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# Bibliometrics unleashed: navigating the landscape of classroom assessment

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**ABSTRACT**

This bibliometric article examines the current state of publication in the field of classroom assessment, exploring the productivity and influence of countries, institutions, and authors. A search query of on the Scopus database using the term “classroom assessment” or “classroom-based assessment” or “assessment for learning” was performed retrieving 824 scholarly articles from 1985 to 2023. VOSviewer software was used to create maps based on network data of scientific publications displaying relationships among researchers, countries, and scientific journals. By analyzing citation patterns and keywords, it identifies popular themes among scholars and highlights areas requiring further research under keywords such as "assessment for learning", "feedback", and "validity". The study provides valuable insights into the evolving landscape of classroom assessment research, offering a comprehensive overview of the key contributors and trends shaping the field. Author keywords were used to explore the co-occurrence of different terms connected to classroom assessment. This study's findings provide a comprehensive comprehension of the current state of classroom assessment research, making a substantial contribution to the education and assessment literature and paving the way for future research directions.



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## 1. INTRODUCTION

Classroom assessment refers to the systematic process of collecting, analysing, and interpreting information the learning progress and accomplishments of students within the educational setting [1], [2]. It includes assessing students' knowledge, skills, understanding, and abilities in relation to the learning objectives and standards of a particular course or subject using a variety of methods and techniques. It can take the form of formative assessments, which are ongoing and used to provide feedback for instructional improvement, or summative assessments, which evaluate students' overall performance at the end of a specific period [3], [4]. The primary purpose of classroom assessment is to support and improve student learning by providing teachers with valuable information to guide their instructional decision making and assist students in reaching their utmost potential [5]. In classrooms that emphasize individualized learning, formative assessment data serves as a valuable tool in identifying which students are prepared to advance to new material and which require additional support [6]. Teachers rely on assessment data to tailor their teaching strategies and tackle any misconceptions that may arise [7]. Ultimately, fostering critical thinking abilities and problem-solving skills is essential for students to successfully navigate the global stage [8], [9].

The relevance of classroom assessment in the field of education that has an impact on teaching practice, student achievements and outcomes [10], [11], and sometimes on the development of education

policies is increasingly more explicit. As a result, classroom assessment entertained quite profound attention from scholars and those engaged in education. Most of the published literature explores different dimensions of the issue of classroom assessment. Five different categories of discussion about classroom assessment were identified. The categories include ways of assessment [12], effects on a student's learning, effectiveness of classroom assessment, technology use in classroom assessment, and students' perception to classroom assessment. A thorough investigation reveals that prior research has generally and consistently indicated that classroom assessment has a powerful, positive influence on students' academic achievement, allowing teachers to gauge students' understanding and progress [13]–[15]. In addition, numerous assessment methods have been documented, demonstrating the adaptability of classroom assessment design [16]. For instance, Popham emphasized that classroom assessment is a critical component of effective teaching and learning and serves several purposes including informing instruction by providing valuable insights into students' strengths and weaknesses, improving student learning through well-designed assessments and formative practices, enhancing motivation by providing constructive feedback and opportunities for improvement, promoting equity with a fair and inclusive assessment design, and supporting teacher accountability for effective instructional practises. The viewpoint of Popham emphasises the significance of deliberate and purposeful assessment in the classroom, with the goal of promoting equal educational opportunities and maximising student achievement [17].

There have been a few assessment-related bibliometric studies that have been done with a specific issue in view as presented in Table 1. Recent research focused on rubric of self-assessment [18] explores the importance of self-assessment for students and the role of rubrics as effective tools. A bibliographic assessment using Scopus data from 2006 to 2021 was conducted. Another research in 2022 [19], presents a knowledge map of teacher assessment research over ten years, using a 10-year dataset from the Web of Science. A bibliometric analysis of 847 articles revealed popular research themes, authors, and countries. Key topics include formative assessment, teacher education, and student performance, with future directions focusing on impact, accountability, and technology. The study suggests integrating quantitative and qualitative methods for more detailed analysis. A recent study conducted an extensive analysis of 1000 publications published between 2010 and 2022 [20], with a specific focus on performance assessment methods that are centred around project-based learning and critical thinking. The study employed a descriptive qualitative bibliometric approach, specifically focusing on publications sourced exclusively from journals indexed in the Google Scholar and Scopus databases. The findings of the bibliometric research revealed a qualitative association between comprehensive performance evaluation rooted in project-based learning and critical thinking.

Table 1. Comparison table of previous assessment-related bibliometric studies

| Author | Database | Range of years | Search within | Search keyword | Total extraction | TDE |
|---|---|---|---|---|---|---|
| Huyền *et al.* [18] | Scopus | 2006-2021 | By all fields | Rubrics AND Self Assessment OR Rubrics AND Self Evaluation OR Rubrics AND Formative Assessment | 698 | 69 |
| Yunyun [19] | Web of Science | 2012-2021 | By article title | "Teacher assessment" OR "Teacher Evaluation" | 853 | 847 |
| Sudirman *et al.* [20] | Google Scholar | 2010-2022 | Not specify | "Performance Assessment, Project Base Learnings, and Critical Thinking" | 1000 | 1000 |

TDE=Total documents examined

Despite the recognized importance of classroom assessment, a comprehensive understanding of the global research output in bibliometric studies in this domain remains elusive especially for bibliometric studies that use Scopus as a single database. The term "Bibliometrics" was first put forward in 1969 [21] and since then, researchers use bibliometric methods of assessment to measure the impact of a particular author or to establish the relationship between two or more authors or works [22]. The field of bibliometrics has become increasingly important in academic research [23]. It involves the statistical examination of written publications, such as articles or books [24]. Bibliometric analysis can be used to assess the productivity of writers, organizations and cross-theme collaborations [25]. Kushairi and Ahmi highlight that the utilization of bibliometric analysis has grown in importance as a method for identifying and scrutinizing patterns and trends in scholarly research [26]. Science mapping which is another approach of evaluative bibliometrics is a technique utilized to highlight the structural and dynamic characteristics of scientific research [27]. The purpose of this study was to perform bibliometric analysis and scientific mapping of works on classroom assessments across a 38-year period, from 1985 to 2023. The search approach involves solely using the title of the published paper to enhance the credibility of the dataset in order to address the following research questions:

i) What is the current state of the publication in the field of classroom assessment?
ii) What are the current citation patterns of publication on classroom assessment?
iii) Which classroom assessment themes are the most popular among scholars?
iv) What is the authorship pattern of the publication on the classroom assessment?

## 2. METHODS

This paper employs a bibliometric analysis, a quantitative and statistical method for analysing academic literature and information sources [28]. Furthermore, bibliometric analysis can also bridge the historical gap in research by quantitatively measuring past and present research activities [29]. It is a field of study that seeks to measure and analyse various aspects of published works, such as academic papers, journals, books, and other documents [30]. Bibliometrics provides valuable insights into the patterns of scientific communication, knowledge dissemination, and academic impact through the application of mathematical and computational methods [31]. These insight can inform future research directions, collaborations and funding decisions [32].

### 2.1. Search strategy

The selection of the documents collected for this study was determined by the research protocol outlined in Figure 1. The information was extracted on July 12, 2023 from the Scopus database as it is a leading abstract and citation database, known for its extensive coverage of academic literature. Scopus distinguishes itself from Web of Science and Google Scholar by continuously expanding its already extensive collection of academic publications, ensuring broader and more up-to-date coverage [27], [33]. Previous bibliometric studies frequently relied on Scopus data to evaluate journals, books, and conference proceedings [34]–[36]. This is unsurprising, given that Scopus is widely recognized as one of the largest curated abstract and citation databases [37], [38]. The combination of keywords "classroom assessment" or "classroom-based assessment" or "assessment for learning" was used to identify each publication of interest. Due to the scant effort committed to bibliometric analysis of classroom assessment, we restricted classroom assessment related document based on their titles and in the area of only social science. The focus of our attention was drawn to the titles of the articles, as they serve as the first point of contact for readers [39]–[41]. The titles encompass the relevant topic matter that is of significance within the research domain and mirrors the aims of the investigation. For this purpose, the following search was conducted: (TITLE ("class assessment" OR "classroom-based assessment" OR "assessment for learning" AND (LIMIT-TO (SUBJAREA,"SOCI")).

