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Visualizing the Evolution of Comprehensive Assessment: A PRISMA-Guided Bibliometric Review Using Dimensions AI and VOSviewer

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ABSTRACT

Research on the topic of Comprehensive Assessment has been widely conducted; however, studies that map the trends and developments of this topic within research databases remain limited. This study aims to map research trends on Comprehensive Assessment available in the Dimensions AI database and identify underexplored topics that could serve as references for future research. The method used in this study is the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), supported by the VOSviewer tool for data visualization and searches through the Dimensions AI database. The analysis was conducted using a bibliometric approach to map research trends and performance in specific subjects. The results of the study indicate a significant increase in the number of publications on Comprehensive Assessment. These findings highlight a growing trend in research on Comprehensive Assessment and identify several underexplored topics or keywords, such as educators, higher education, effectiveness, applications, employment, and other factors. These topics hold great potential to contribute new insights if further developed in future studies related to Comprehensive Assessment.

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ABSTRAK

Penelitian tentang topik Penilaian Komprehensif telah banyak dilakukan; namun, studi yang memetakan tren dan perkembangan topik ini dalam basis data penelitian masih terbatas. Studi ini bertujuan untuk memetakan tren penelitian tentang Penilaian Komprehensif yang tersedia dalam basis data Dimensions AI dan mengidentifikasi topik yang kurang dieksplorasi yang dapat berfungsi sebagai referensi untuk penelitian di masa mendatang. Metode yang digunakan dalam studi ini adalah Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), yang didukung oleh alat VOSviewer untuk visualisasi data dan pencarian melalui basis data Dimensions AI. Analisis dilakukan menggunakan pendekatan bibliometrik untuk memetakan tren dan kinerja penelitian dalam subjek tertentu. Hasil studi menunjukkan peningkatan yang signifikan dalam jumlah publikasi tentang Penilaian Komprehensif. Temuan ini menyoroti tren pertumbuhan dalam penelitian tentang Penilaian Komprehensif dan mengidentifikasi beberapa topik atau kata kunci yang kurang dieksplorasi, seperti pendidik, pendidikan tinggi, efektivitas, aplikasi, pekerjaan, dan faktor lainnya. Topik-topik ini memiliki potensi besar untuk memberikan wawasan baru jika dikembangkan lebih lanjut dalam studi masa depan yang terkait dengan Penilaian Komprehensif.

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INTRODUCTION

Educational assessment plays a crucial role in determining the quality of learning and the success of a nation's education system. Assessment is a process of evaluating, measuring, and monitoring students' achievements in various aspects of learning, including cognitive, affective, and psychomotor domains (Black & Wiliam, 2009). A comprehensive assessment does not merely measure learning outcomes but also encompasses critical components such as student engagement, critical thinking skills, and the development of social skills (Gulikers et al., 2004). In the global education context, comprehensive assessment is critical to improving the quality and relevance of education, aligning with the increasingly complex demands of the job market, and equipping the younger generation with 21st-century skills (Darling-Hammond et al., 2009).

Research on comprehensive assessment in education has been growing; however, its direction and trends still need to be clearly and systematically documented. Over the past decade, there has been a significant increase in scientific publications by researchers in international journals, particularly those indexed by Scopus (Irawan et al., 2024). However, concerns have arisen that many of these publications merely follow global trends without reflecting specific educational needs (Irawan & Purwasih, 2024). Some studies indicate that international collaboration is beginning to develop, but the topics discussed are repetitive and lack innovation (Galeano-Barrera et al., 2022). Therefore, it is essential to understand new directions and research trends in comprehensive assessment within the field of education.

In Indonesia, the implementation of educational assessment still faces several challenges (Pramesti, 2021). One major issue is the need for a deep understanding of the concept of comprehensive assessment. Teachers often focus more on assessing final learning outcomes (summative assessment) than formative assessment, which provides student feedback during the learning process (Astuti et al., 2025; Muktamar et al., 2023). Furthermore, authentic assessment, which aims to evaluate students' abilities in real-world contexts, remains suboptimal due to limited resources and teacher training (Jannah et al., 2025).

