & Rasinski, 2004; Nes, 2003). When synthesising these findings, it is evident that the development of reading fluency is a universal issue, irrespective of factors such as age, language or cultural differences of the reader (Christodoulou, 2010). Furthermore, reading fluency should be regarded as a crucial component of a holistic reading programme, as it is deemed to be of significant importance (Moats, 2007).

1.2. Significance of the Study and Research Questions

The importance of language in facilitating comprehension of the world, the exchange of ideas, and the dissemination of culture has been a constant throughout history. The ability to communicate through language is comprised of four fundamental components: listening, speaking, reading, and writing. While listening and speaking skills are acquired informally prior to formal education, reading and writing skills are typically developed through structured education in school. Reading skills are typically acquired systematically within the school environment, distinguishing it from other language skills. A pivotal aspect of fluent reading is its fluency, which is crucial for students' overall academic development. At this juncture, the roles of teachers, students, parents, researchers and administrators become evident as integral components of the system. It is imperative that the intricate nature of 'fluent reading' as a scientific discipline is thoroughly examined and cultivated by all stakeholders, both in the present and in the past. At this juncture, it is imperative to undertake theoretical and experimental studies on 'fluent reading' and the contribution of journals that publish on this subject. A substantial number of publications in the field of fluent reading have been published in the Web of Science (WoS) database since 1965.

As has been the case in previous eras, a plethora of academic studies on 'reading fluency' are currently being published (Arnesen et al., 2017; Dowhower, 1987; Kieffer & Christodoulou, 2020; Kiuru et al., 2013; Kim, 2015; Miller & Schwanenflugel, 2008; Rashotte, 1983; Samuels, 2007; Stanovich, 1980; Valencia et al., 2010; Zhang & Ke, 2020; This demonstrates that 'reading fluency' remains a significant field of study in the present day. Consequently, it is imperative to undertake a comprehensive examination of extant studies on 'reading fluency' from a historical perspective. In light of the aforementioned assertions, it is strongly recommended that researchers who publish on 'fluent reading' pay particular attention to cited publications, cited authors, terms with the highest frequency and centrality values, and cited terms. These concepts are expected to emerge with high frequency in a relatively short time. Citation analysis is a recognised method that helps to identify important academic articles, leading journals, and commonalities and differences across disciplines (Biehl et al., 2006). It is also recognised as a critical tool for examining the historical development of key research topics in a particular research area and assessing the comparative impact of different studies (Donthu et al., 2021). By leveraging citation analysis, researchers can identify prevalent research topics, methodologies employed, and emergent research trends. This approach also facilitates a more profound comprehension of the intricacies inherent within these pivotal subjects (Chen et al., 2021).

A review of studies on 'fluent reading' reveals the prevalence of national and international studies that evaluate published articles, books and papers. This observation underscores the necessity for contemporary bibliometric studies in the domain of 'fluent reading'. The present study aspires to analyse the extant literature on 'fluent reading' from a bibliometric perspective, with the objective of generating a bibliometric map of studies pertaining to its utilisation in education. In this framework, the following research questions were investigated:

1. Who are the most influential authors on ‘reading fluency’?
2. Which universities and countries are the most influential in ‘reading fluency’?
3. What is the status of citations related to ‘reading fluency’ in education?
4. What are the keywords and trending topics related to ‘reading fluency’?
5. How do clusters emerge according to author matching in journal research on ‘fluent reading’?

Garfield (2006) emphasises that bibliometric mapping offers the opportunity to analyse the history of a field, its structure, the flow of information, the influence of journals and the long-term citation status of publications. When used in conjunction with bibliometric mapping, it is possible to visualise the most prolific authors, institutions and countries in a given discipline and thus identify trends in literature production over time. This process plays an important role in ranking academic fields and providing an overview (Garfield, 2006).

2. METHOD

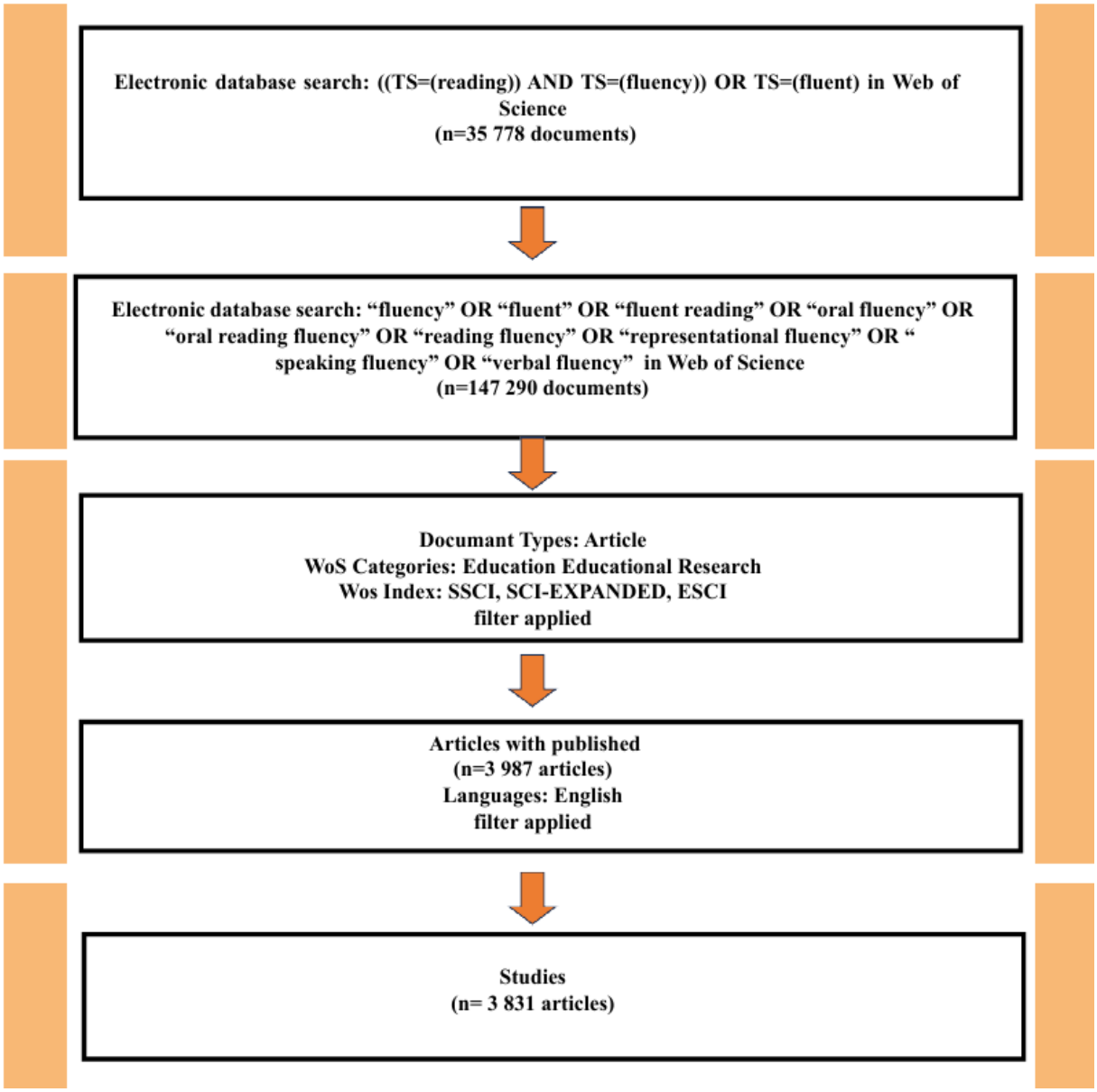
In this study, publications on ‘reading fluency from past to present’ were analysed using a range of analytical methods including co-citation analysis, author co-citation analysis and word frequency analysis. Descriptive data on the distribution of studies in the field by country, institution and time were obtained from the Web of Science (WoS) database. The analysis was performed using ‘R version 12.0 software’ (R Development Core Team, 2021) and various libraries including ‘bibliometrix’, ‘wordcloud’ and ‘ggplot2’.

2.1. Data Collection Tool

The 'Web of Science (WoS)' database was utilised to obtain the bibliometric data analysed in this study. WoS is recognised as one of the world's leading academic databases due to the wide scope and diversity of the publications it searches (Pranckutė, 2021). In addition, it provides a comprehensive distribution of bibliometric data of the publications it scans by classifying them according to countries, scientific fields and journals. It is important to note that, by providing basic statistical data, it functions as a significant resource for researchers engaged in data analysis.

As illustrated in Figure 1, the data on 'fluent reading' was retrieved from the Web of Science (WoS) database as of February 2025. The electronic database search was conducted using the following keywords: ((TS=(reading)) AND TS=(fluency)) OR TS=(fluent)), yielding a total of 35,778 documents.

Figure 1. Data screening stages



Subsequently, keyword clouds related to the subject were generated on the WoS platform. The search was further expanded using keywords obtained from the word cloud related to fluent reading. Electronic database search: 'fluency' OR 'fluent' OR 'fluent reading' OR 'oral fluency' OR 'oral reading fluency' OR 'reading fluency' OR 'representational fluency' OR 'speaking fluency' OR 'verbal fluency' in Web of Science (n=147 290 documents) were obtained. Then Document Types: The WoS categories assigned to this article are Education and Educational Research. The WoS index used was SSCI, SCI-EXPANDED and ESCI. Following the application of the filter, 3,987 articles were obtained. Subsequently, a filter was applied for articles in English, and 3,831 articles were obtained.

During the analysis process in R, 'early papers, proceedings, retracted publications' were excluded, leaving 3584 papers to be evaluated. As WoS allows the download of up to 500 results in 'BibTeX' format, the metadata set consists of seven independent 'BibTeX' files, which were then combined into a single file using Visual Studio Code Editor. Table 1 provides a comprehensive summary of the descriptive data for the studies retrieved:

Table 1 Descriptive data of obtained studies

Description	Results
Timespan	1965:2024
Sources	458
Documents	3584
Annual average number of publications	43.79
Average citations per doc	18.91
Total references	110608
Keywords Plus (ID)	3105
Author's Keywords (DE)	7297
Authors	7605
Authors of single-authored docs	790
Authors of multi-authored docs	6815
Multi-authored documents	2705
Single-authored docs	879
Co-Authors per Doc	2.75
International co-authorships	% 17.33

A thorough analysis of Table 1 reveals that 3584 articles from 458 sources on reading fluency were published between 1965 and 2024, with an average of 43.79 articles published per year. The average number of citations per document for these articles is 18.91, and the total number of references is 110608. The number of keywords for these articles is 3105, while the number of author's keywords is 7297.The number of authors of single-author documents is 790, while the number of authors of multi-author documents is 6815.The number of single-authored documents is 879, while the number of multi-authored articles is 2705. The average number of co-authors per article is 2.75, and international co-authorship is 17.33%.

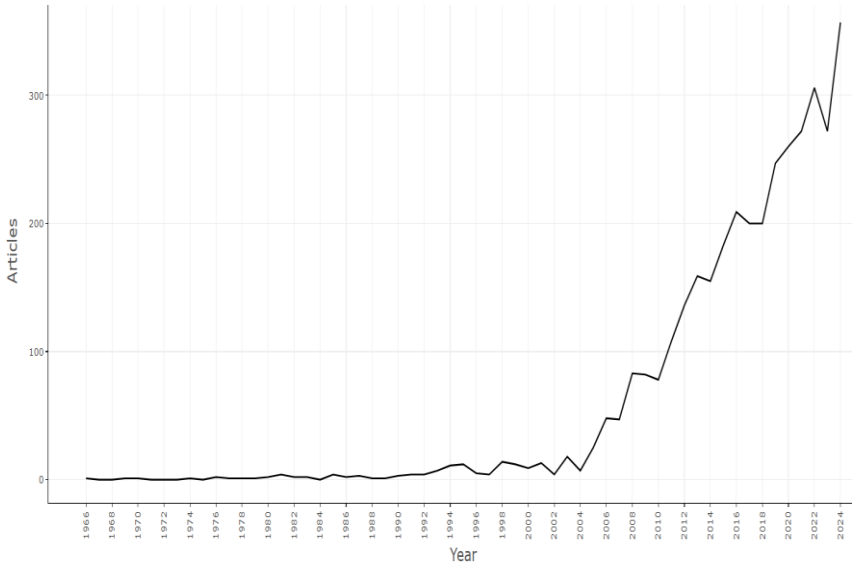
2.2. Data Analysis

Mathematical correlations were identified through the use of visualisation approaches based on metadata and bibliometric data obtained from the articles included in the study. These data were collected using R Studio software and a bibliometric package, and analyses were performed using co-authorship, bibliographic linking, keyword co-occurrence and citation. A threshold was used to create more meaningful maps, and these were produced using the R Studio software and bibliometric package. The relationship between elements (e.g. publication, journal, author) is determined by the number of sources they share in the bibliographic link; that is, two separate references to the same publication is called a bibliographic match. The analysis of keyword co-occurrence shows the evolution of the field of study over time (Donthu et al., 2021) and is a useful tool for identifying hotspots in various disciplines (Ahmi, 2022).

3. RESULTS

The annual scientific production related to the study is illustrated in Figure 2.When Figure 2 is analysed, it is evident that there were 4.02 articles on fluent reading on average from 1965 to 2004, including the year 2004, and this average increased to 171.35 from 2004 to 2024. A particularly notable peak in publications was observed in 2024, as illustrated in Figure 3, which details the number of citations according to year.

Figure 2. Annual scientific production



As demonstrated in Figure 3, the number of citations of 3584 articles published on fluent reading from 1965 to 2024 is displayed. It is evident that there has been a significant increase, particularly between 1989 and 1994. Figure 4 presents the three-field plot (author-keyword-affiliation).