This query produced 829 documents in total. Then, 5 documents are removed as they were classified as erratum. The final documents of 824 remain for this study. After a thorough data cleaning process which confirm no duplicate entries, the initial number of documents remained unchanged. All the data retrieved from was then exported in both comma-saperated values (.csv) and research information systems (.ris) formats.

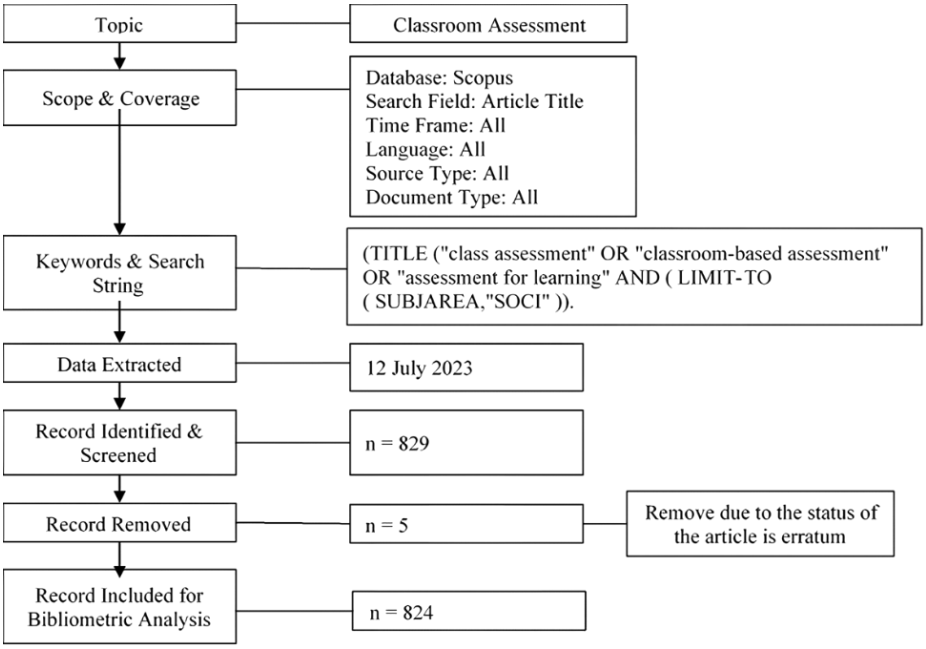


Figure 1. Flow diagram of the search strategy

### 2.2. Data cleaning and harmonisation

Figure 1 illustrates the search strategy employed in this study. To prevent double counting and the introduction of false positive results, errata documents and retracted documents were excluded from the analysis. For data processing, the study utilized the following tools:i) Bibliomagika 1.9, a Microsoft Excel application, to clean the extracted data, calculate the frequencies and percentages of published materials, and generate relevant charts and graphs [42]; ii) VOSviewer (version 1.6.15) to create and visualize the bibliometric networks [43]; and iii) Harzing's Publish and Perish software to calculate citation metrics [44].

The data extracted from Scopus is saved as a Microsoft Excel file named "Scopus_exported_refine_values.csv." This file is then imported into Bibliomagika version 1.9, which automatically generates various analyses, including basic information, publication by year, publication by source title, highly cited documents, and authorship analysis. To ensure data accuracy, the author's data from Bibliomagika is copied and pasted into Bibliomagika split for further data cleaning and harmonization, focusing on authors, affiliations, and countries. Additionally, a search for missing data on the Scopus database is conducted to obtain more precise information. Using the function remove duplicate in Microsoft Excel. For data cleaning related to keywords, the software Openrefine is utilized, using the Scopus.csv file from the aforementioned dataset. In Openrefine, keywords undergo a cluster and decluster process to ensure consistency and accuracy. Once the data is cleaned and harmonized, it is imported into VOSviewer for visualization purposes.

## 3. RESULTS AND DISCUSSION OF FINDINGS

This section presents the findings of a bibliometric analysis exploring key research questions as stated in Table 2. This analysis provides a comprehensive overview of the field by examining publication trends, citation patterns, prominent research themes, and authorship dynamics. Through various bibliometric techniques, the study offers valuable insights into the current scholarly conversation surrounding classroom assessment.

Table 2. Summary of research questions and data provided

| Research Questions | | Data Provided |
|---|---|---|
| i) | What is the current state of the publication in the field of classroom assessment? | Descriptive statistics: Counting the number of publications, average publication year, publication trend over time. |
| ii) | What are the current citation patterns of publications on classroom assessment? | Citation analysis: Examining citation counts, co-citation analysis, and identifying highly cited publications. |
| iii) | Which classroom assessment themes are the most popular among scholars? | Keyword co-occurrence analysis: Identifying frequently occurring keywords to determine popular themes. |
| iv) | What is the authorship pattern of the publication on the classroom assessment? | Authorship and Co-authorship analysis: Identifying authors per document, most productive authors and co-authorship by organisations and countries |

### 3.1. Current state of the publication in the field of classroom assessment

In addressing RQ1, which explores the current state of publication in the field of classroom assessment, our analysis involved examining publication trends. We assessed the total number of publications each year, categorized them by document type, language, source title, and source title type, as well as publication subject area. The data for this analysis were derived from bibliographic information sourced from the Scopus database.

#### 3.1.1. Publication trends

The Table 3 provides a trend analysis of classroom assessment-related publications published between 2013 and 2023. The range of total publications (TP) is 33 to 63, with the highest number in 2022. The information comprises the total number of publications (TP), the number of cited publications (NCP), the total number of citations (TC), the average number of citations per publication (C/P), the average number of citations per cited publication (C/CP), the h-index, and the g-index for each year between 2013 and 2023. The analysis demonstrates fluctuations in publication output and citation influence over time. The year 2013 saw the greatest number of citations, with subsequent years exhibiting varying levels of research activity. The h-index and g-index measure the impact and productivity of publications, accordingly. This data can be used to evaluate the impact and visibility of classroom assessment literature over time.

Figure 2 illustrates the publication and citation statistics over time. In 1985, there was one publication with 93 citations laying a foundation for subsequent years. Notably, in 1998, there was a surge in publications, reaching 13, accompanied by a huge 1412 citations, indicating a significant impact. The trends continued with fluctuations, but in 2011, there was a remarkable increase with 29 publications and high citation count of 1917. The following years showed a steady growth in both publications and citations, with the highest recorded result in 2013 of 61

publications with 1107 citations. From the 824 publications in the analysis, 19 082 citations accumulated that indicates a consistent and prolific scholarly output, with certain years standing out due to increased productivity and impact. The fluctuations in citation numbers illustrate varying degrees of influence for each publication, emphasizing the importance of quality and significance in assessing the overall impact of the research endeavours.