The development of Indonesia's educational curriculum, particularly the 2013 Curriculum (K13) and the Merdeka Curriculum has emphasized the importance of comprehensive assessment to accurately depict educational goals' achievement (Saleh et al., 2025; Siswanto et al., 2026). However, in practice, implementing such assessments still requires better support in teacher training and the development of appropriate resources (Nada & Alkhawa, 2024). In global studies, comprehensive assessment is also intended to help educators identify students' needs and progress individually, facilitating more personalized learning (Hattie & Timperley, 2007). Through systematic evaluation, such assessments serve as a measurement tool and motivation for students to continue developing their abilities (Andrade, 2010; Tarso et al., 2025).

Additionally, digital technology and big data play a role in developing comprehensive assessments, particularly in analyzing trends and patterns in education more effectively and efficiently (Siswanto et al., 2024). This opens up opportunities for researchers to continuously

update assessment methods that are responsive to the needs of modern education, both in Indonesia and globally. Therefore, this study aims to examine research trends related to comprehensive assessment in education using the Dimensions AI database and identify underexplored topics that can serve as references for researchers in future studies.

METHOD

The publication data was extracted from the Dimensions database on October 21, 2024. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method was used to extract articles from the Dimensions database. The PRISMA flow diagram is presented in Figure 1.

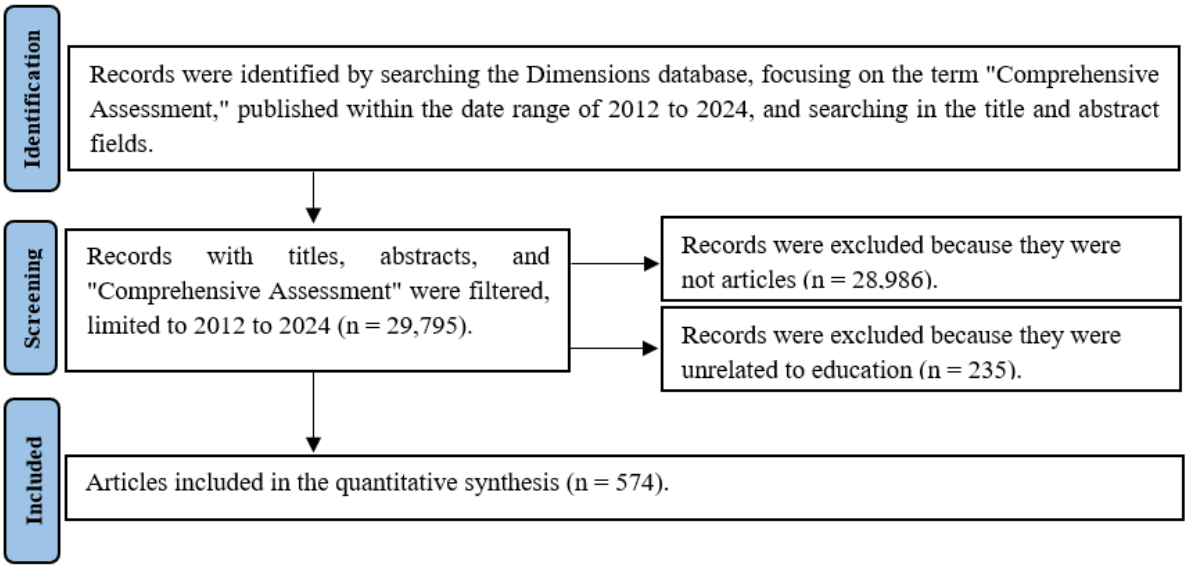

Figure 1. PRISMA Flow Diagram

Five types of research metrics are used for data analysis: scientometrics, bibliometrics, cybermetrics, informetrics, and altmetrics (Murugesu et al., 2022). Bibliometric analysis was applied to examine the distribution of research articles, terms, and keywords. This methodology is crucial in identifying research trends (Peni, 2023;Syros et al., 2022). Moreover, bibliometric analysis is essential for evaluating research impact based on the citations received (Page et al., 2020). The data used in this study was obtained through online searches conducted on https://app.dimensions.ai and extracted on October 21, 2024. The methodology was a systematic review, following the stages outlined in the PRISMA flow diagram (Eck & Waltman, 2010; Limori et al., 2025). The PRISMA stages include identification, screening, and inclusion, as illustrated in Figure 1. During the Identification and Screening stages, 29,795 records were retrieved from dimensions.ai, considering each key term in the "title and abstract" search option. Finally, in the Inclusion stage, the sample was refined, resulting in 574 accessible articles for further analysis.