Figure 3. Annual citaions production

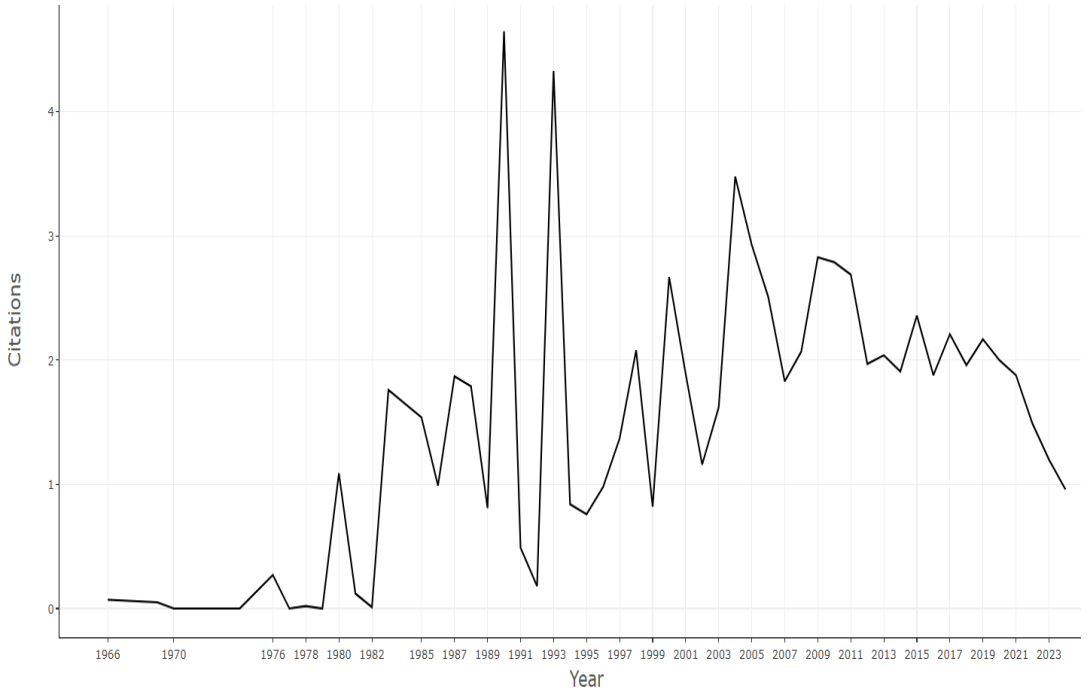
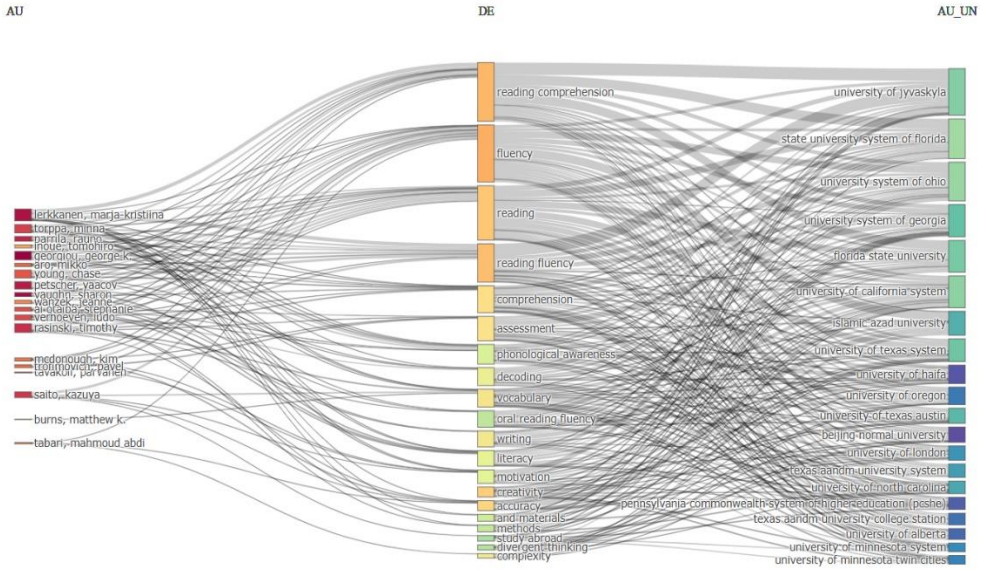


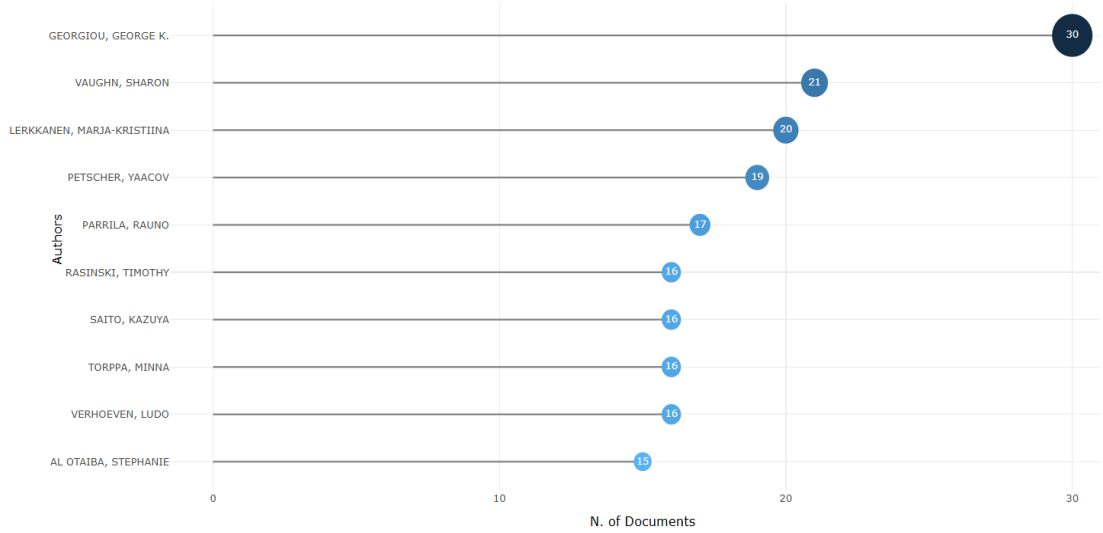
Figure 4. Three-field plot (keyword-author-affiliation)



3.1. Authors

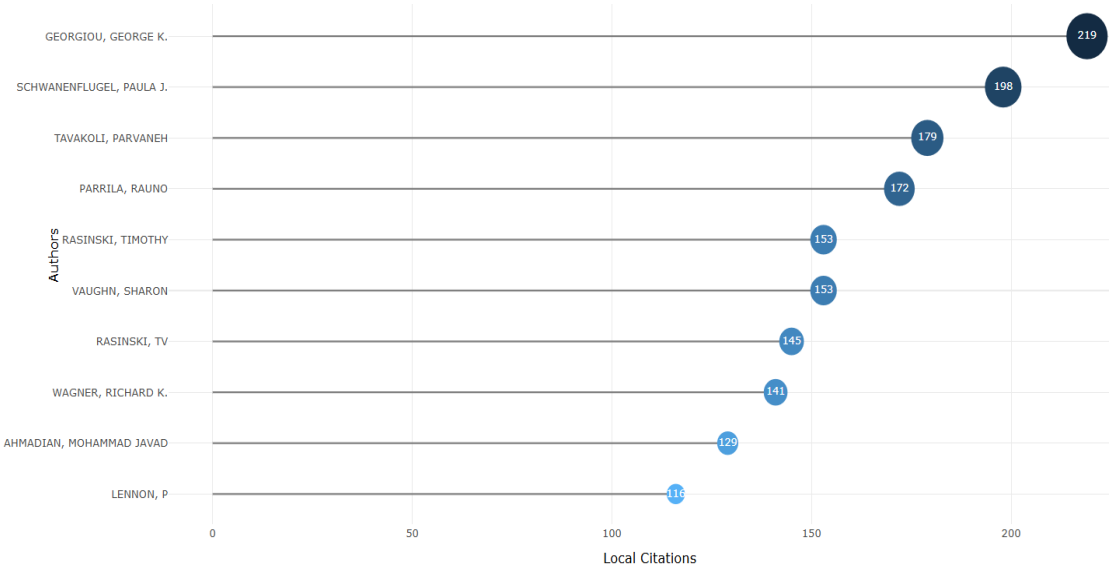
In the Web of Science database, 7,605 researchers who published with fluent reading were identified. The 10 authors who published the most in the journal are enumerated in Figure 5. When Figure 5 is analysed, Georgiou, George K. ranks first with 30 studies, Vaughn, Sharon ranks second with 21 studies and Lerkkanen, Marja-Kristiina ranks third with 20 studies.

Figure 5. Most relevant authors



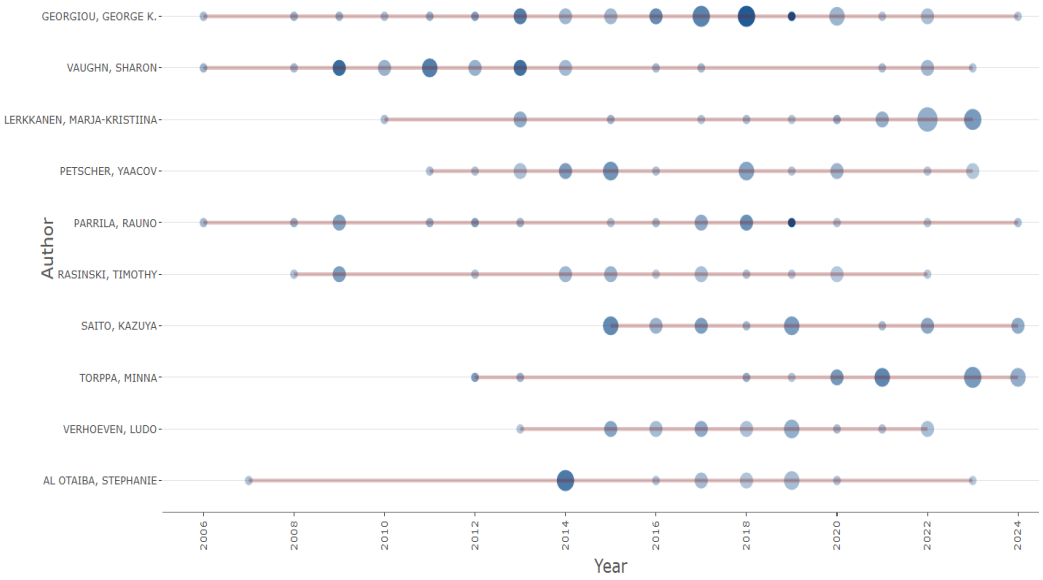
As illustrated in Figure 6, an analysis of the 7,605 researchers who published on fluent reading in the Web of Science database reveals the authors who received the highest number of local citations. The analysis demonstrates that Georgiou, George K. holds the top position with 219 citations, followed by Schwanenflugel, Paula J. with 198 citations and Tavakoli, Parvaneh with 179 citations.

Figure 6. Most local cited authors



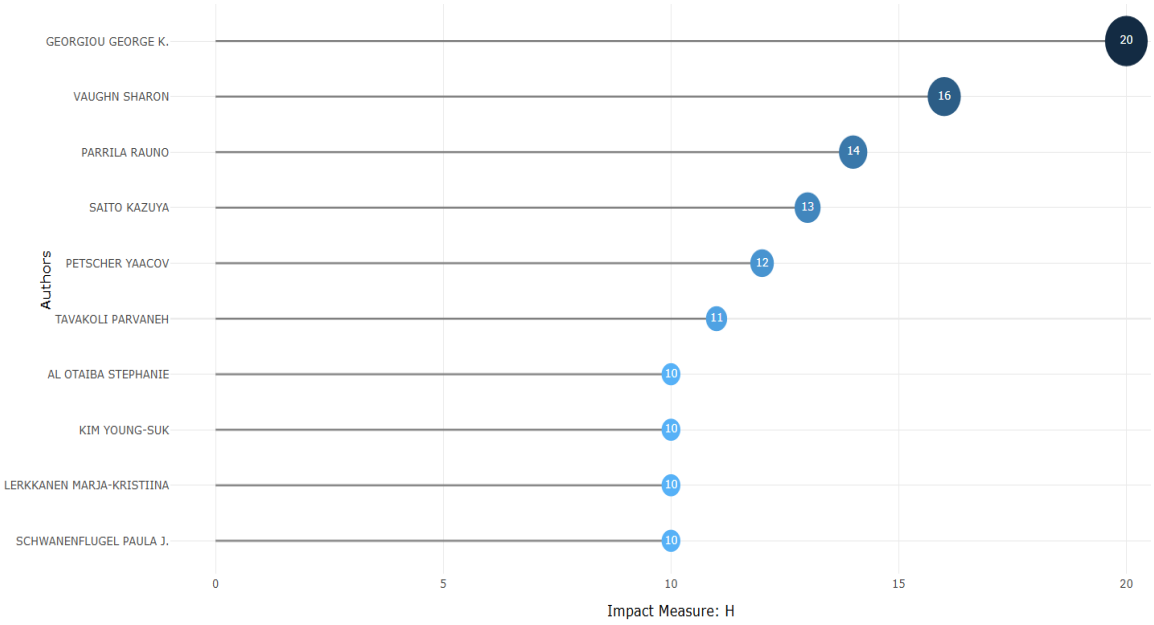
The following study provides an analysis of the authors publishing on fluent reading in this journal according to years (see Figure 7). When Figure 7 is analysed, Georgiou, George K., who published the most, was very active between 2006-2024, with a particular concentration between 2006-2023. A similar trend was observed in Sharon Vaughn, who ranked second among the most prolific authors, with a concentration of publications between 2007 and 2023. Marja-Kristiina Lerkkanen also exhibited a peak in publications between 2010 and 2023.