Table 3. Year of publication

| Year | TP | NCP | TC | C/P | C/CP | *h* | *g* |
|---|---|---|---|---|---|---|---|
| 2013 | 61 | 50 | 1107 | 18.15 | 22.14 | 19 | 32 |
| 2014 | 39 | 34 | 412 | 10.56 | 12.12 | 10 | 18 |
| 2015 | 33 | 31 | 615 | 18.64 | 19.84 | 13 | 24 |
| 2016 | 53 | 48 | 775 | 14.62 | 16.15 | 16 | 26 |
| 2017 | 40 | 37 | 484 | 12.10 | 13.08 | 12 | 20 |
| 2018 | 54 | 50 | 912 | 16.89 | 18.24 | 18 | 29 |
| 2019 | 52 | 43 | 350 | 6.73 | 8.14 | 11 | 16 |
| 2020 | 59 | 51 | 401 | 6.80 | 7.86 | 12 | 17 |
| 2021 | 57 | 43 | 242 | 4.25 | 5.63 | 9 | 12 |
| 2022 | 63 | 31 | 76 | 1.21 | 2.45 | 4 | 6 |
| 2023 | 39 | 4 | 7 | 0.18 | 1.75 | 1 | 2 |

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

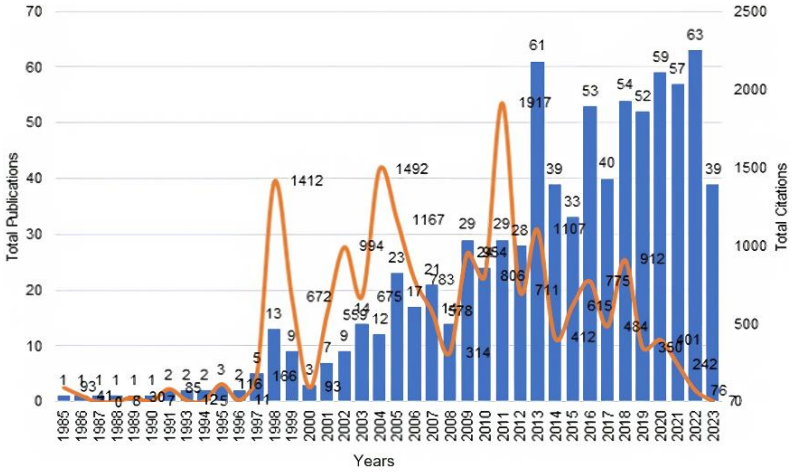


Figure 2. Total publications and citations by year

### 3.1.2. Documents types

In the discipline of classroom assessment, the bibliometric analysis uncovered a total of 824 publications. The majority of these were articles, accounting for 581 publications (70.51 % of the total). The second most prevalent document format, with 163 publications (19.78%), was book chapters. Each conference paper and review contributed 22 (2.67%) publications, while editorials and books contributed 15 (1.82%) and 14 (1.70%) publications, respectively. Notes and correspondence were marginalized, with 6 (0.73%) and 1 (0.12%) respective publication (s).

### 3.1.3. Source type

The analysis of 824 publications in the field of classroom assessment uncovered a variety of source categories that contribute to the dissemination of research. 620 publications, or 75.24 percent of the total, journals emerged as the prominent publication venue. The second most prevalent source type, with 148 publications (17.96%), was books. With 33 publications, book series made up a lesser but still significant percentage of the total. Conference proceedings were also an important source type, accounting for 22 publications (2.67%). Finally, trade publications represented a modest proportion, with a solitary publication (0.12%).

### 3.1.4. Publications by source titles

Based on their research output and citation influence, Table 4 lists the most active source titles in the field of classroom assessment. With 34 publications and 1881 total citations, "Assessment in education: principles, policy, and practise" stands out with a high average of 55.32 citations per publication. Following closely behind with 22 publications and 1062 citations, "Studies in educational evaluation" demonstrates a significant impact with an average of 48.27 citations per publication. Several additional source titles, including "Educational

measurement: issues and practise", "Assessment and evaluation in higher education", and "SAGE handbook of research on classroom assessment", exhibit substantial research output and citation impact, thereby contributing to the academic literature in the field. The h-index and g-index provide additional insight into these source titles' influence and cumulative impact. This analysis provides researchers seeking credible sources and publications for classroom assessment studies with useful information.

Table 4. Most active source titles

| Source title | TP | TC | C/P | C/CP | h-index | g-index |
|---|---|---|---|---|---|---|
| Assessment in education: principles, policy and practice | 34 | 1881 | 55.32 | 55.32 | 21 | 34 |
| Studies in educational evaluation | 22 | 1062 | 48.27 | 48.27 | 14 | 22 |
| Enabling power of assessment | 21 | 222 | 10.57 | 10.57 | 8 | 14 |
| Sage handbook of research on classroom assessment | 20 | 270 | 13.50 | 13.50 | 10 | 16 |
| Educational measurement: issues and practice | 18 | 930 | 51.67 | 51.67 | 12 | 18 |
| Assessment and evaluation in higher education | 17 | 869 | 51.12 | 51.12 | 14 | 17 |
| Curriculum journal | 15 | 578 | 38.53 | 38.53 | 10 | 15 |
| Teaching and teacher education | 14 | 476 | 34.00 | 34.00 | 11 | 14 |
| Frontiers in education | 11 | 44 | 4.00 | 4.00 | 3 | 6 |
| New directions for teaching and learning | 11 | 115 | 10.45 | 10.45 | 8 | 10 |
| Applied measurement in education | 10 | 956 | 95.60 | 95.60 | 8 | 10 |
| Classroom assessment and educational measurement | 9 | 27 | 3.00 | 27.00 | 3 | 5 |
| International encyclopedia of education, third edition | 8 | 0 | 0.00 | 0.00 | 0 | 0 |
| Teacher learning with classroom assessment: perspectives from asia pacific | 8 | 21 | 2.63 | 2.63 | 3 | 4 |
| Phi delta kappan | 7 | 2509 | 358.43 | 418.17 | 7 | 7 |
| Assessing writing | 7 | 155 | 22.14 | 22.14 | 5 | 7 |
| Educational assessment | 7 | 258 | 36.86 | 36.86 | 7 | 7 |
| Language testing | 6 | 315 | 52.50 | 52.50 | 6 | 6 |
| Journal of educational research | 6 | 291 | 48.50 | 48.50 | 6 | 6 |
| Teacher development | 6 | 106 | 17.67 | 17.67 | 4 | 6 |

Notes: TP=total number of publications; TC=total citations; CiteScore=average citations received per document published in the source title; SJR=SCImago Journal Rank measures weighted citations received by the source title; SNI=source normalised impact per paper measures actual citations received relative to citations expected for the source title's subject field.

### 3.1.5. Publications by countries

In Table 5 provides a bibliometric analysis of the top 10 countries contributing to publications on classroom assessment. The United States leads with 278 publications, 8021 total citations, and an average of 28.85 citations per publication, demonstrating a significant impact. With an average of 51.19 citations per publication, the United Kingdom follows with 119 publications and 6092 citations, demonstrating a notable impact. Canada and Australia make substantial contributions, with 72 and 57 publications, respectively. New Zealand, Hong Kong, and China also produce a substantial amount of research. The United States (53) and United Kingdom (35) have the highest h-index, which indicates the number of publications with at least h citations. United States (13) and United Kingdom (9) have the highest g-index, which measures the cumulative impact of highly cited publications. The analysis exposes the research output and influence of various nations in the field of classroom assessment, thereby shedding light on their contributions to academic literature.

Table 5. Top 10 countries contributed to the publications

| Country | TP | TC | NCP | C/P | C/CP | h-index | g-index | Pub. Year Start | m-index |
|---|---|---|---|---|---|---|---|---|---|
| United States | 278 | 8021 | 239 | 28.85 | 33.56 | 53 | 13 | 1985 | 1.359 |
| United Kingdom | 119 | 6092 | 100 | 51.19 | 60.92 | 35 | 9 | 1987 | 0.946 |
| Canada | 72 | 1068 | 58 | 14.83 | 18.41 | 18 | 7 | 1998 | 0.692 |
| Australia | 57 | 1099 | 45 | 19.28 | 24.42 | 19 | 7 | 2000 | 0.905 |
| New Zealand | 41 | 771 | 37 | 18.80 | 20.84 | 17 | 3 | 2005 | 0.895 |
| Hong Kong | 36 | 753 | 31 | 20.92 | 24.29 | 15 | 4 | 1995 | 0.517 |
| China | 34 | 285 | 24 | 8.38 | 11.88 | 10 | 2 | 2010 | 0.714 |
| Netherlands | 29 | 1407 | 26 | 48.52 | 54.12 | 15 | 2 | 2009 | 1.000 |
| Malaysia | 24 | 87 | 13 | 3.63 | 6.69 | 6 | 4 | 2013 | 0.545 |
| Norway | 21 | 325 | 21 | 15.48 | 15.48 | 10 | 1 | 2013 | 0.909 |

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

### 3.1.6. Publications by institutions

In Table 6 provides a bibliometric analysis of the research output and impact metrics of several universities. Queen's University (Canada) and the University of California (United States) rank first and second, respectively, with 27 and 23 total publications. King's College London (United Kingdom) is

distinguished by its high number of citations (3199) and average number of citations per publication (145.41). The average number of citations per publication at the University of Auckland (New Zealand) and Duquesne University (United States) is 24.50 and 44.44, respectively. The h-index represents the number of publications with at least h citations, with King's College London and Queen's University ranking first and second, respectively, with 14 and 16 publications. Queen's University, University of California, and King's College London all have a g-index of 3, which indicates the influence of their most cited work. The data illustrates the research output and influence of these universities in the field of classroom assessment, with each institution contributing significantly to the academic literature.