RESULTS

The findings of this study are based on the analysis of the collected data. These results will be discussed in depth to understand better the discoveries made during the research. This section is divided into several parts to facilitate comprehension of the various aspects analyzed and identify trends, patterns, and implications derived from the results. Among the key points are:

Number of Publications

The search conducted between 2012 and 2024 yielded 547 scientific articles. The annual distribution of these 547 publications in education is presented in Figure 2.

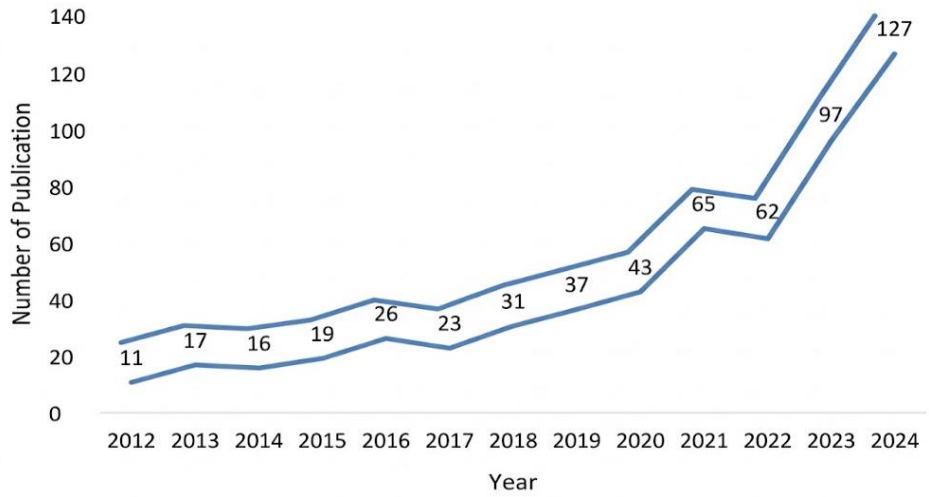

Figure 2. Number of publications on the topic of Comprehensive Assessment in Education

The graph's vertical axis represents the number of publications, while the horizontal axis shows the range of years. Based on Figure 2, there is a clear trend of increasing publication numbers over time. During the early period (2012–2016), the number of publications was relatively low, gradually rising from 11 in 2012 to 26 in 2016. In the mid-period (2017–2020), the increase became more stable, with publication numbers growing from 31 in 2017 to 43 in 2019. However, a significant spike occurred in 2021, with 65 publications, following a decline to 37 publications in 2020. In the final period (2021–2024), the number of publications surged dramatically, reaching 97 in 2023 and peaking at 127 publications in 2024.

The graph demonstrates a significant upward trend in publication numbers from 2012 to 2024. The sharpest growth occurred in the later years, reflecting increasing attention to Comprehensive Assessment in education. This indicates that this study area has gained greater relevance, leading to increased research contributions.

Number of Citations

The number of Comprehensive Assessment in Education citations from 2012 to 2024 totaled 3,788. Furthermore, the annual number of citations is presented in Figure 3.

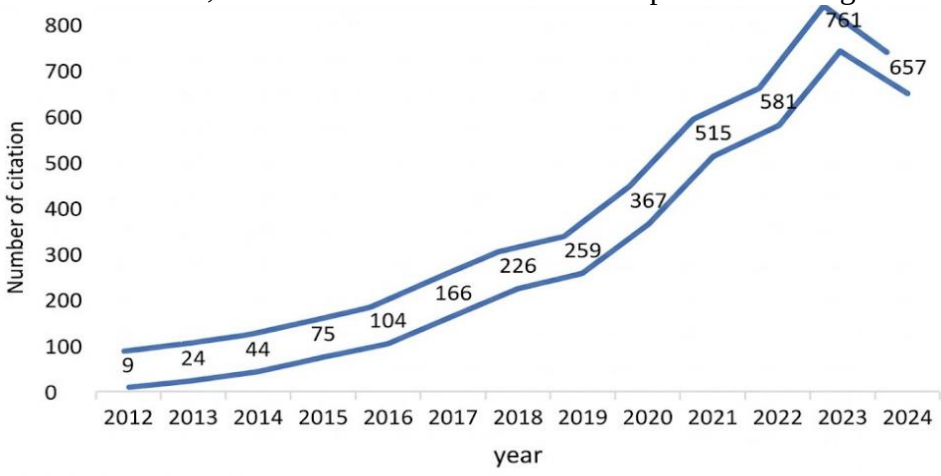

Figure 3. Number of citations on the topic of Comprehensive Assessment in Education

Figure 3 illustrates the development of citations for Comprehensive Assessment in education from 2012 to 2024. Overall, the graph shows a significant upward trend in the number of citations during this period, although there has been a slight decline in recent years. The number of citations remained relatively low during the early period (2012–2016). Starting with just nine citations in 2012, the number gradually and steadily increased, reaching 104 in 2016. This period reflects the initial acceptance and recognition of the resulting publications.