Figure 7. Authors' production over time



As illustrated in Figure 8, the most prominent authors in terms of local impact among 7,605 researchers who published with fluent reading in the Web of Science database are Georgiou George K. (h_=20), Vaughn Sharon (h_=16) and Parrila Rauno (h_=14), respectively.

Figure 8. Authors' local impact



3.2. Affiliations

As illustrated in Figure 9, the majority of publications originate from the State University System of Florida, with a total of 139 studies. The University System of Ohio follows closely behind, with 122 studies, while the University of California System ranks third with 117 studies.

Figure 9. Top 10 universities with the most articles

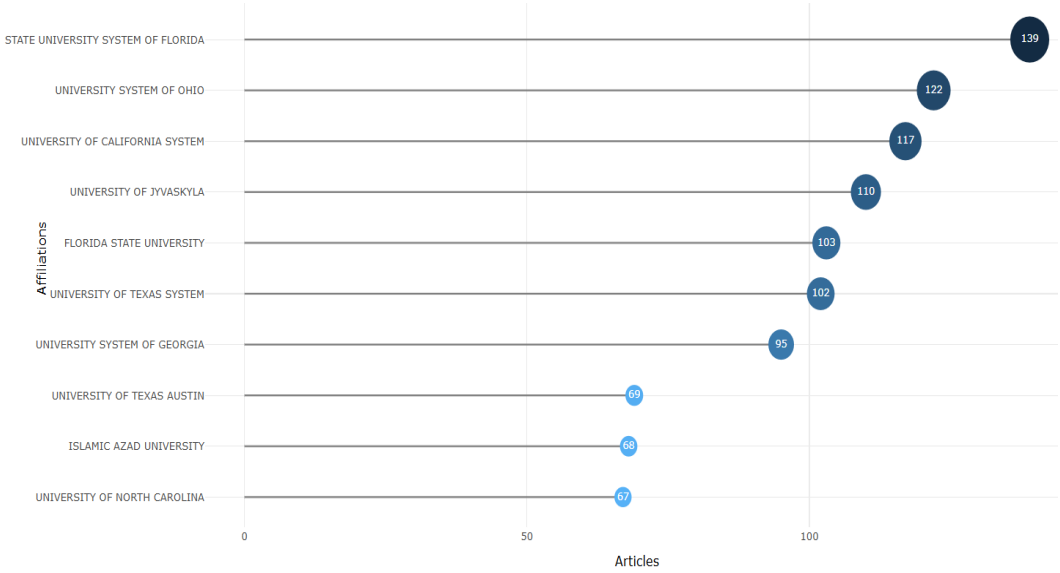
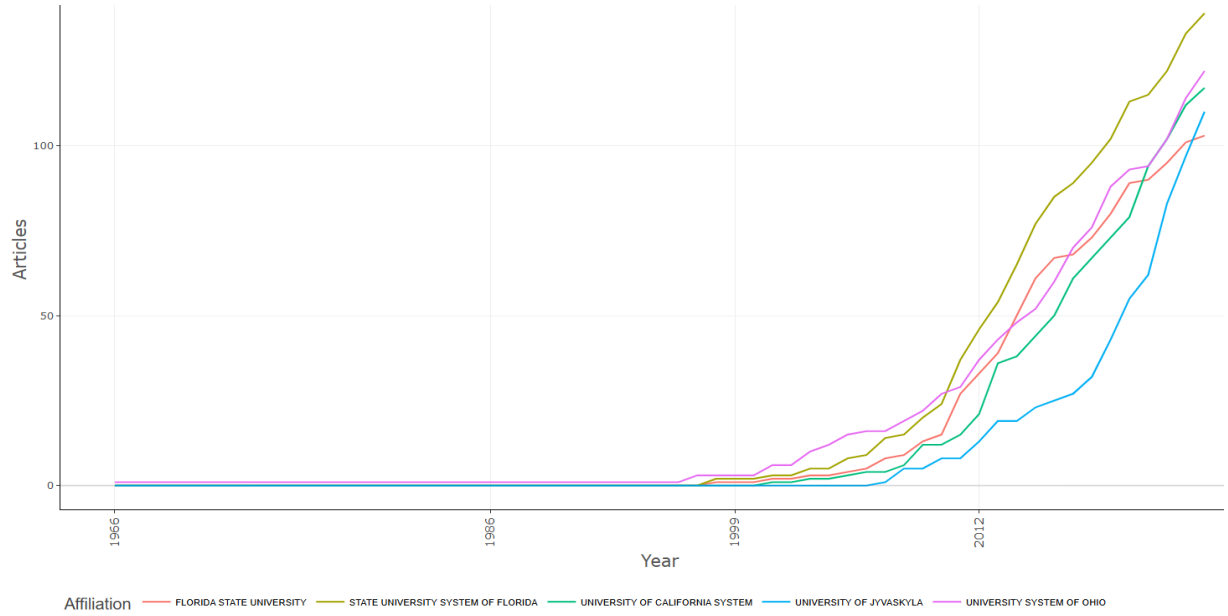


Figure 10 provides a visual representation of the temporal progression in the production of organisations publishing on fluent reading. It is evident that a stable process was observed between 1989 and 1998, followed by a period of growth in all institutions between 1998 and 2007. This trend of acceleration continued through 2007-2016. Post-2016, it was determined that all institutions exhibited an increase in the publication of articles, indicating a consistent rise in article production across all periods.

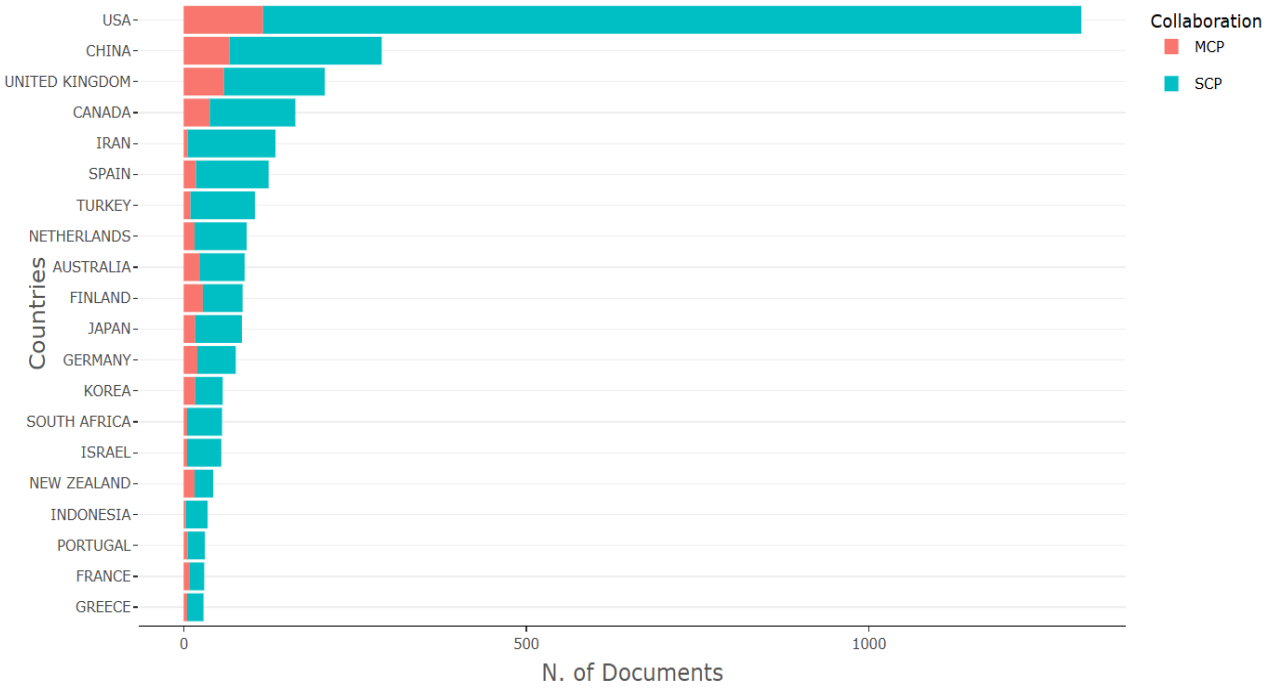
Figure 10. Affiliations' production over time



3.3. Countries

As illustrated in Figure 11, the countries of the responsible authors who published on reading fluency are enumerated as follows: the USA is ranked first with 1310 articles, China is ranked second with 289 articles, and the United Kingdom is ranked third with 206 articles.

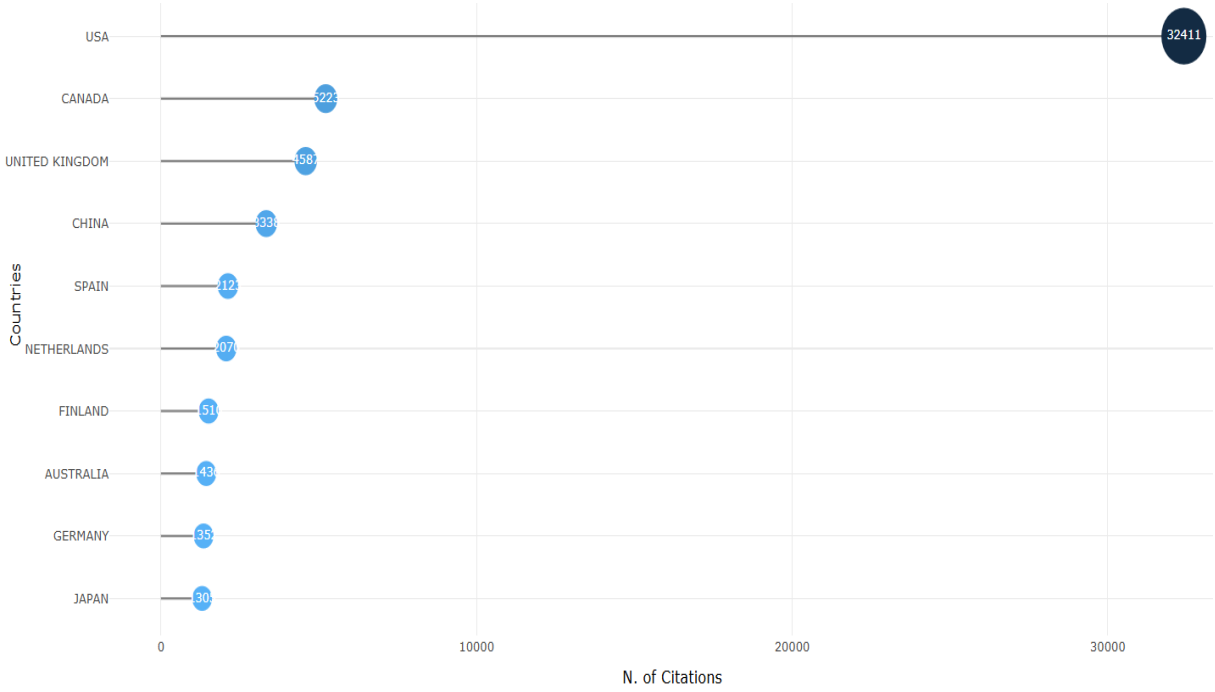
Figure 11. Corresponding author's countries



Notes: MCP=Multiple Country Publications; SCP = Single Country Publications. China and Taiwan are merged into (China) as the software used treats both the Republic of China (Taiwan) and People's Republic of China (Mainland China) as one country.

As illustrated in Figure 12, the distribution of the number of citations of articles published on reading fluency according to countries is presented. An analysis of Figure 12 reveals the top ten countries. The USA is ranked first with 32 411 citations, Canada is ranked second with 5 223 citations, and the United Kingdom is ranked third with 4 587 citations.

Figure 12. Top 10 countries with the most articles



3.4. Documents

The most globally cited articles related to fluent reading are presented in Table 2. The article with the highest number of citations, totalling 445, is'Theoretical links among naming speed, precise timing mechanisms and orthographic skill in dyslexia' by Bowers, P.G. and Wolf, M., published in 1993. In second place, with 431 citations, is the article 'Should We Use Characteristics of Conversation to Measure

Grammatical Complexity in L2 Writing Development?' by Biber, D., Gray, B. and Poonpon, K. (2011). In third place, with 423 citations, is the article by Sénéchal, M. (2006), 'Testing the Home Literacy Model: Parent Involvement in Kindergarten Is Differentially Related to Grade 4 Reading Comprehension, Fluency, Spelling, and Reading for Pleasure'.