Table 6. Most productive institutions with minimum of five publications

| Affiliation | Country | TP | NCP | TC | C/P | C/CP | *h* | *g* |
|---|---|---|---|---|---|---|---|---|
| Queen's University | Canada | 27 | 530 | 25 | 19.63 | 21.20 | 16 | 3 |
| University of California | United States | 23 | 434 | 19 | 18.87 | 22.84 | 10 | 3 |
| King's College London | United Kingdom | 22 | 3199 | 20 | 145.41 | 159.95 | 14 | 1 |
| The University of Auckland | New Zealand | 18 | 441 | 16 | 24.50 | 27.56 | 11 | 2 |
| Duquesne University | United States | 16 | 711 | 15 | 44.44 | 47.40 | 12 | 1 |
| University of Cambridge | United Kingdom | 16 | 857 | 13 | 53.56 | 65.92 | 7 | 2 |
| Virginia Commonwealth University | United States | 12 | 463 | 10 | 38.58 | 46.30 | 6 | 2 |
| University of Macau | Macau (China) | 12 | 111 | 8 | 9.25 | 13.88 | 6 | 2 |
| University of London | United Kingdom | 11 | 465 | 10 | 42.27 | 46.50 | 7 | 1 |
| University of Waikato | New Zealand | 11 | 229 | 10 | 20.82 | 22.90 | 8 | 1 |
| University of Colorado | United States | 11 | 153 | 10 | 13.91 | 15.30 | 6 | 1 |
| University of Twente | Netherlands | 10 | 480 | 8 | 48.00 | 60.00 | 7 | 1 |
| University of South Carolina | United States | 9 | 193 | 9 | 21.44 | 21.44 | 6 | 1 |
| Queensland University of Technology | Australia | 9 | 365 | 8 | 40.56 | 45.63 | 6 | 1 |
| University of Ottawa | Canada | 9 | 133 | 7 | 14.78 | 19.00 | 5 | 1 |

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

### 3.1.7. Language of documents

Understanding the distribution of publications across different languages is crucial for assessing the global impact and inclusiveness of research in the classroom context. The analysis of 824 publications on classroom assessment revealed that English is by far the most prevalent language, accounting for 809 publications (98.18%) of the total. 9 (1.09%), 3 (0.36%), 2 (0.24%), and 2 (0.24%) publications, respectively, were written in Spanish, Portuguese, German, Italian, and Turkish, representing a reduced percentage of the total.

### 3.1.8. Subject area

This study then categorises the published documents by subject area, as summarised in Table 7. Social sciences dominate the distribution of research on classroom assessment with 824 publications (100%) followed by arts and humanities (12.99%), psychology (9.47%), computer science (3.40%), and business, management, and accounting (2.50%). Other subject areas have a representation between 0.12% and 3.40%.

Table 7. Subject area

| Subject Area | Total Publications (TP) | Percentage (%) |
|---|---|---|
| Agricultural and biological sciences | 3 | 0.36 |
| Arts and humanities | 107 | 12.99 |
| Biochemistry, genetics and molecular biology | 2 | 0.24 |
| Business, management and accounting | 21 | 2.55 |
| Computer science | 28 | 3.40 |
| Decision sciences | 3 | 0.36 |
| Dentistry | 1 | 0.12 |
| Earth and planetary sciences | 2 | 0.24 |
| Economics, econometrics and finance | 7 | 0.85 |
| Engineering | 21 | 2.55 |
| Health professions | 22 | 2.67 |
| Mathematics | 11 | 1.33 |
| Medicine | 21 | 2.55 |
| Neuroscience | 1 | 0.12 |
| Nursing | 3 | 0.36 |
| Pharmacology, toxicology and pharmaceutics | 3 | 0.36 |
| Physics and astronomy | 3 | 0.3 |
| Psychology | 78 | 9.47 |
| Social sciences | 824 | 100.00 |

#### 3.1.9. Summary of research question 1

RQ1: What is the current evaluation status of the publication in the classroom? This bibliometric analysis examines publications published from1985 to mid- 2023. This undertaking is to indicate the trends towards classroom assessment application which started in the second decade of the 2000s that has continued into following decade. According to the conducted analysis, it appears that classroom assessment or assessment for learning will capture the focus of an increasing number of practitioners, researchers, and academics in the decades to come. This analysis also clearly showcased a rise in developing country involvement in this research category.

The early publishing years of nations' classroom assessment research projects show various phases of participation. From 1985 to 2000, prominent nations including the United State, United Kingdom, Canada, Australia, and New Zealand lay the framework for further advancements. Mid-range initiators from 2001 to 2010 represent varied locales. This group includes Hong Kong, Spain, South Africa, Mexico, Japan, and Germany, showing an increasing awareness of classroom evaluation across educational contexts.

From 2011 through 2016, the late initiators sparked a global classroom assessment research boom. China, Netherlands, Singapore, Turkey, Iran, Ireland, Portugal, Sweden, Malaysia, Norway, Macao, Indonesia, and Switzerland explored at this period. This rise reflects the changing educational landscape and a growing awareness of how evaluation practises affect learning. By categorising nations into these three eras, researchers may see how classroom assessment research has evolved and how ideas and practises have affected modern educational methods.

### 3.2. Citation patterns of publications on classroom assessment

The objective of our second RQ (What are the current citation patterns of publication on classroom assessment?) is to determine the articles with the greatest impact on classroom assessment and display the citation patterns of these publications using data gathered from the Scopus database. In order to respond to RQ2, we unveiled citation metrics and analyzed the citation networks of 824 articles. Using the number of citations by other works, citation analysis measures the impact of the documents on the classroom assessment [45]. We analyzed the data using Publish and Perish and VOSviewer by Harzing.

#### 3.2.1. Citation metrics

Table 8 provides citation metrics for research on classroom assessment, which spans 824 publications published over 38 years. These papers received a total of 19,082 citations, resulting in an annual average of 502.16 citations. Each paper received an average of 23.16 citations, demonstrating its significance and recognition in the field. The astounding number of 11,470.95 citations per author demonstrates the significant impact individual authors have had in the field of classroom assessment. Each author contributed to an average of 502.96, and each paper had an average of 2.25 authors, indicating collaborative efforts in research publication. The h-index of 65 and the g-index of 116 indicate, correspondingly, the significant impact of highly cited papers and the cumulative impact of influential works. Overall, these metrics reveal a robust and influential research landscape in classroom assessment, with extensive author collaboration and a substantial contribution to academic literature over the years.

Table 8. Citations metrics

| Metrics | Data |
|---|---|
| Publication years | 1985-2023 |
| Papers | 824 |
| Number of citations | 19082 |
| Citations years | 38 |
| Citations per year | 502.16 |
| Citations per paper | 23.16 |
| Citations per author | 11470.95 |
| Papers per author | 502.96 |
| Authors per paper | 2.25 |
| h-index | 65 |
| g-index | 116 |

#### 3.2.2. Highly cited documents

In Table 9 lists the top 10 highly cited articles in the field of classroom assessment. The table also provides the citations per year (C/Y) for each article, reflecting the ongoing impact and relevance of the research. The C/Y values range from 48.31 for the most cited article to 8.78 for the twentieth most cited article. These highly cited articles have significantly contributed to the field of classroom assessment, addressing

various aspects, such as assessment practices, teacher-student interactions, and the impact of assessment on student achievement. Their enduring influence and high citation rates indicate their significance in shaping research and practice in the domain of classroom assessment.