In the mid-period (2017–2020), the increase in citations became more pronounced. In 2017, citations reached 166, grew to 367 in 2020, and peaked at 515 in 2021. This surge indicates the growing influence of these publications within academic circles, likely due to high-quality research or alignment with prevailing trends at the time. In the final period (2021–2024), the graph shows a peak of 761 citations in 2022, the highest point during the entire period. However, this was followed by a decline to 657 citations in 2024. This decrease could be attributed to the emergence of new research focuses or a reduced reliance on related publications in subsequent studies.

Overall, the trend highlights these publications' significant impact on the academic community, particularly during 2020–2022. Despite a slight decline in the last two years, the number of citations remains substantial, indicating that the publications are still relevant, even if they are no longer the primary focus. This underscores the growing attention to comprehensive assessment over the past decade and suggests its continued development.

Field

Based on research, publications on Comprehensive Assessment in the field of Education can be categorized. Furthermore, the number of publications across the most significant fields is presented in Figure 4.

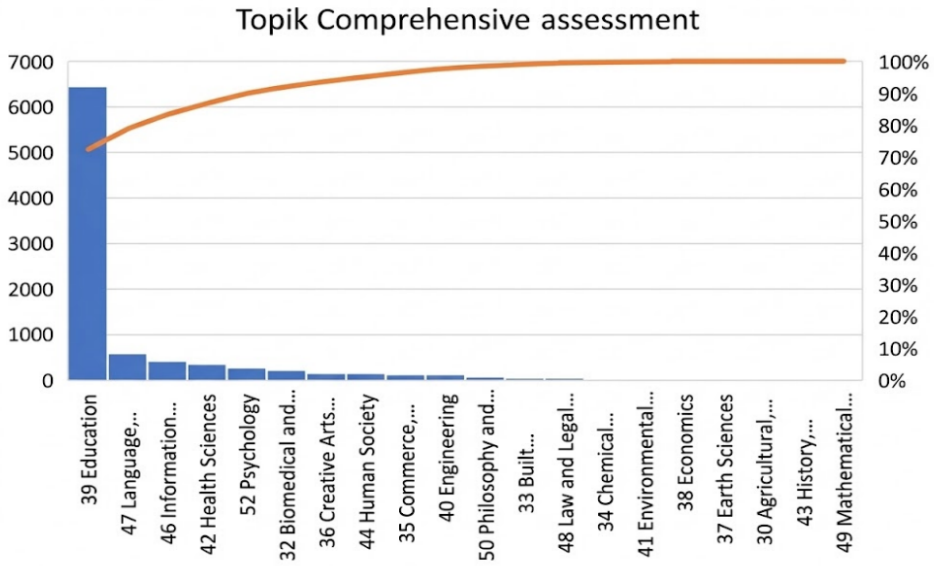

Figure 4. Number of publications on the topic of Comprehensive Assessment in Education

Figure 4 shows that the topic of "Comprehensive Assessment" is most commonly found in education, with 6,447 articles published. This indicates that the topic is highly relevant in the educational domain, where "comprehensive assessment" refers to an evaluation approach that measures various aspects of student development beyond exam scores or standardized tests. Such evaluations often involve diverse assessment methods, including portfolios, observations, project-based tasks, and skill-based tests, to provide a more holistic view of student progress. Overall, these findings highlight that "Comprehensive Assessment" is a

rapidly growing theme in educational literature, reflecting a shift in how we evaluate learning outcomes and emphasizing the importance of diverse and comprehensive assessments in supporting student learning.

Journal

Based on journals, publications on Comprehensive Assessment in education can be categorized. Furthermore, the number of publications by journal (most prominent) is presented in Figure 5.