Table. 2 Most global cited documents

Document	DOI	Total Citations	T C Per Year
Bowers Pg, 1993, Read Writ	10.1007/BF01026919	445	13.48
Biber D, 2011, Tesol Quart	10.5054/Tq.2011.244483	431	28.73
Sénéchal M, 2006, Sci Stud Read	10.1207/S1532799xssr1001_4	423	21.15
Lennon P, 1990, Lang Learn	10.1111/J.1467-1770.1990.Tb00669.X	399	11.08
Sherry M, 2010, High Educ	10.1007/S10734-009-9284-Z	347	21.69
Edmonds Ms, 2009, Rev Educ Res	10.3102/0034654308325998	336	19.76
Graham S, 2011, Harvard Educ Rev	10.17763/Haer.81.4.T2k0m13756113566	317	21.13
Hasbrouck J, 2006, Read Teach	10.1598/RT.59.7.3	307	15.35
Silva T, 1993, Tesol Quart	10.2307/3587400	301	9.12
Pikulski Jj, 2005, Read Teach	10.1598/RT.58.6.2	295	14.05
Callahan Rm, 2005, Am Educ Res J	10.3102/00028312042002305	287	13.67
Graham S, 2018, Educ Psychol-Us	10.1080/00461520.2018.1481406	282	35.25
Derwing Tm, 1998, Lang Learn	10.1111/0023-8333.00047	256	9.14
Mccutchen D, 2000, Educ Psychol	10.1207/S15326985EP3501_3	246	9.46
Goodwin Ap, 2013, Sci Stud Read	10.1080/10888438.2012.689791	242	18.62
Adlof Sm, 2006, Read Wrıt	10.1007/S11145-006-9024-Z	240	12.00
Elola I, 2010, Lang Learn Technol	NA	239	14.94
Greenhow C, 2009, Learn Medıa Technol	10.1080/17439880902923580	228	13.41
Natıon P, 2007, Innov Lang Learn Tea	10.2167/İllt039.0	226	11.89
Derwing Tm, 2009, Lang Teaching	10.1017/S026144480800551X	220	12.94

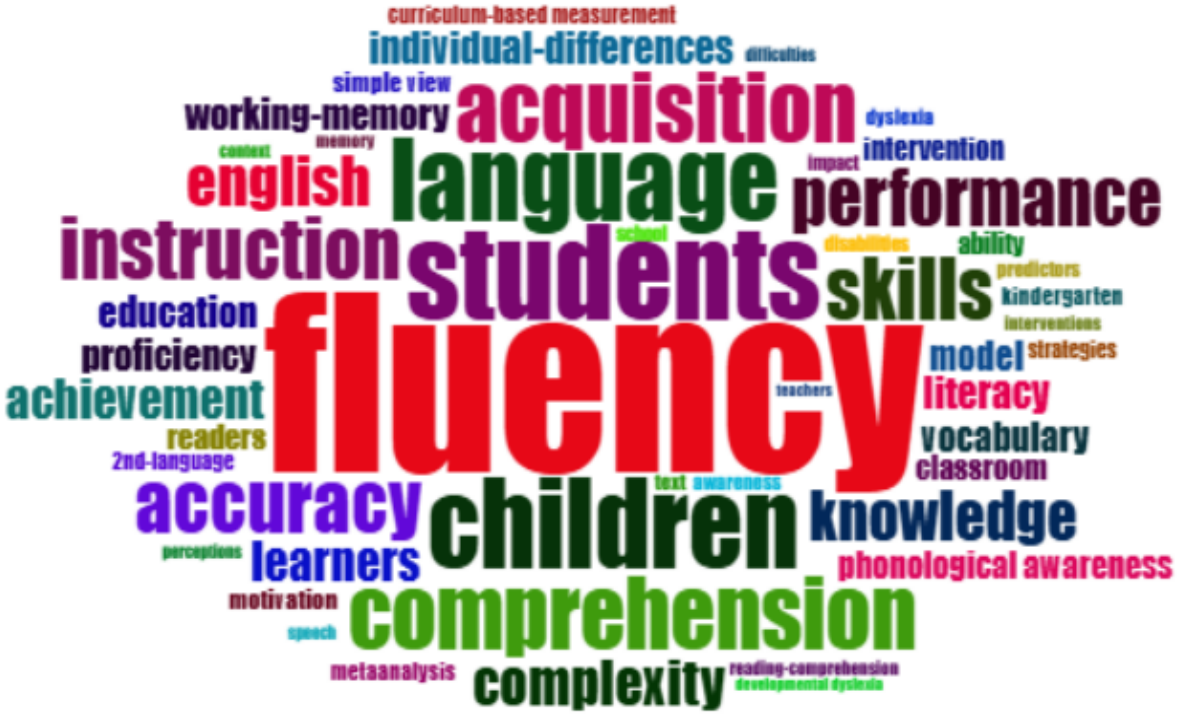
The most locally cited articles concerning fluent reading are enumerated in Table 3. The first article is 'Investigating Fluency in EFL: A Quantitative Approach' by Lennon P, 1990 with 116 citations. In second place with 90 citations is Hasbrouck J, 2006, 'Oral Reading Fluency Norms: A Valuable Assessment Tool for Reading Teachers' in 2006. The third most frequently cited article is the study 'Fluency: Bridge Between Decoding and Reading Comprehension' by John J. Pikulski and David J. Chard (2005), which has received 89 citations.

Table 3. Most local cited documents

Document	DOI	Year	Local Citations
Lennon P, 1990, Lang Learn	10.1111/j.1467-1770.1990.tb00669.x	1990	116
Hasbrouck J, 2006, Read Teach	10.1598/RT.59.7.3	2006	90
Pikulski Jj, 2005, Read Teach	10.1598/RT.58.6.2	2005	89
Dowhower Sl, 1987, Read Res Quart	10.2307/747699	1987	67
Allington Rl, 1983, Read Teach	https://www.jstor.org/stable/1001078	1983	62
Miller J, 2008, Read Res Quart	10.1598/RRQ.43.4.2	2008	56
Rasinski T, 2009, Lit Res Instr	10.1080/19388070802468715	2009	56
Hudson Rf, 2005, Read Teach	10.1598/RT.58.8.1	2005	54
Ahmadian Mj, 2011, Lang Teach Res	10.1177/1362168810383329	2011	54
De Jong N, 2011, Lang Learn	10.1111/j.1467-9922.2010.00620.x	2011	52
Valencia Sw, 2010, Read Res Quart	10.1598/RRQ.45.3.1	2010	49
Adlof Sm, 2006, Read Writ	10.1007/s11145-006-9024-z	2006	48
Benjamin Rg, 2010, Read Res Quart	10.1598/RRQ.45.4.2	2010	44
Riedel Bw, 2007, Read Res Quart	10.1598/RRQ.42.4.5	2007	43
Tilstra J, 2009, J Res Read	10.1111/j.1467-9817.2009.01401.x	2009	40
Biber D, 2011, Tesol Quart	10.5054/tq.2011.244483	2011	39
Bowers Pg, 1993, Read Writ	10.1007/BF01026919	1993	38
Kim Ys, 2011, Sci Stud Read	10.1080/10888438.2010.493964	2011	37
Mccutchen D, 2000, Educ Psychol	10.1207/S15326985EP3501_3	2000	36
Stahl Sa, 2005, J Lit Res	10.1207/s15548430jlr3701_2	2005	36

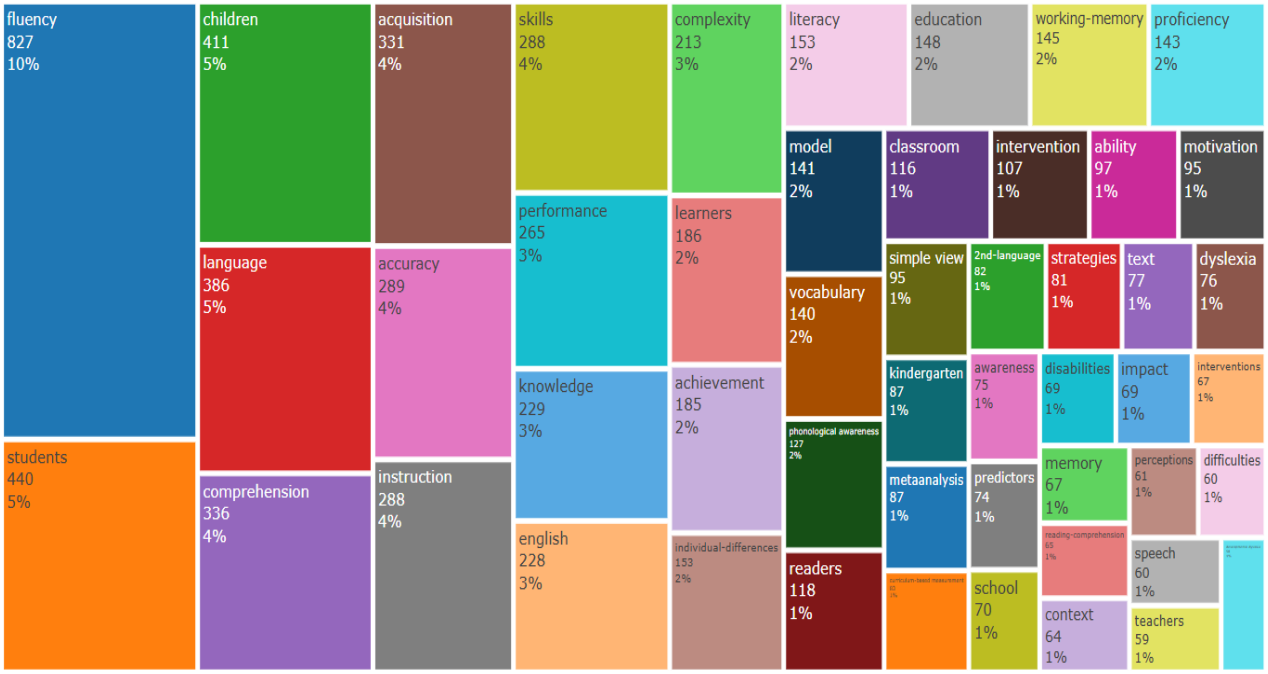
The word cloud obtained from the articles published on fluent reading is presented in Figure 13. When Figure 17 is analysed, it is evident that the most prevalent words are those pertaining to fluency (827), students (440), children (411), language (386), comprehension (336), acquisition (331), accuracy (289), instruction (288), skills (288) and performance (265).

Figure 13. WordCloud



The TreeMap obtained from the articles published on fluent reading is presented in Figure 14.

Figure 14. TreeMap



The alteration of the vocabulary in the articles published on fluent reading according to time is demonstrated in Figure 15.

Figure 15. Words' frequency over time

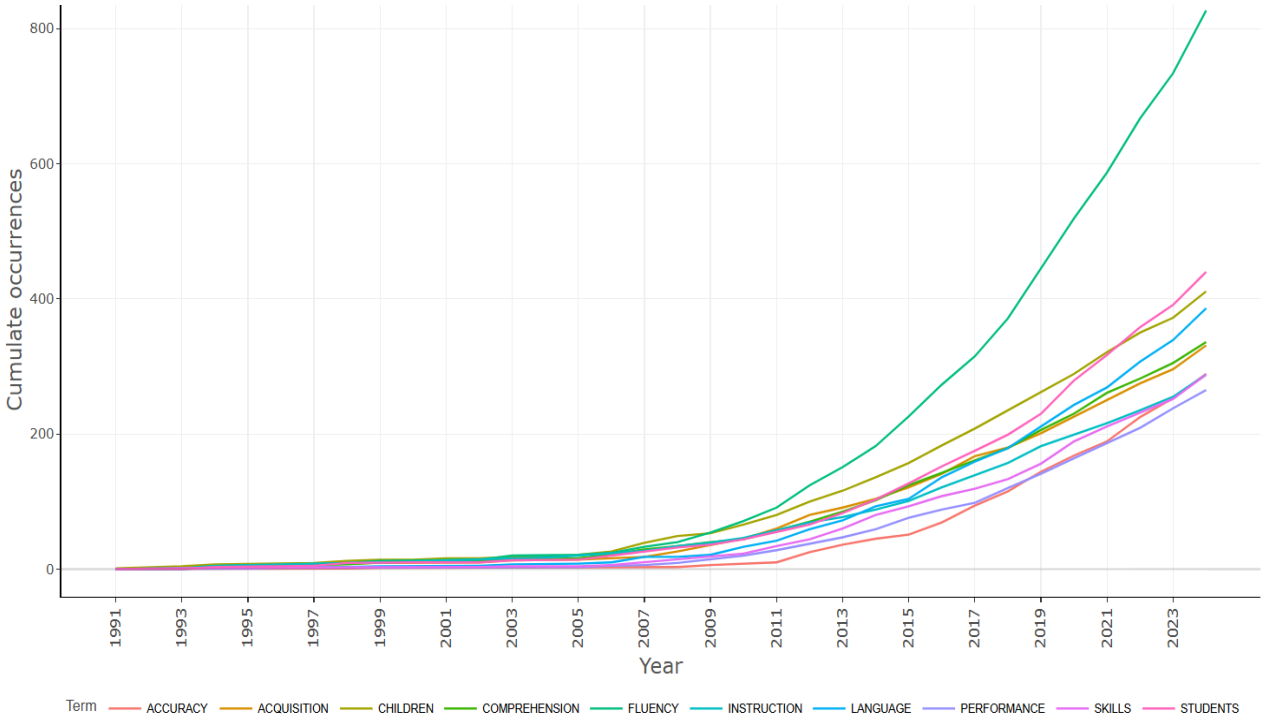
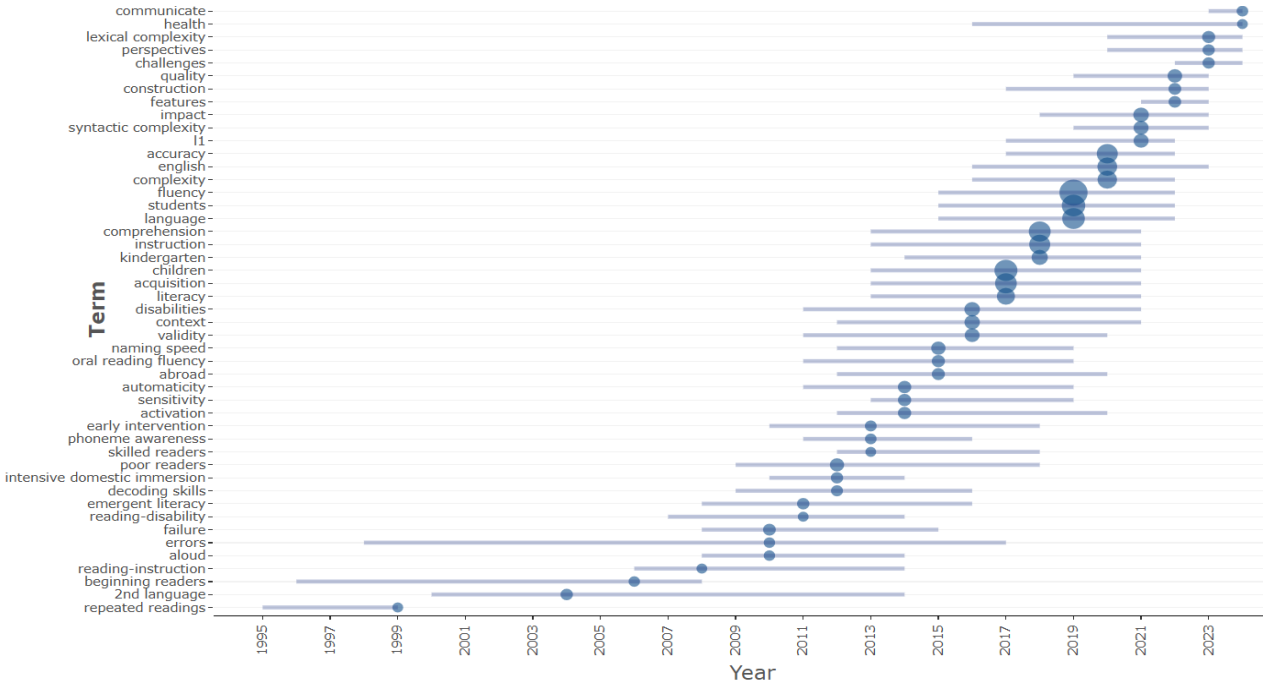


Figure 16 provides a visual representation of the trend topics of the articles published on reading fluency according to years. An analysis of Figure 20 reveals that between 1995 and 2012, disabilities (69), context (64), validity (50) and naming speed (40) were among the trending topics. In the subsequent period between 2013 and 2024, the most prevalent trending topics were fluency (827), students (440), children (411), language (14), low prior knowledge (386) and comprehension (336).