Table 9. Top 10 highly cited articles

| No. | Author(s) | Title | TC | C/Y |
|---|---|---|---|---|
| 1 | Black and Wiliam [5] | Inside the black box raising standards through classroom assessment | 1256 | 48.31 |
| 2 | Wiliam [46] | What is assessment for learning? | 579 | 44.54 |
| 3 | Haladyna, *et al.* [47] | A review of multiple-choice item-writing guidelines for classroom assessment | 510 | 23.18 |
| 4 | Schuwirth, *et al.* [48] | Programmatic assessment: from assessment of learning to assessment for learning | 438 | 33.69 |
| 5 | Black, *et al.* [49] | Working inside the black box: assessment for learning in the classroom | 430 | 21.50 |
| 6 | Stiggins [50] | Assessment crisis: the absence of assessment for learning | 398 | 15.92 |
| 7 | Wiliam, *et al.* [51] | Teachers developing assessment for learning: impact on student achievement | 368 | 18.40 |
| 8 | La Paro, *et al.* [52] | The classroom assessment scoring system: findings from the prekindergarten year | 278 | 13.90 |
| 9 | Marshall and Drummond [53] | How teachers engage with assessment for learning: lessons from the classroom | 255 | 14.17 |
| 10 | Allen, *et al.* [54] | Observations of effective teacher-student interactions in secondary school classrooms: predicting student achievement with the classroom assessment scoring system-secondary | 225 | 20.45 |

The fascinating feature of the citations is the network visualisation map by country in Figure 3 and source titles in Figure 4. 29 countries have reached the thresholds based on the minimum number of five documents by an author and the minimum number of five citations by an author. Figure 3 can be viewed in conjunction with Table 7, which details the number of citations received by each country. The United States, United Kingdom, Canada, Australia, and the Netherlands are among the countries with the highest number of citations in studies on classroom assessment.

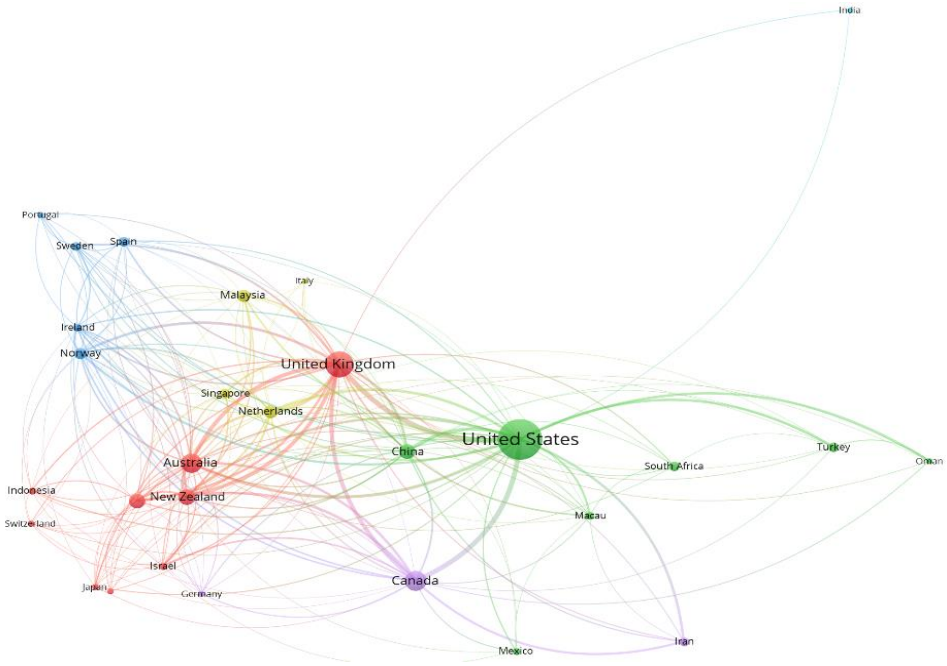


Figure 3. Network visualisation map of the citation by countries

In addition, we can also examine the citations between source titles. Here, the network represents the titles of sources (such as journals, conference proceedings, and books) that cite one another the most. The citation represents the cumulative number of citations exchanged between source title A and source title B. Out of the total number source titles, 26 have fulfilled the criteria of having minimum number of documents and citations which is set at 5. Figure 4 can also be viewed in conjunction with Table 6, which provides a comprehensive list of most active source titles in classroom assessment studies depending on the number of documents generated. Phi Delta Kappan (2,509), assessment in education: principles, policy, and practise

(1,881), studies in educational evaluation (1,062), applied measurement in education (956), and educational measurement: issues (956), were the top five most cited source documents.

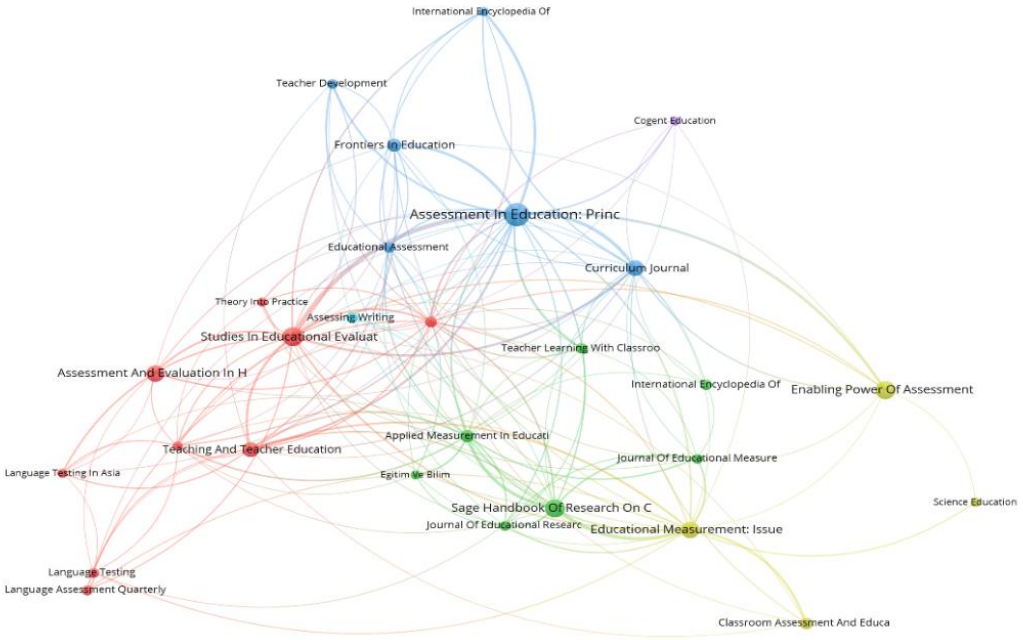


Figure 4. Network visualisation map of the citation by sources

### 3.2.3. Summary of research question 2

RQ2: What are the current citation patterns of publications on classroom assessment? Thus far, from 824 documents extracted from the Scopus database have yielded 19,082 citations which equates to 502.16 citations per paper, 23.16 citations per paper, 502.96 papers per author and 2.25 authors per paper. The data estimates that all 824 documents papers have been cited at least once, with some papers possibly having more than one citation. The studies on classroom assessment also have achieved an h-index of 65 and a g-index of 116 when this data was analyzed. The article authored by Black and William [5] has garnered the most citations among studies on classroom assessment establishing them as prominent authors in this field.

## 3.3. Themes in classroom assessment studies

To answer RQ3 (Which classroom assessment topics are most popular among scholars?), we conducted a co-occurrence analysis of the keywords and terms from the titles and abstracts of the Scopus database-obtained data. Co-occurrence of keywords occurs when two keywords appear alongside one another in an article, indicating a relationship between the two concepts [55]. The co-occurrence and keyword evaluation is conducted because an author's keywords adequately depict the article's content [56].

### 3.3.1. Keywords

The data depicts in Table 10 the distribution of publications across a variety of classroom assessment research keyword phrases. The keyword "assessment for learning" emerged as the most popular, accounting for 22.02% of all publications. It demonstrates the importance of research that focuses on assessment practises that contribute to the learning process. Additionally, "feedback" and "validity" are notable keywords, appearing in 8.30% and 5.48 % of all publications, respectively. These topics highlight the significance of providing students with constructive feedback and the reliability of assessment instruments utilized in educational research.