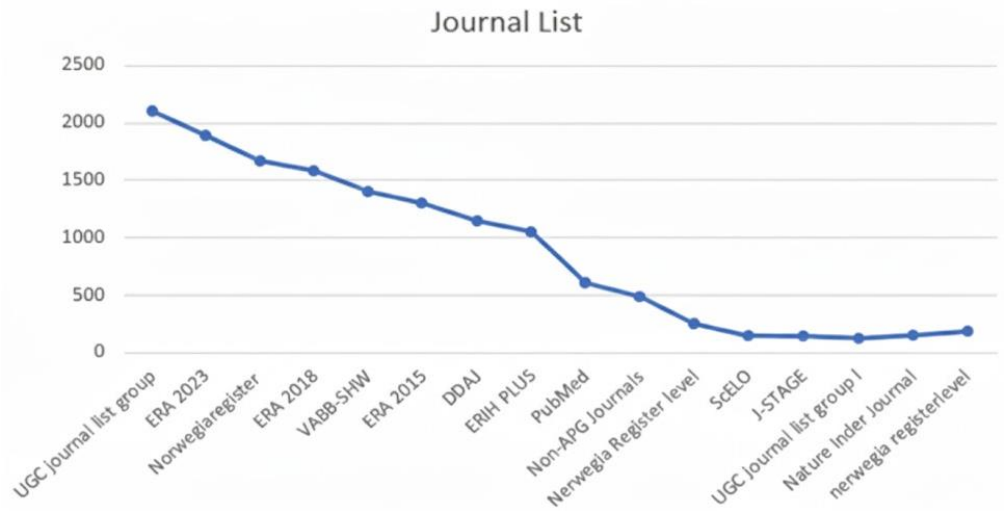

Figure 5. Journal List

The data shows that the UGC Journal List Group has the highest number of publications, with 2,089 publications on "comprehensive assessment" from 2012 to 2024, indicating that journals in this group are the preferred choice for publishing research related to this topic. In contrast, Nature Index Journals have only one publication, suggesting that this topic needs to be represented more in widely influential journals like those in the Nature Index. The average annual publication rate of 890.875 indicates that interest in "comprehensive assessment" research in education remains high and consistent among academics.

Researchers

Based on researchers, publications can be categorized. Furthermore, the number of publications by the most prominent researchers is presented in Table 1.

Tabel 1. Number of publications based on researchers

Name	Organization, Country	Publications	Citations	Citations mean
Gwo-Jen Hwang	National Taiwan University of Science and Technology, Taiwan	101	3.622	35,86
Kathleen Lynne Lane	University of Kansas, United States	79	2.050	25,95
Marja-Kristiina Lerkkanen	University of Jyväskylä, Finland	78	1.741	22,32
Sharon R Vaughn	The University of Texas at Austin, United States	76	2.754	36,24
Chin-Chung Tsai	National Taiwan Normal University, Taiwan	71	2.829	39,85

Cees P M Van Der Vleuten	Maastricht University, Netherlands	69	3.161	45,81
Laura M Justice	The Ohio State University, United States	65	2.138	32,89
D I Zou	Education University of Hong Kong, China	61	2.535	41,56
Phillip Hallinger	Mahidol University, Thailand	60	3.712	61,87
Dragan Gašević	Monash University, Australia	60	3.689	61,48

The data shows the top 10 researchers in Comprehensive Assessment research in education, with contributions from various countries. Gwo-Jen Hwang from Taiwan leads with 101 publications and 3,622 citations. At the same time, Phillip Hallinger from Thailand and Dragan Gašević from Australia have the highest average citations, with 61.87 and 61.48, respectively, indicating the significant impact of their research. Kathleen Lynne Lane from the United States and Cees P M Van Der Vleuten from the Netherlands also made significant contributions. Overall, researchers from Taiwan, the United States, and Europe dominate this field, with numerous publications substantially impacting the global academic community. Lastly, the publications by country, with the highest number of publications, are presented in Figure 6.