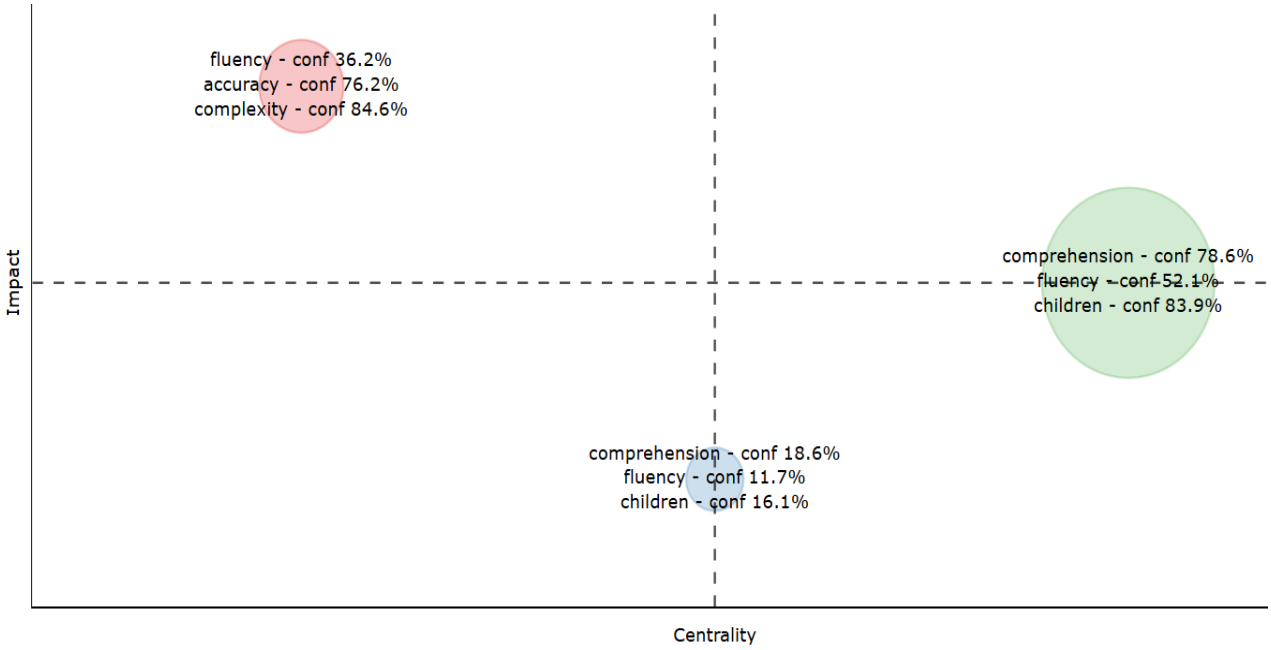
Figure 16. Trend topics (keywords)



3.5. Clustering by Coupling

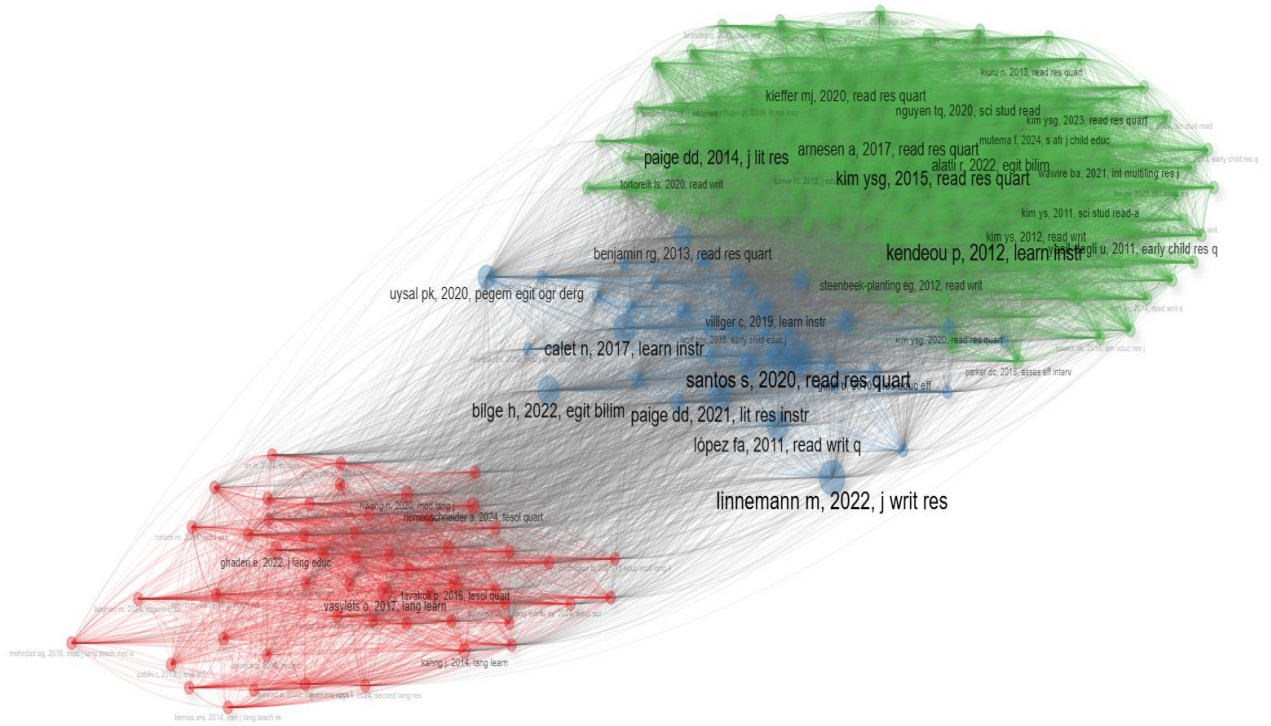
The articles published on fluent reading were analysed according to the documents over the years, and the results are presented in Figure 17. The analysis of Figure 17 indicates the presence of three clusters. The first group consists of 'fluency - conf 35.5% accuracy - conf 76.2% complexity - conf 84.6%'. The second group is characterised by 'comprehension - conf 18.6%, fluency - conf 11.8%, children - conf 16.1%'. The third group is distinguished by 'comprehension- conf 78.6%, fluency - conf 52.7%, children - conf 83.9%'.

Figure 17. Clustering according to documentation



The analysis of the clustering of articles published on reading fluency by authors over the years is presented in Figure 18.

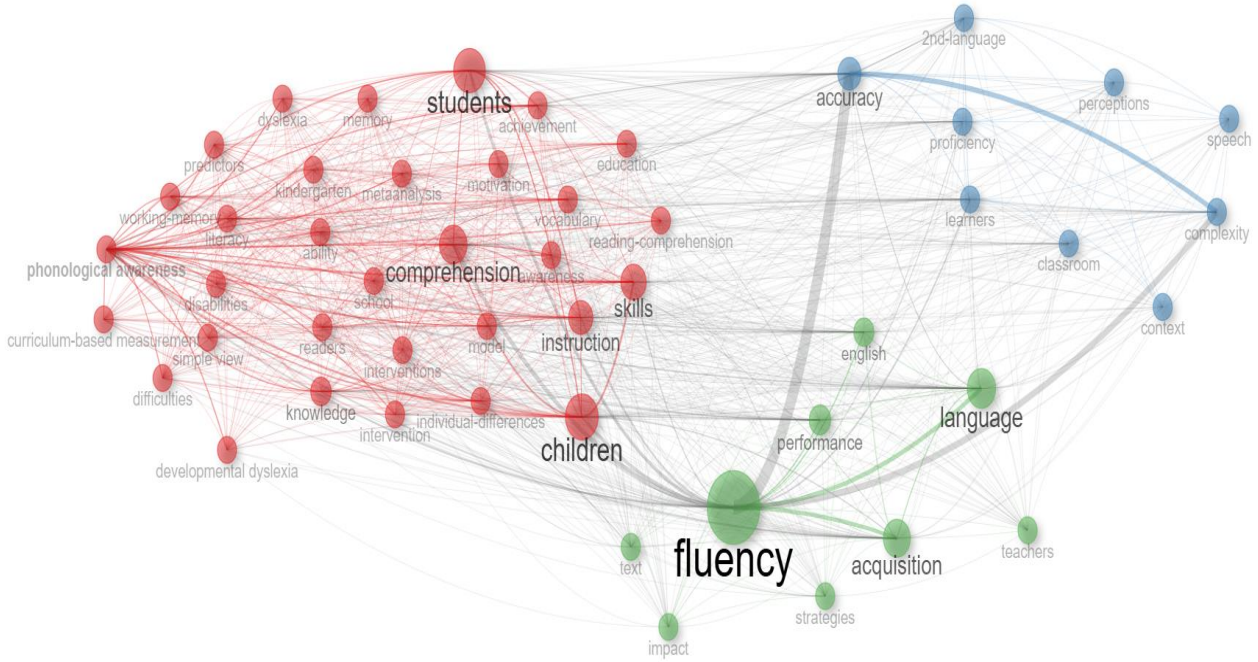
Figure 18. Clustering according documents



3.6. Co-occurrence Network

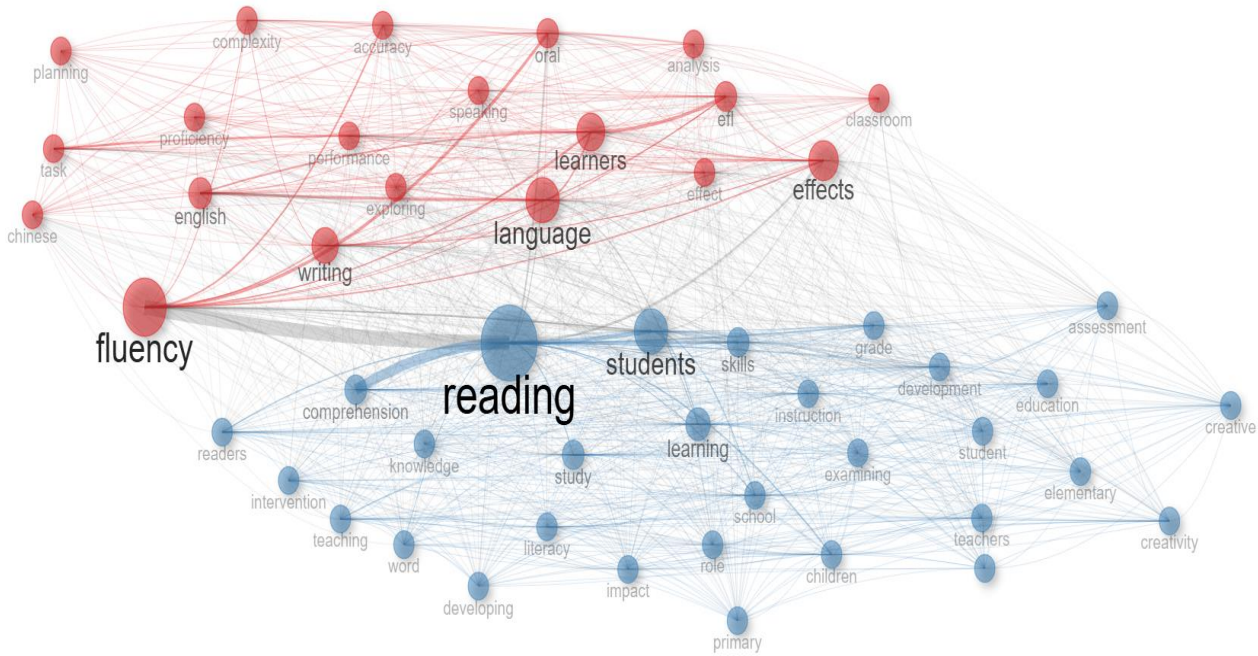
The co-occurrence network formed by the articles published on fluent reading according to keywords over the years was analysed and presented in Figure 19. When Figure 19 was analysed, it was found that 'fluency, performance, language, acquisition, strategies, impact, text, English, teachers' formed a network together. Similarly, the nodes 'students, children, comprehension, instruction, skills, phonological awareness' formed a network together, while the nodes 'accuracy, perception, complexity, learners, contexts' formed a network together.