Other important topics include "self-regulated learning" and "self-assessment," which account for 3.17 and 2.19 percent of publications, respectively. These themes emphasise the growing interest in comprehending and nurturing students' abilities to take charge of their own learning and evaluate their own performance. In addition, "mathematics education," "teacher assessment," and "teaching and learning" each account for approximately 2% of the publications, demonstrating the emphasis placed on research pertaining to effective teaching strategies, teacher assessment practises, and the broader process of teaching and learning.

Table 10. Top author's keywords

| Author Keywords | Total Publications (TP) | Percentage (%) |
|---|---|---|
| Assessment for learning | 181 | 22.02% |
| Feedback | 68 | 8.30% |
| Validity | 45 | 5.48% |
| Self-regulated learning | 26 | 3.17% |
| Self-assessment | 18 | 2.19% |
| Mathematics education | 18 | 2.19% |
| Teacher assessment | 16 | 1.95% |
| Teaching and learning | 15 | 1.82% |
| Secondary school | 13 | 1.58% |
| Pedagogy | 12 | 1.46% |
| Peer assessment | 10 | 1.22% |
| Physical education | 8 | 0.97% |
| Kindergarten | 8 | 0.97% |
| Grading | 7 | 0.85% |
| Rubrics | 6 | 0.73% |
| Psychometric properties | 6 | 0.73% |
| Autonomy | 5 | 0.61% |
| Classroom assessment techniques | 5 | 0.61% |
| Teacher professional development | 5 | 0.61% |
| School leader | 5 | 0.61% |

The analysis was extended using VOSviewer, a software application for constructing and visualising bibliometric networks, to map all keywords (including both author keywords and index keywords) provided for each document. This section analyses the co-occurrence of each keyword that appears a minimum of eight times. According to this criterion, 43 keywords were identified. Displayed in Figure 5 is a network representation of all VOSviewer keywords in which the colour, circle size, font size, and thickness of the connecting lines indicate the strength of the relationship between keywords [57]. Similar keywords, denoted by the same colour, are frequently grouped together. The diagram illustrated the close relationship and frequent co-occurrence of classroom assessment, fairness, reliability, validity, performance assessment and all green. Each colour depicts in this diagram represents a cluster. In this visualisation map, nine clusters are present.

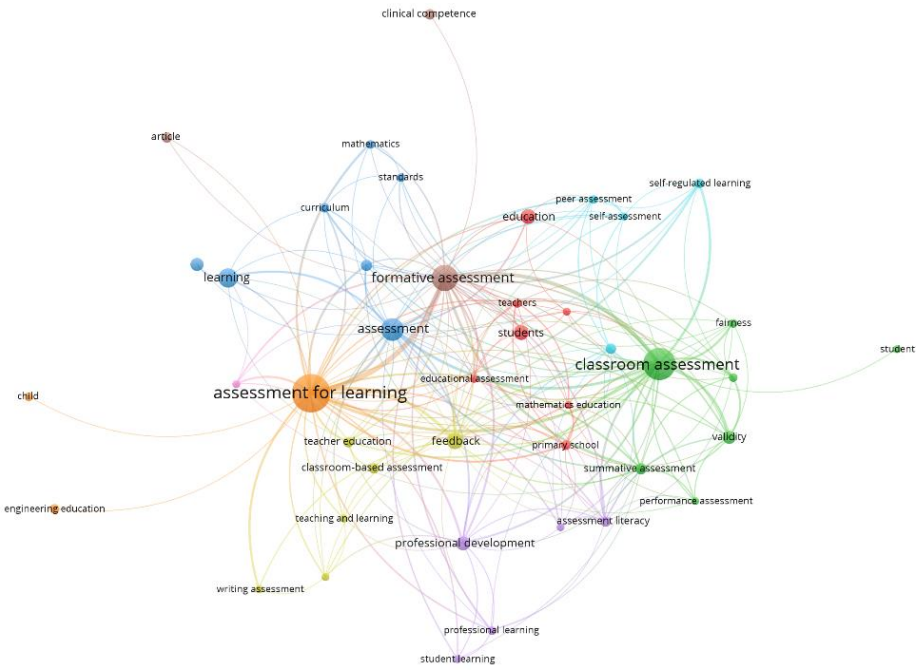


Figure 5. Network visualisation map of all keywords

The clusters are themed accordingly. The first cluster (which is coloured red) is comprised of seven items that relate to learning ecosystem enrichment. Cluster two depicts in green comprises seven items with the theme of assessment equity. The third cluster, which is coloured blue, consists of seven items that belong

to the theme of mathematics education, while the fourth (yellow) cluster contains six items that fall under the theme of effective writing pedagogy. The fifth cluster consists of five items that relate to empowering educators' growth. The sixth cluster of four items relates to the enhancing learner autonomy theme. The seventh cluster consists of three items is under the child-centered assessment theme. Followed by the eighth cluster with three items is related to enhancing clinical competence and finally in cluster ninth that is only with one item regarding physical education. Overall, the data highlights the significance of research in assessment practises, feedback, and self-regulated learning in the field of education, while also recognising the significance of various other themes that contribute to a holistic understanding of educational practises and pedagogy.

### 3.3.2. Title and abstract

This study also looked at the occurrences of publication titles and combinations of publication titles and abstracts from the Scopus database appeared. This part looks at how often each term that appears ten times or more appears with other words. Based on this configuration, 339 words are sufficient to meet the minimum standard. However, this software will figure out a relevance score for each of the 339 terms. Based on this finding, the best grade will be chosen. The usual choice is to pick 60% of the most relevant terms. So, 203 terms were chosen, which was the usual number suggested by the software. The VOSviewer software then made a co-occurrence map of these words, which can be seen in Figure 6. In this network visualisation, the nodes are the terms or concepts, and the distance between them shows how they relate to each other [11]. In this diagram, each colour stands for a different cluster. There are six clusters in this visualisation map, which will stand for six different themes.

Assessment and learning contexts group (red: 77 items) as the first theme, assessment and learning motivation group (green: 33 items) as the second theme, class-room assessment and measurement validity group (blue: 32 items) as the third theme, foreign language assessment group (yellow: 27 items) as the fourth theme, classroom assessment techniques group (purple: 23 items) as the fifth theme, and assessment pro-cess and teacher guidance group (turquoise: 12 items) as theme six.

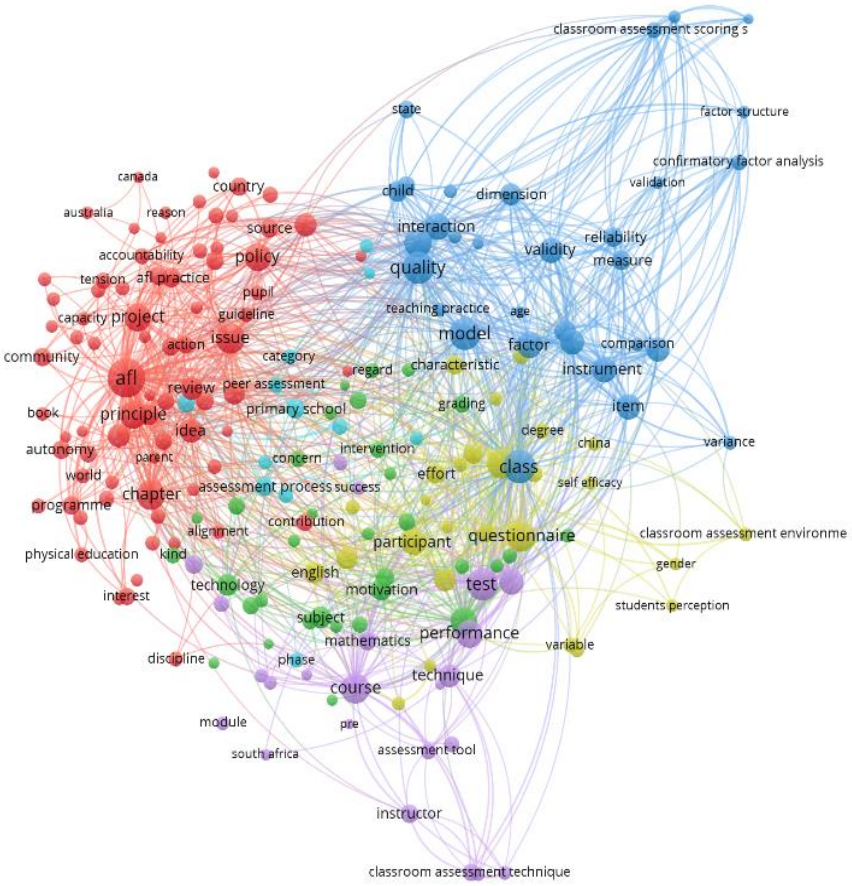


Figure 6. VOSviewer visualisation of a term co-occurrence network based on title and abstract fields (binary counting)