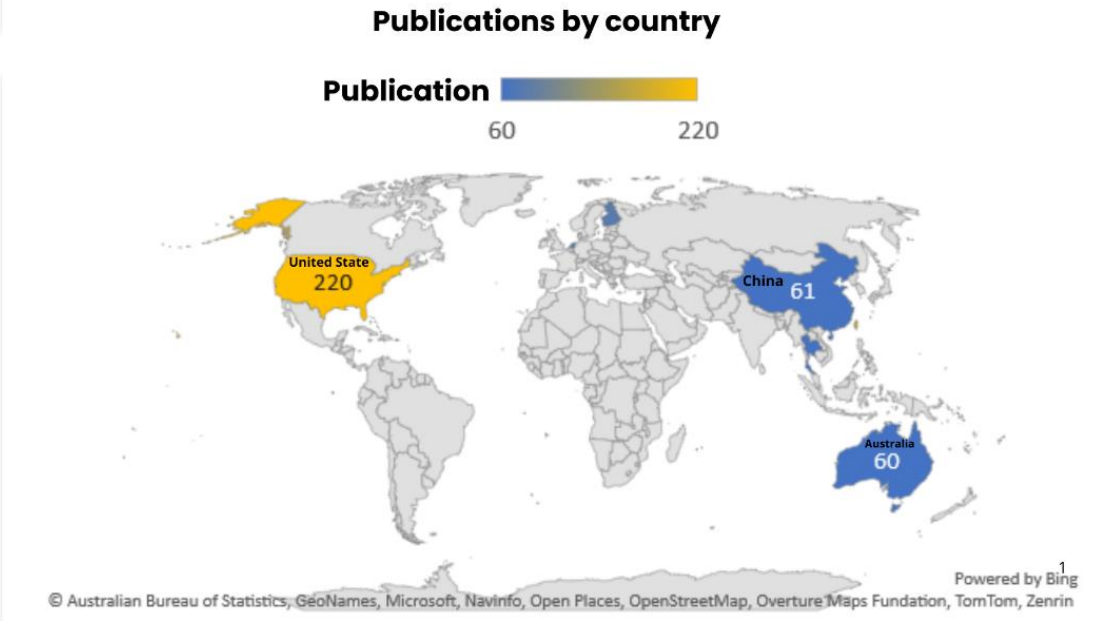

Figure 6. Number of publications based on countries

The data on the number of publications related to comprehensive assessment in Figure 6 shows significant contributions from various countries. The United States ranks at the top with 220 publications, followed by China and Australia, each contributing around 60 publications, which is also a considerable contribution. These findings highlight the importance of comprehensive assessment as a global topic and open opportunities for further exploration of under-researched aspects.

Network Visualization for Co-occurrence

VOSviewer provides a network visualization map. Furthermore, the network visualization for the co-occurrence of the term "Comprehensive Assessment" in education is presented in Figure 7.

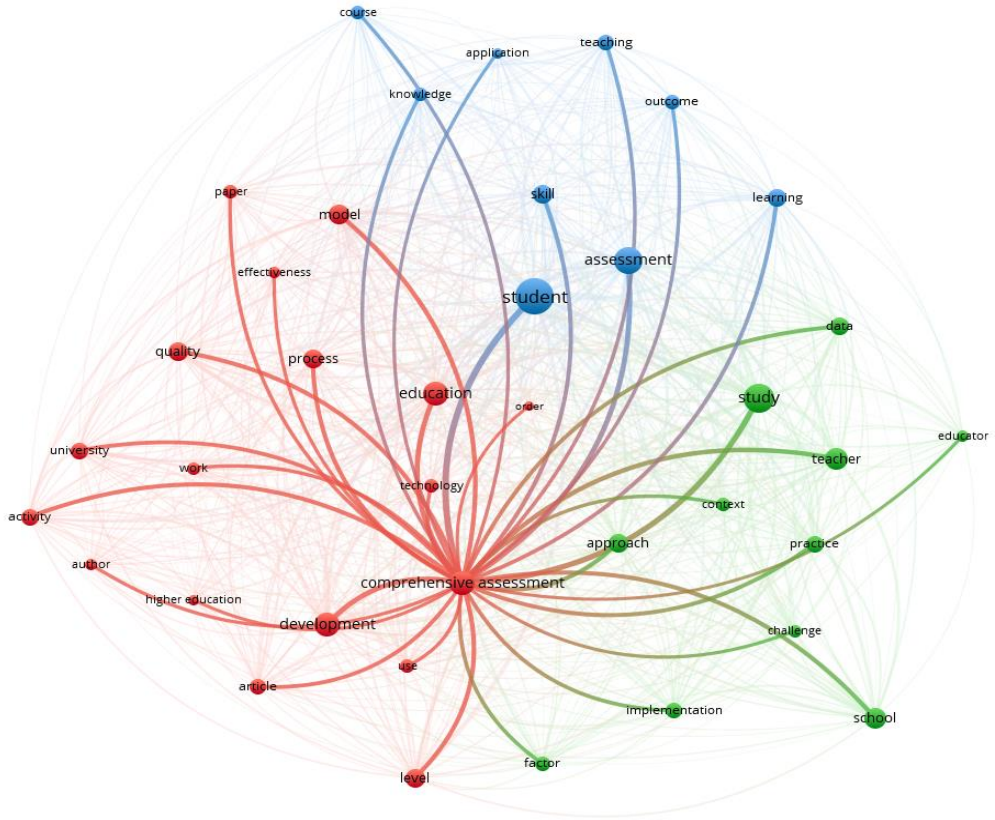

Figure 7. Network visualization on the topic of Comprehensive Assessment in Education