Figure 19. Co-occurrence network by keywords



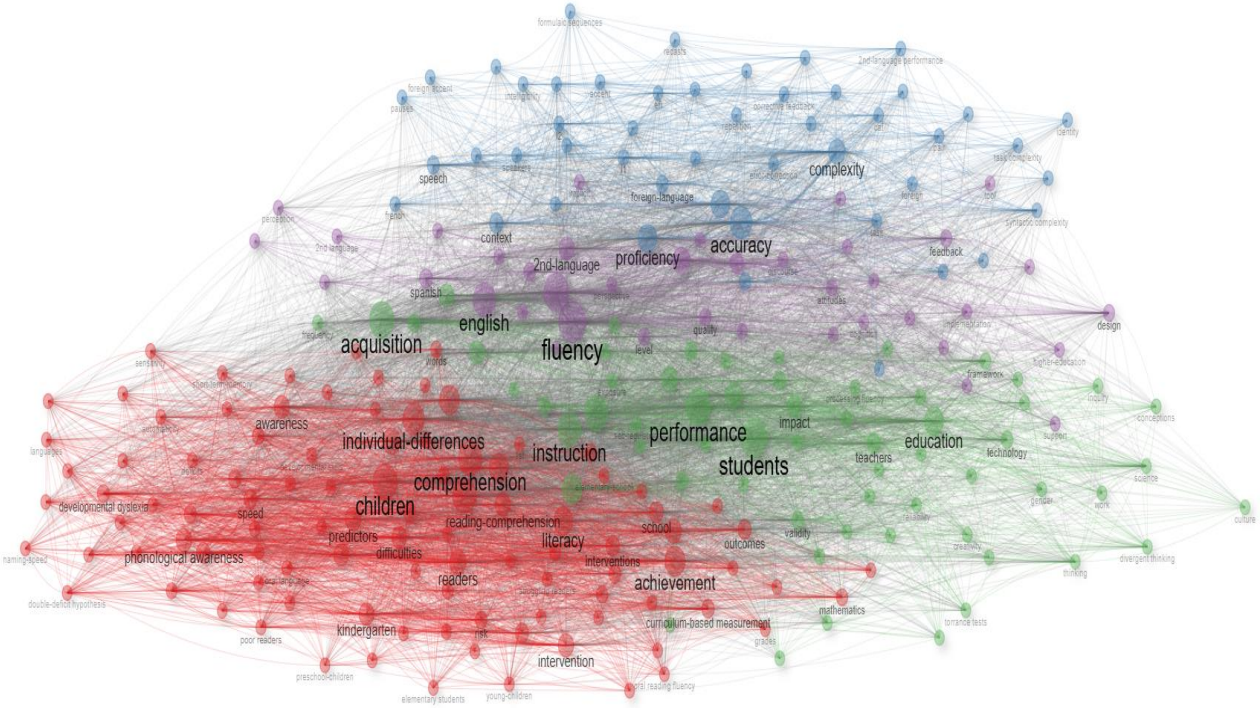
The co-occurrence network formed by the articles published on fluent reading according to the titles over the years was analysed and presented in Figure 20. When Figure 20 was analysed, it was found that 'reading, students, learning, comprehension, study, skills' formed a network together. Similarly, 'fluency, language, writing, learners, effects, English' formed a network together.

Figure 20. Co-occurrence network by titles



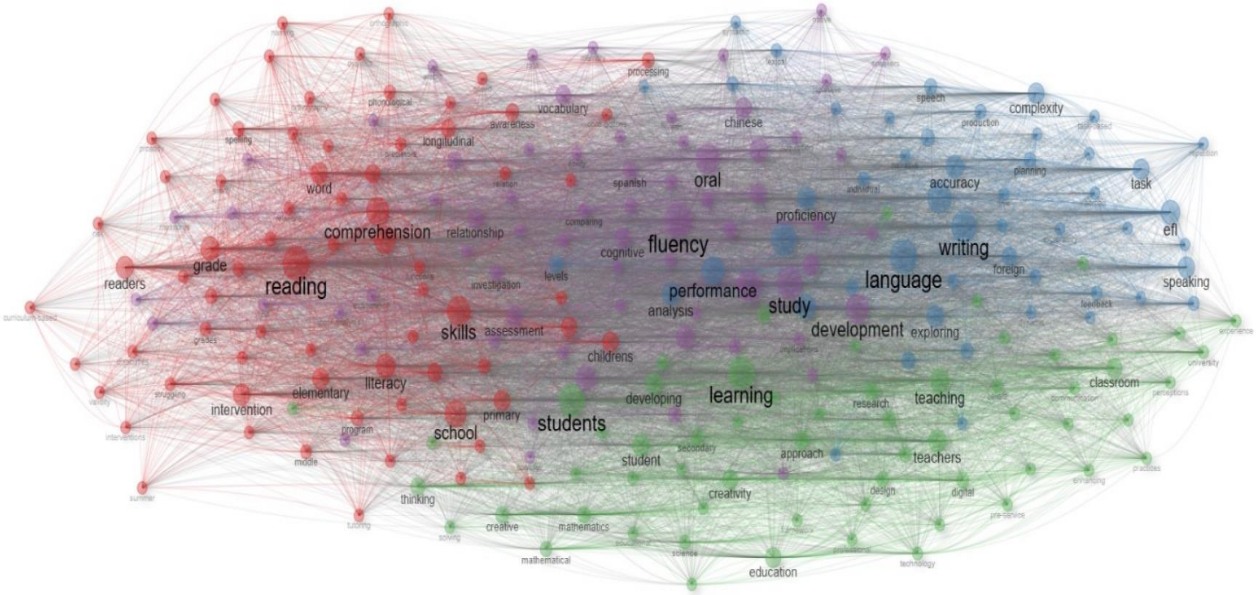
The thematic map formed by the articles published on fluent reading according to keywords over the years was analysed and presented in Figure 21. When Figure 21 was analysed, four different thematic maps were formed around the words 'children, students, fluency and accuracy'.

Figure 21. Thematic map by keywords



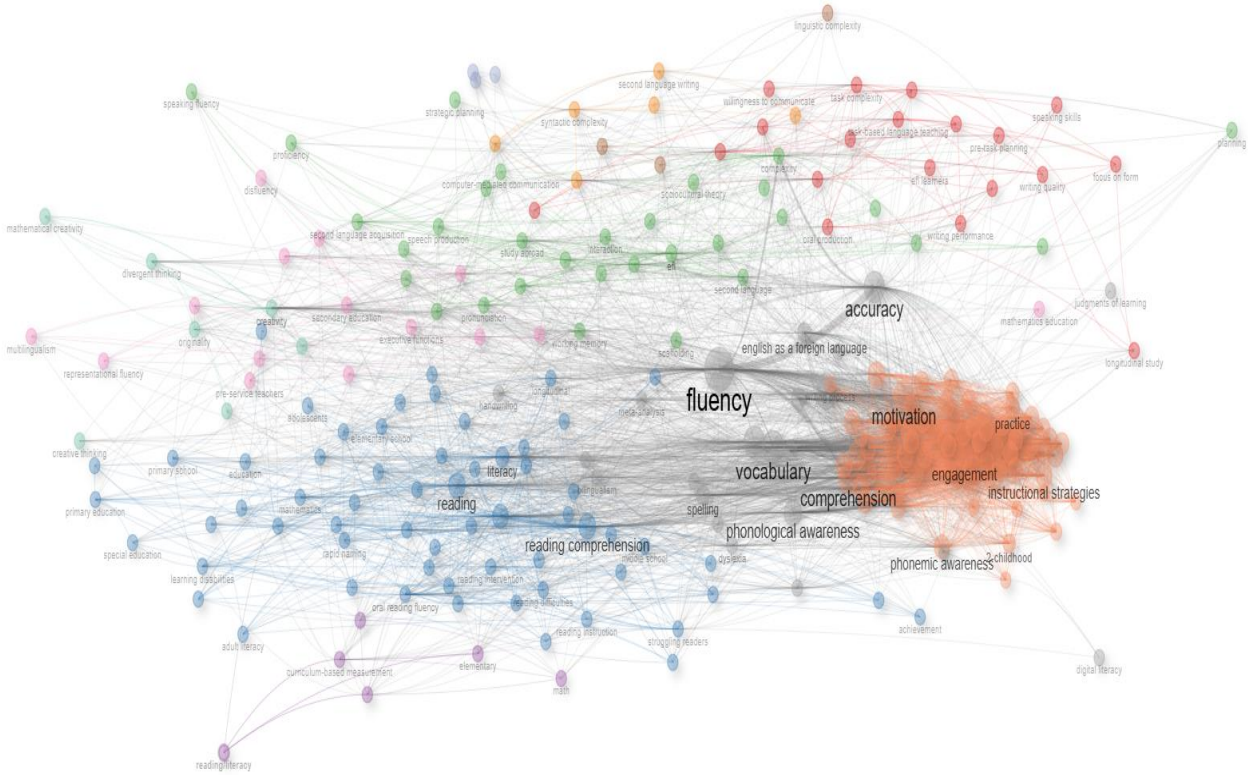
The thematic map formed by the titles of articles published on reading fluency over the years was analysed and presented in Figure 22. When Figure 22 was analysed, four different thematic maps were formed around the words 'reading, language, fluency and students'.

Figure 22. Thematic map by titles



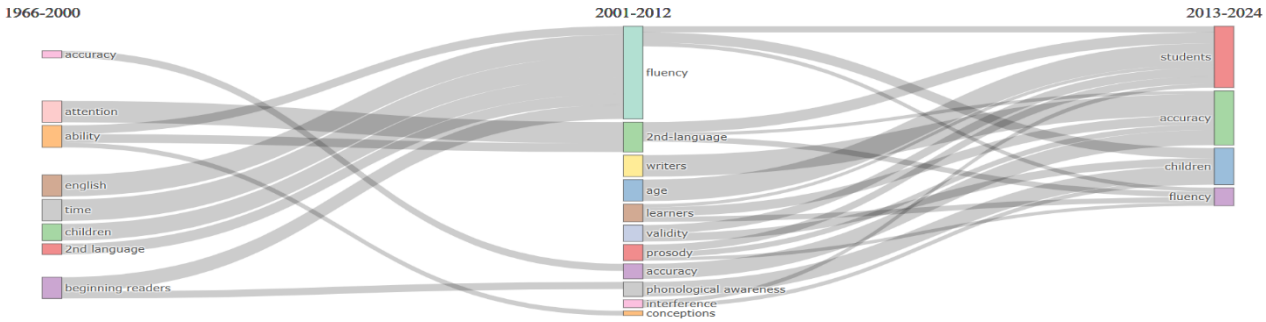
The thematic map of articles published on reading fluency according to author keywords over the years was analysed and presented in Figure 23. When Figure 27 is examined, the thematic map was formed around the following words: 'fluency, comprehension, reading comprehension, complexity, L2 writing, creativity, syntactic complexity, curriculum-based measurement, higher education and writing fluency'.

Figure 23. Thematic map by authors's keywords



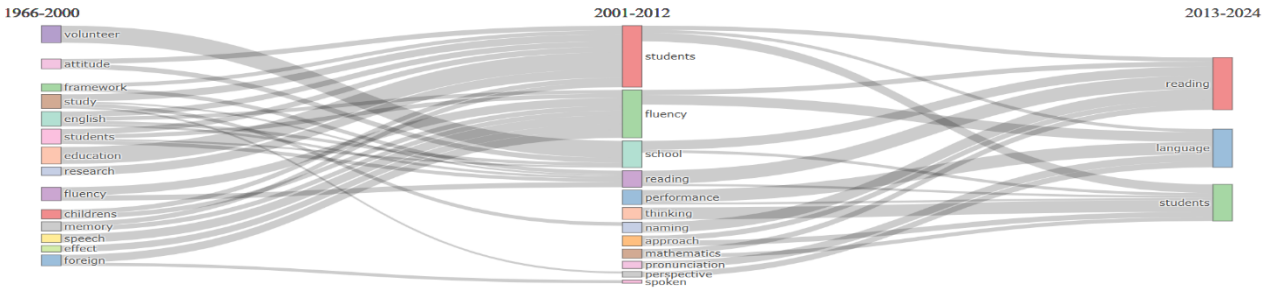
The thematic evolution of articles published on fluent reading according to keywords over time was analysed and presented in Figure 24. When Figure 24 is analysed, it is evident that the keywords 'accuracy, attention, ability, English, time, children, second language, beginning readers' were predominant between 1966-2000. However, a shift occurred between 2001-2012, with the keywords 'fluency, second language, writers, age, learners, validity, prosody, accuracy, phonological awareness, interference, conceptions' assuming prominence. A similar trend was observed in the years 2013-2024, with the keywords 'students, accuracy, children, fluency' assuming prominence.

Figure 24. Thematic evolution by keywords



The thematic evolution of articles published on fluent reading, as indicated by their titles, was analysed and presented in Figure 25. The analysis of Figure 25 reveals that the keywords 'volunteer, attitude, framework, study, English, students, education, research, fluency, children, memory, speech, effect, foreign' were particularly salient between 1966 -2000, while the keywords 'students, fluency, school, reading, performance, thinking, naming, approach, mathematics, pronunciation, perspective, spoken' were more prevalent between 2001-2012. Similarly, the words 'reading, language, students' were more prevalent between 2013-2024.