### 3.3.3. Summary of research question 3

RQ3: which classroom assessment themes are the most popular among scholars? This paper found nine themes based on the analysis of the co-occurrences of the keywords, namely learning ecosystem enrichment, assessment equity, mathematics education, effective writing pedagogy, empowering educators' growth, enhancing learner autonomy, child-centered assessment, enhancing clinical competence, and physical education. However, after analysing the occurrences of term on the title and abstract of the Scopus database, there are six clusters discovered in this visualisation map. These themes were grouped as assessment and learning contexts group as the first theme, assessment and learning motivation group as the second theme, classroom assessment and measurement validity group as the third theme, foreign language assessment group as the fourth theme, classroom assessment techniques group as the fifth theme, and assessment process and teacher guidance group as theme six.

## 3.4. Authorship and co-authorship

To answer RQ4 (what is the authorship pattern of the publication on the classroom assessment?), we analyzed the number of authors per document, most active authors in the classroom assessment and co-authorship by author, organizations and countries on the publication of classroom assessment. By examining the number of authors per document and co-authorship by author, organization, and country, it will give insight into the collaboration patterns and reveal the extent of the teamwork, multidisciplinary collaboration, and international partnership. By analyzing the most active authors, it helps to identify the key contributors in the field of classroom assessment. This pattern in authorship tracking throughout time, can shed lights on how the field of classroom assessment is evolving.

### 3.4.1. Publications by authors

Table 11 illustrates the distribution of authors per document for classroom assessment publications. 305 (37%) of the total 824 publications had a single author, while 241 (29%) had two. Three, four, and five-authored works accounted for 147 (18%), 79 (10%), and 29 (4%) publications, respectively. The percentage of documents with six or more authors decreased progressively, with a single publication having six, seven, eight, nine, or ten authors. One publication listed fifteen and eighteen authors, respectively. Notably, the authors of one document designated as a conference review were not listed. This analysis provides insights into the authorship patterns in the literature on classroom assessment, revealing a variety of collaborative efforts and single-author contributions.

Table 11. Number of author(s) per document

| Author Count | Total Publications (TP) | Percentage (%) |
|---|---|---|
| 0 | 1 | 0.12 |
| 1 | 305 | 37.01 |
| 2 | 241 | 29.28 |
| 3 | 147 | 17.82 |
| 4 | 79 | 9.58 |
| 5 | 29 | 3.52 |
| 6 | 10 | 1.21 |
| 7 | 4 | 0.48 |
| 8 | 1 | 0.12 |
| 9 | 2 | 0.24 |
| 10 | 3 | 0.36 |
| 15 | 1 | 0.12 |
| 18 | 1 | 0.12 |
| Total | 824 | 100.00 |

*Conference review document. No author is listed

In Table 12 contains a list of the most prolific authors in the field of classroom assessment, along with publication statistics. Christopher DeLuca has the most publications and citations, with 21 publications and 391 in total. Susan M. Brookhart is next with 15 publications and 709 citations, followed by Richard J. Stiggins with 12 publications and an impressive 1198 citations. The average number of citations per publication varies among the authors, with Stiggins having 99.83 and Paul Black an extraordinary 299.11. From 12 for De Luca, Brookhart, and Wiliam to 3 for Schildkamp and Klinger, the h-index ranges. Notably, several authors have a g-index of 1, indicating that their most cited works have a cumulatively significant impact. These prolific authors have made substantial contributions to the discipline, and their research and publications have had a significant impact on the classroom assessment literature.

Table 12. Most productive authors

| Author's Name | Country | TP | NCP | TC | C/P | C/CP | *h* | *g* |
|---|---|---|---|---|---|---|---|---|
| DeLuca, Christopher | Canada | 21 | 19 | 391 | 18.62 | 20.58 | 12 | 2 |
| Brookhart, Susan M. | United States | 15 | 14 | 709 | 47.27 | 50.64 | 12 | 1 |
| Stiggins, Richard J. | United States | 12 | 11 | 1198 | 99.83 | 108.91 | 11 | 1 |
| McMillan, James H. | United States | 9 | 8 | 453 | 50.33 | 56.63 | 5 | 1 |
| Black, Paul | United Kingdom | 9 | 9 | 2692 | 299.11 | 299.11 | 8 | 0 |
| Cowie, Bronwen | New Zealand | 9 | 9 | 175 | 19.44 | 19.44 | 6 | 1 |
| Wiliam, Dylan | United States | 8 | 8 | 3122 | 390.25 | 390.25 | 8 | 0 |
| Van der Kleij, Fabienne M. | Australia | 7 | 6 | 388 | 55.43 | 64.67 | 6 | 1 |
| Johnson, Robert L. | United States | 7 | 7 | 174 | 24.86 | 24.86 | 5 | 0 |
| Harrison, Chris Ann | United Kingdom | 7 | 5 | 838 | 119.71 | 167.60 | 4 | 1 |
| Schildkamp, Kim | Netherlands | 6 | 4 | 225 | 37.50 | 56.25 | 3 | 1 |
| Pianta, Robert C. | United States | 6 | 6 | 983 | 163.83 | 163.83 | 6 | 0 |
| Klinger, Don A. | New Zealand | 6 | 5 | 85 | 14.17 | 17.00 | 4 | 1 |

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index

### 3.4.2. Co-authorship by author

Co-authorship refers to the scientific collaboration between two or more authors on a publication to complete a particular task or assignment associated with the research project. Figure 7 depicts the network visualisation map of co-authorship between authors. A total of 206 authors meet the threshold of having two of a minimum number of documents of an author and five of the minimum number of citations of an author, however, only 55 authors are included in the largest set of connected items.