Figure 7 displays three colored clusters indicating the division of research focus on the topic of Comprehensive Assessment. Each color in the circles represents a different cluster, with the red cluster being the largest, followed by the green cluster, and then the blue cluster. Each cluster represents the main focus of the research, prioritized based on the size and number of items within the colored circle. This is also discussed by Firat et al. (2022) and Tarso et al. (2025), who explain that the relationship between terms in the network visualization is depicted by lines connecting one term to another, showing clusters within the research topic area. Research Focus One is marked by the red cluster, which includes 18 items. In this cluster, several key terms with the largest circle sizes take center stage, such as Comprehensive Assessment, education, development, process, model, and quality. These keywords reflect the main theme of the first research focus, which concerns the fundamental aspects of comprehensive assessment, focusing on quality and educational development.

Research Focus Two, represented by the green cluster, consists of 11 items. This cluster centers around keywords like study, teacher, school, approach, and implementation. These keywords indicate that the research focuses on the analysis of needs, performance, and the role of teachers and educational institutions in the assessment process.

Research Focus Three is marked by the blue cluster, which includes 9 items. The key terms in this cluster are student, assessment, learning, teaching, and skills. This cluster focuses on the role of students in comprehensive assessment, including skill development and relevant learning models. Overall, this visualization provides an overview of the direction and priorities in research related to Comprehensive Assessment, with each colored cluster representing complementary study focuses.

Overlay Visualization for Co-occurrence

Similarly, VOSviewer provides an overlay visualization map. Furthermore, the overlay visualization for the co-occurrence of the term "Comprehensive Assessment" in education is presented in Figure 8.

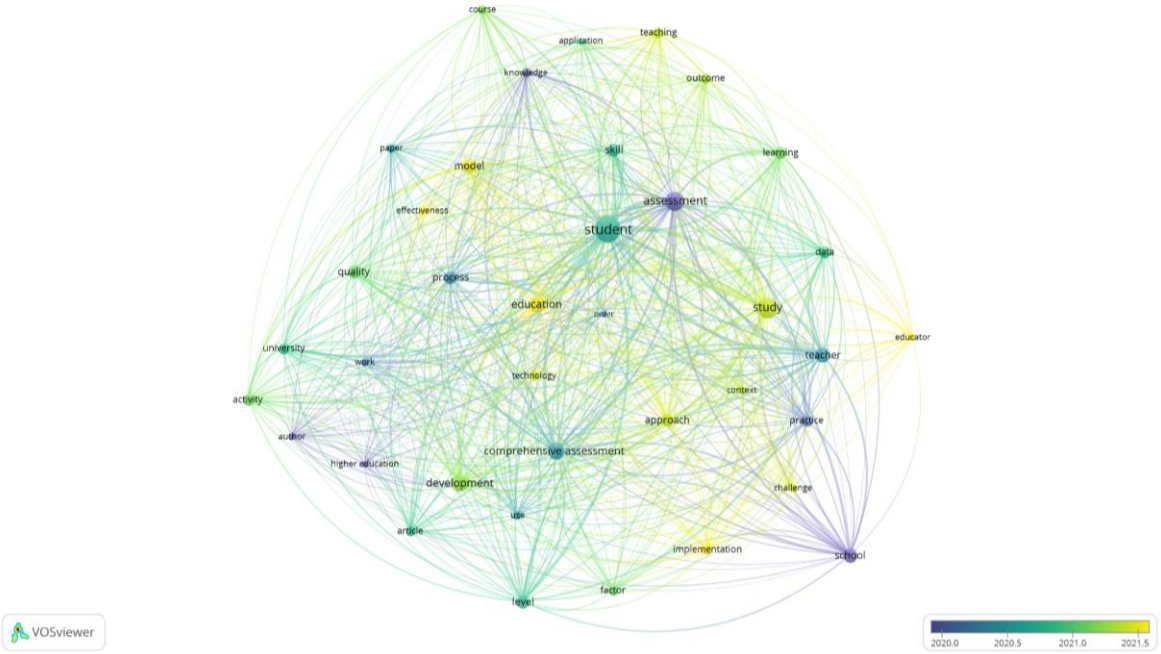

Figure 8. Overlay visualization on the topic of Comprehensive Assessment in Education