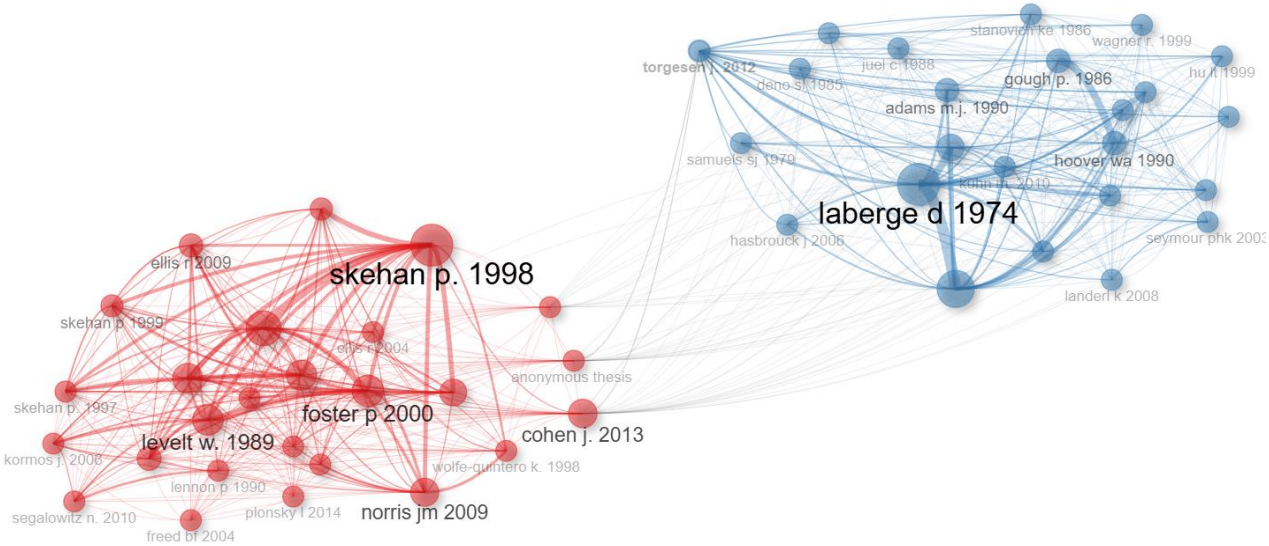
Figure 25. Thematic evolution by tittles



3.7. Co-citation Network

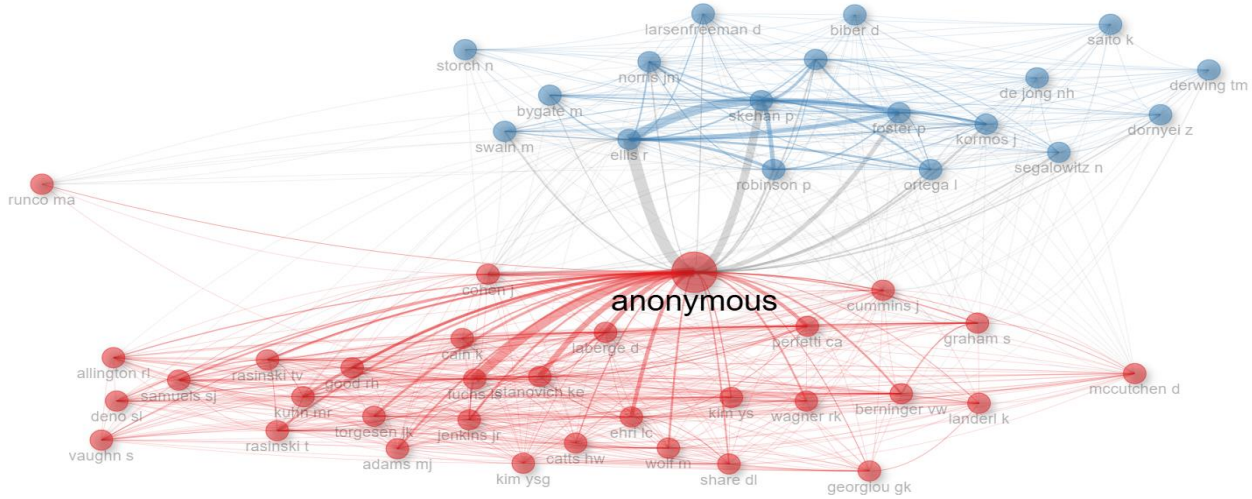
The co-citation networks formed by the articles published on fluent reading over the years were analysed according to the documents and presented in Figure 26. When Figure 30 is analysed, the co-citation networks according to documents are as follows: Laberge D 1974 (cluster = 2; betweenness = 23.140; closeness = 0.005; pagerank = 0.043); Skehan P. 1998 (cluster = 1; betweenness = 0.710; closeness = 0.004; pagerank = 0.037).); Foster P. 2000 (cluster = 1; betweenness = 0.385; closeness = 0.012; pagerank = 0.043); Levelt W. 1989 (cluster = 1; betweenness = 9.415; closeness = 0.005; pagerank = 0.023); Norris Jm 2009 (cluster = 1; betweenness = 0.336; closeness = 0.004; pagerank = 0.025).Cohen J. 2013 (cluster = 1; betweenness = 675.655; closeness = 0.007; pagerank = 0.016).

Figure 26. Co-citation network doc



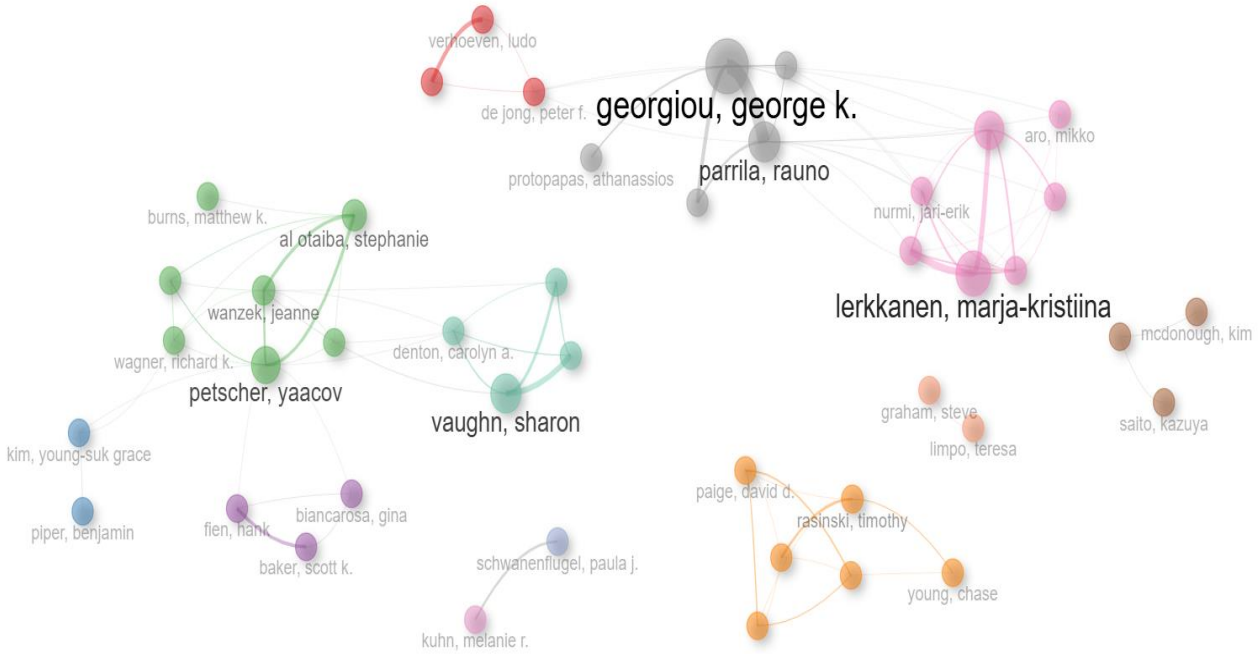
The co-citation networks of articles published on reading fluency over the years were analysed according to authors and presented in Figure 27. Figure 27 shows the following co-citation networks according to authors: Anonymous (cluster = 1; betweenness = 638.315; closeness = 0.010; pagerank = 0.081); Robinson P (cluster = 2; betweenness = 3.756; closeness = 0.007; pagerank = 0.024); Foster P 2 000 (cluster = 1; betweenness = 0.385; closeness = 0.012; pagerank = 0.043); Ellis R (cluster = 2; betweenness = 267.679; closeness = 0.009; pagerank = 0.037); Ske Han P (cluster = 2; betweenness = 15.723; closeness = 0.007; pagerank = 0.040).Segalowitz N (cluster = 2; betweenness = 310.690; closeness = 0.009; pagerank = 0.016).

Figure 27. Co-citation network author



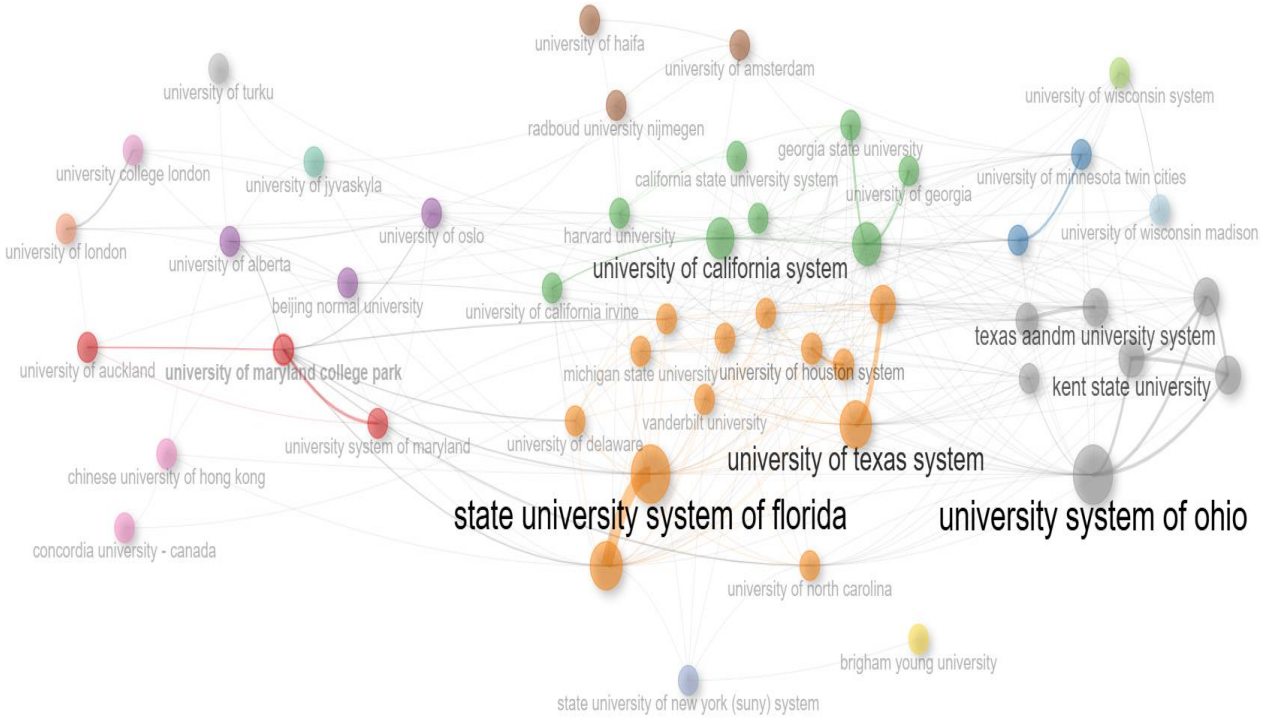
The collaboration network formed by the articles published on fluent reading was analysed and presented in Figure 28. Figure 28 shows the collaboration network according to the authors: Georgiou, George K. (cluster = 8; betweenness = 23.651; closeness = 0.053; pagerank = 0.043); Lerkkanen, Marja-Kristiina (cluster = 7; betweenness = 4.706; closeness = 0.045; pagerank = 0.038); Vaughn, Sharon (cluster = 9; betweenness = 3.351; closeness = 0.029; pagerank = 0.033); Petscher, Yaacov (cluster = 3; betweenness = Petscher, Yaacov (cluster = 3; betweenness = 55.222; closeness = 0.048; pagerank = 0.045); Parrila, Rauno (cluster = 8; betweenness = 27.814; closeness = 0.059; pagerank = 0.039).

Figure 28. Author-collaboration network



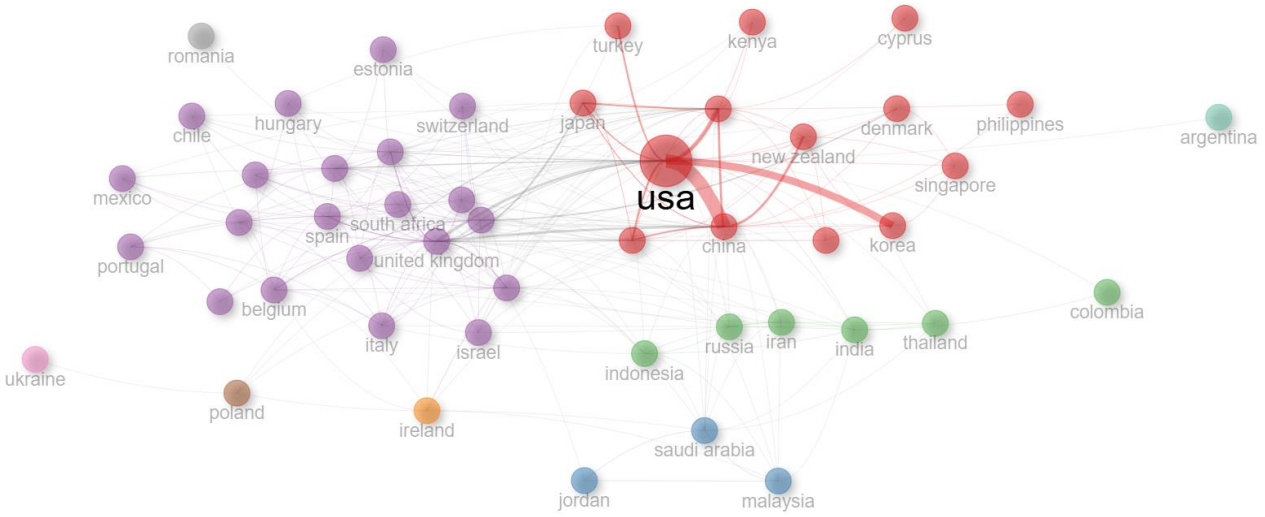
The collaboration network of organisations formed by the published articles on fluent reading was examined and presented in Figure 29. Figure 29 shows the collaboration network according to the organisations: State University System of Florida (cluster = 5; betweenness = 159.934; closeness = 0.014; pagerank = 0.056); University System of Ohio (cluster = 8; betweenness = 53.558; closeness = 0. 013; pagerank = 0.047); University of Texas System (cluster = 5; betweenness = 52.454; closeness = 0.013; pagerank = 0.042); University of California System (cluster = 3; betweenness = 103.803; closeness = 0.014; pagerank = 0.027); Kent State University (cluster = 8; betweenness = 1.093; closeness = 0.011; pagerank = 0.033).