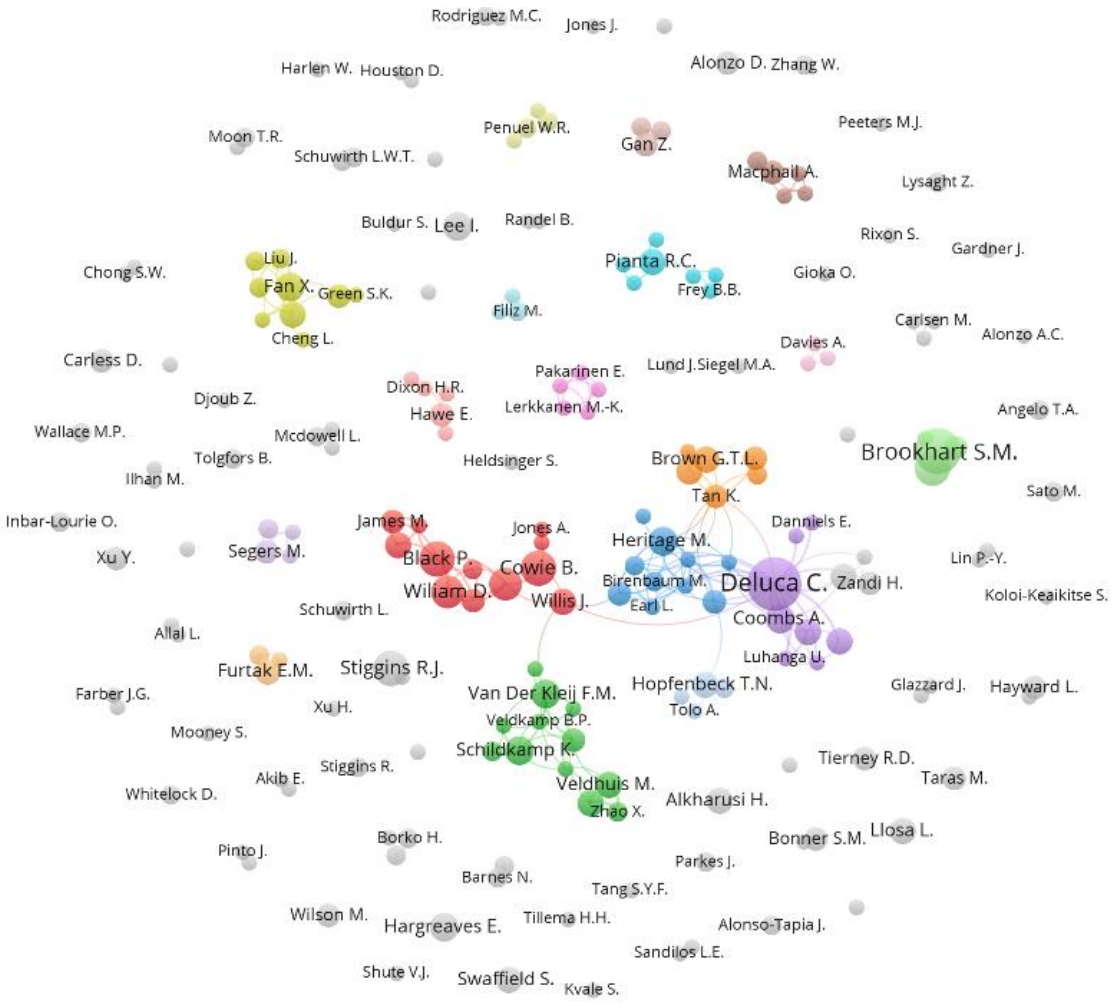


Figure 7. Network visualisation map of the co-authorship by authors

### 3.4.3. Co-authorship by organisations

Co-authorship by organisations refers to the scientific collaboration between two or more organizations on a publication in order to complete a specific mission or assignment associated with the research project. Figure 8 depicts the network visualisation map of co-authorship between organisations. Based on the minimum number of documents for an organisation and the minimal number of citations for an organisation of two, a total of 102 organisations meet these criteria; however, only nine organisations are in the largest set of connected items.


Figure 8. Network visualisation map of the co-authorship by organisations

### 3.4.4. Co-authorship by countries

In bibliometrics, the term "co-authorship by countries analysis" refers to the study of joint research projects between various countries in academic or scientific publications. Figure 9 displays a network visualisation that focuses on comprehending the connections and patterns of international collaboration. 29 out of 82 countries satisfy the requirement based on a country's minimum number of papers being equal to 5. There are 8 clusters within this network that show eight different groups that actively collaborate among them.

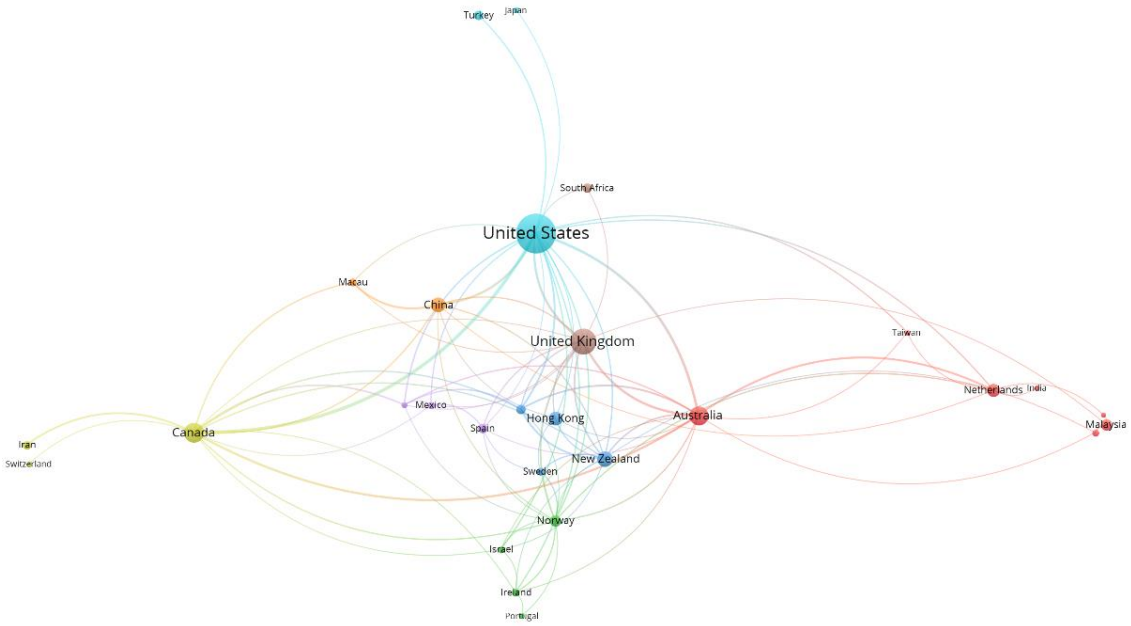


Figure 9. Network visualisation map of the co-authorship by countries

### 3.4.5. Summary of research question 4

RQ4: What is the authorship pattern of the publication on the classroom assessment?. Based on the knowledge acquired from the previous examination, it becomes apparent that there is a profound comprehension of the collaborative dynamics present in the domain of classroom assessment. The analysis of authorship distribution within documents indicates a prominent trend of collaboration and joint endeavour within the area. The prevalence of collaborative practises is highlighted by the significant proportion (66.29%)

of articles in the dataset that are produced by one or two persons. The aforementioned pattern is also strengthened by the predominant occurrence of publications including two or more authors, constituting a combined total of 98.41% of the articles examined. The data indicates a prevailing inclination towards smaller collaborative teams, as papers including more than five writers account for just 5.59% of the overall sample. Significantly, the findings shown in Figure 7 of the preceding section illustrate that out of a total of 206 writers who are interconnected, only 55 authors retain ties within the broader group. This observation serves to underline the prevailing collaborative culture that exists within the field of classroom assessment.

The study directs attention towards writers who have made significant contributions to the advancement of the area. The considerable number of publications associated with these authors not only emphasises their steadfast devotion but also demonstrates their dedication to furthering the discussion on classroom assessment. Of particular significance is the exceptional accomplishment of "Wiliam, Dylan," who has amassed the maximum number of citations, totalling 3122. This serves as a witness to the tremendous respect and impact that his scholarly contributions have acquired throughout the academic world. Furthermore, the noteworthy h-index scores attributed to "Stiggins, Richard J." and "Brookhart, Susan M." (11 and 12, respectively) are indicative of a sizable body of published work that has received great attention and citation. Moreover, the worldwide influence of the contributions made by these esteemed writers is appropriately demonstrated by their international representation, which encompasses a wide range of nations such as the United States, United Kingdom, Canada, New Zealand, Australia, and the Netherlands. The aforementioned facts provide a comprehensive representation of the complex and significant dynamics present in the field of classroom assessment.

## 4. CONCLUSION

This study, similar to earlier bibliometric studies, offered valuable insights into the field of classroom assessment, presented a forecast for future research endeavours, and uncovered collaborative possibilities through the analysis of historical study data. One notable constraint of this study is its exclusive reliance on studies that were indexed solely by the Scopus database. It is possible that there are studies which have made substantial contributions to the subject of classroom assessment, but have not been included in the Scopus index. Consequently, these studies may not be readily accessible. The analyses, however, were conducted based on the keywords chosen by the authors. Alternative terminologies that have been created in a wider context may provide different results. In the context of bibliometric studies, researchers can enhance the comprehensiveness of their study by integrating findings from several databases. Researchers that are interested in conducting studies on classroom assessment have the opportunity to explore many areas, such as "alternative assessment," "holistic assessment," and "authentic assessment," within the context of motor themes, based on their own interests.

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