Figure 29. Institutions-collaboration network



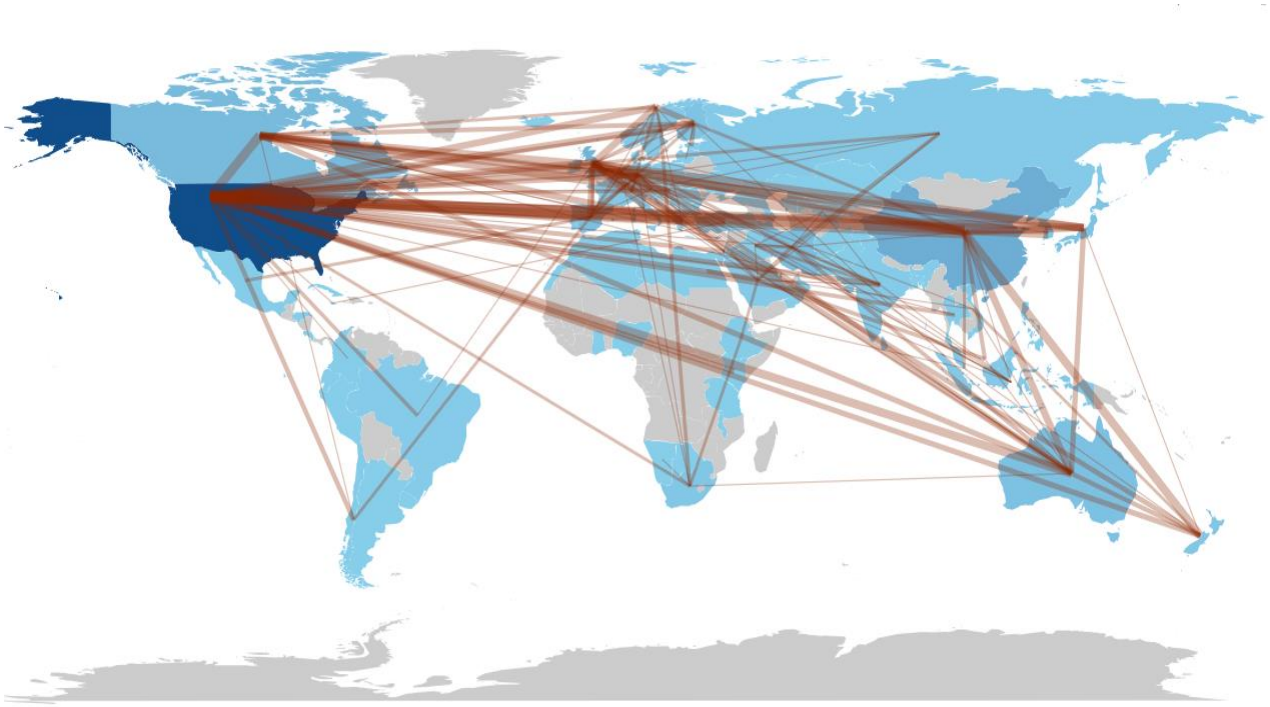
The collaboration network of countries formed by the published articles related to reading fluency was analysed and presented in Figure 30. Figure 30 shows the collaboration network according to the countries: The USA (cluster = 1; betweenness = 415.883; closeness = 0.017; pagerank = 0.0145); the United Kingdom (cluster = 4; betweenness = 192.609; closeness = 0. 016; pagerank = 0.085); China (cluster = 1; betweenness = 94.711; closeness = 0.014; pagerank = 0.076); Canada (cluster = 1; betweenness = 60.972; closeness = 0.014; pagerank = 0.057); Australia (cluster = 1; betweenness = 24.530; closeness = 0.013; pagerank = 0.043).

Figure 30. Countries-collaboration network



A thorough analysis was conducted on the 'Countries' collaboration world map', which was created by the countries that have published on "reading fluency" over the years (Figure 31). The analysis yielded several notable findings, including the identification of cooperation relations between the USA and China (41), the USA and Korea (30), the USA and Canada (22), and the USA and the United Kingdom (18).

Figure 31. Countries' collaboration world map



4. CONCLUSION AND DISCUSSION

A bibliometric analysis of 3584 articles on 'fluent reading' published in the WoS database since 1965 was conducted in this study, and the results obtained are presented in all aspects. Between 1965 and 2024, 3584 articles on fluent reading were published from 458 sources, with an average of 43.79 articles published per year. The average number of citations per document for these articles is 18.91, and the total number of references is 110,608. The number of Keywords Plus for these articles is 3,105, and the number of Author's Keywords is 7,297. The number of authors of single-author documents is 790, and the number of authors of multi-author documents is 6,815. The number of single-authored documents is 879, while the number of multi-authored articles is 2705. The average number of co-authors per article is 2.75, and the percentage of international co-authorship is 17.33%.

A total of 7,605 researchers published with fluent reading, and an analysis of the 10 authors who published the most in the journal reveals Georgiou, George K. to be in first place with 30 studies, followed by Vaughn, Sharon in second place with 21 studies, and Lerkkanen, Marja-Kristiina in third place with 20 studies. When the information on the authors with the most local citations is analysed, Georgiou, George K. ranks first with 219 citations, followed by Schwanenflugel, Paula J. with 198 citations and Tavakoli, Parvaneh with 179 citations. A further analysis of the studies published by authors who publish on fluent reading in this journal according to years reveals that Georgiou, George K., who published the most, was very active between 2006-2024, with a particularly high concentration of publications between 2006-2023. A similar trend was observed in Sharon Vaughn, who ranked second among the most prolific publishers, with a focus spanning from 2007 to 2023. Marja-Kristiina Lerkkanen also exhibited a concentrated publishing pattern between 2010 and 2023.

A study of the authors with the highest local impact among 7605 researchers who published with fluent reading in the Web of Science database reveals that Georgiou George K. (h_=20) ranks first, followed by Vaughn Sharon (h_=16) in second place and Parrila Rauno (h_=14) in third. When the institutions with the highest number of publications are analysed, the State University System of Florida ranks first with 139 studies, the University System of Ohio ranks second with 122 studies, and the University of California System ranks third with 117 studies. When the countries of the responsible authors publishing on fluent reading are analysed, the USA ranks first with 1295 articles, China ranks second with 278 articles, and the United Kingdom ranks third with 202 articles. A similar outcome is observed when the distribution of the number of citations of the articles published on fluent reading according to the countries is analysed. The top 10 countries are as follows: the USA is in first place with 32,411 citations, Canada is in second place with 5,223 citations, and the United Kingdom is in third place with 4,587 citations.

The article 'Theoretical links among naming speed, precise timing mechanisms and orthographic skill in dyslexia' by Bowers, P.G., Wolf, M. in 1993, which has received 445 citations, is the most globally cited article on reading fluency. In second place, with 431 citations, is the article 'Should We Use Characteristics of Conversation to Measure Grammatical Complexity in L2 Writing Development?' by Biber, D., Gray, B. and Poonpon, K. (2011). In third place, with 423 citations, is the article by Sénéchal, M. (2006), 'Testing the Home Literacy Model: Parent Involvement in Kindergarten Is Differentially Related to Grade 4 Reading Comprehension, Fluency, Spelling, and Reading for Pleasure'.Among the most locally cited articles, the first one is 'Investigating Fluency in EFL: A Quantitative Approach' by Lennon P, 1990 with 116 citations.In the second place with 90 citations is Hasbrouck J, 2006, 'Oral Reading Fluency Norms: A Valuable Assessment Tool for Reading Teachers (2006) occupies third place in the ranking. The study, which bears the title 'Fluency: Bridge Between Decoding and Reading Comprehension' and was authored by John J. Pikulski and David J. Chard in 2005, has received 89 citations.

A subsequent analysis of the word cloud obtained from the articles published on fluent reading reveals that the most common words are those pertaining to fluency (827), students (440), children (411), language (386), comprehension (336), acquisition (331), accuracy (289), instruction (288), skills (288) and performance (265). When the trend topics of the articles published on fluent reading were analysed according to years, disabilities (69), context (64), validity (50) and naming speed (40) were among the trend topics between 1995-2012. Subsequent to 2013, the most prevalent Trending Topics were found to be fluency (827), students (440), children (411), language (14), low prior knowledge (386) and comprehension (336).A subsequent analysis of the articles published on fluent reading according to the documents over the years revealed the presence of three clusters. The first group consists of 'fluency - conf 35.5% accuracy - conf 76.2% complexity - conf 84.6%'. The second group consists of 'comprehension - conf 18.6% fluency - conf 11.8% children - conf 16.1%'. Finally, in the third group, the results are as follows: 'comprehension - conf 78.6% fluency - conf 52.7% children - conf 83.9%'.

The co-occurrence network formed by the articles published on fluent reading according to keywords over the years was analysed, revealing the formation of networks involving terms such as 'fluency, performance, language, acquisition, strategies, impact, text, English, teachers'. A similar analysis of the co-occurrence network formed by the articles published on fluent reading according to keywords over the years revealed the formation of a network involving terms such as 'students, children, comprehension, instruction, skills, phonological awareness'. A further analysis of the co-occurrence network formed by the articles published on fluent reading according to keywords over the years revealed the formation of a network involving terms such as 'accuracy, perception, complexity, learners, contexts'. The co-occurrence network formed by the articles according to the titles over the years was analysed and presented in Figure 24. When Figure 24 was analysed, 'reading, students, learning, comprehension, study, skills' formed a network together, and similarly, 'fluency, language, writing, learners, effects, English' formed a network together.

The analysis of the Thematic Map formed by the articles published on fluent reading according to keywords over the years yielded four distinct Thematic Maps centred on the terms 'children', 'students', 'fluency' and 'accuracy'. Similarly, the analysis of the Thematic Map formed by the titles of the published articles over the years resulted in four Thematic Maps centred on the terms 'reading', 'language', 'fluency' and 'students'. The Thematic Map formed by the articles according to the author keywords over the years is presented in Figure 27. When Figure 27 is analysed, the Thematic Map is formed around the words 'fluency, comprehension, reading comprehension, complexity, L2 writing, creativity, syntactic complexity, curriculum-based measurement, higher education and writing fluency'.

A thematic analysis of the keywords associated with articles on fluent reading over time revealed that, between 1966 and 2000, the most prevalent keywords were 'accuracy, attention, ability, English, time, children, second language, beginning readers'. -2000, while the keywords 'fluency, second language, writers, age, learners, validity, prosody, accuracy, phonological awareness, interference, conceptions' emerged between 2001-2012. Similarly, the words 'students, accuracy, children, fluency' became dominant between 2013-2024. The analysis of the thematic evolution of articles published on fluent reading according to their titles over the years revealed the following keywords: 'volunteer, attitude, framework, study, English, students, education, research, fluency, children, memory, speech, effect, foreign'. The former group dominated between 1966 and 2000, while the latter group prevailed between 2001 and 2012. A similar pattern emerged between 2013 and 2024, with the terms 'reading', 'language' and 'students' assuming prominence.

When the co-citation networks formed by the articles published on fluent reading over the years are analysed according to the documents, the first five co-citation networks according to the documents are as follows: Laberge D 1974; Skehan P 1998; Foster P 2000; Levelt W 1989; Norris Jm 2009; Cohen J 2013. When the co-citation networks formed by the published articles over the years are analysed according to the authors, the following co-citation networks are in the top five according to the authors: Anonymous; Robinson P; Foster P 2000; Ellis R; Skehan; Segalowitz N.When the co-citation networks formed by the articles over the years are analysed according to the sources, the following co-citation networks are in the top five according to the authors:Journal of Education Psychology; Reading and Writing; Reading Research Quarterly; Scientific Studies of Reading; Journal of Learning Disabilities; The Language Learning Journal; The International Journal of Applied Linguistics.

When the collaboration network analysis of the articles published on reading fluency is analysed according to the authors, the following five authors emerge in the top rankings: Georgiou, George K; Lerkkanen, Marja-Kristiina; Vaughn, Sharon; Petscher, Yaacov; Parrila, Rauno.When the collaboration networks formed by the published articles are analysed according to the institutions, the following five institutions emerge in the top rankings: State University System of Florida; University System of Ohio; University of Texas System; University of California System; Kent State University.When the collaboration networks formed by the articles are analysed according to the countries, the top five are as follows: USA; United Kingdom; China; Canada; Australia. When the 'Countries' collaboration world map' created by the countries publishing on 'reading fluency' over the years was analysed, it was found that USA-China (41), USA-Korea (30), USA-Canada (22) and USA-United Kingdom (18) were found to be in collaboration.

To summarise, the present article employs a bibliometric analysis of articles on 'fluent reading' in the WoS database from past to present. It is suggested that the studies on 'fluent reading', which has undergone such a period of development from past to present, will provide a perspective for both practitioners, researchers and publishing organisations for the future process.

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