Figure 8 illustrates the use of colors to show the development of keyword usage in research over time. Purple indicates keywords that began to be used around 2020, green shows their usage in 2021, and yellow signifies keywords that have emerged recently, particularly since 2021. The yellow-colored circles represent new themes in this field, such as educator, model, effectiveness, implementation, challenge, and education. The presence of these keywords reflects new topics that have begun to attract attention in this area of research.

In research innovation, the connections between keywords are also meaningful. Keywords that do not directly relate to other keywords often indicate novelty or innovation in the field. Based on the figure, Comprehensive assessment and study, as the two main themes previously focused on in the first and second research areas, do not directly connect with new keywords like effectiveness, model, and educator. This suggests the potential for developing research topics by bridging previously unconnected themes. through this overlay visualization, researchers can easily observe publication trends year by year. The yellow color, marking the newest topics, helps researchers identify current trends to determine the most relevant and up-to-date research directions. Overall, this mapping is valuable for future research, identifying key themes and spotting aspects that have not been extensively studied. The connections between main themes and new keywords offer opportunities for future researchers to explore untapped topics while contributing new insights to Comprehensive Assessment research.

Overlay Visualization for Co-occurrence

In addition, VOS viewer displays a density visualization map. Furthermore, the density visualization for the co-occurrence of the term "Comprehensive Assessment" in education is presented in Figure 9.

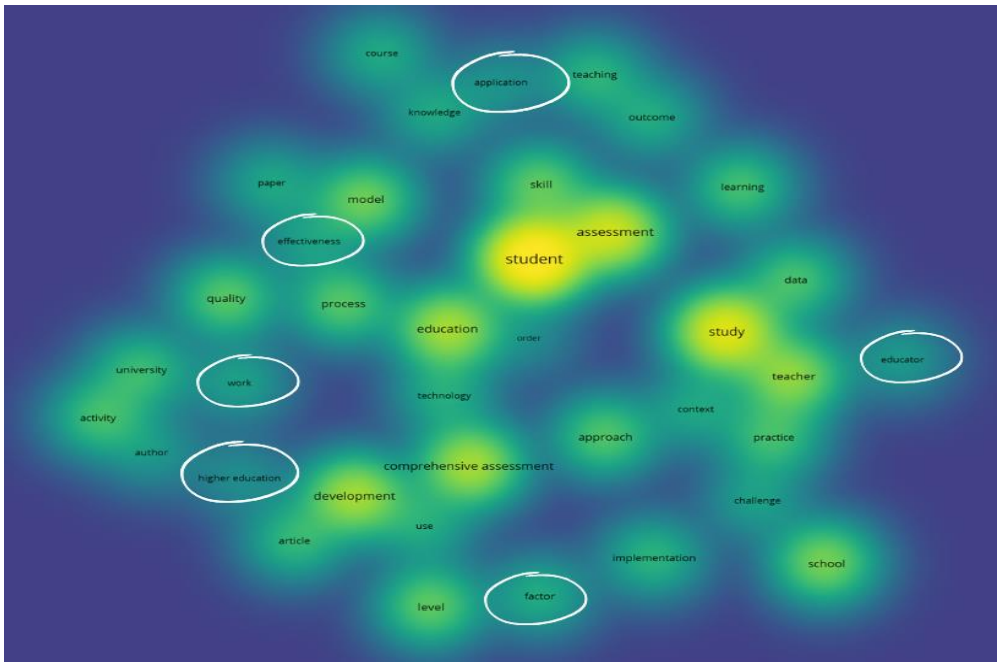

Figure 9. Overlay visualization on the topic of Comprehensive Assessment in Education

Figure 9 displays the density visualization of research on Comprehensive Assessment based on VOS viewer analysis. This density visualization shows how frequently a topic is researched within a research group Click or tap here to enter text.. The color density in the visualization serves as a guide to identify topics that are still underexplored. The more faded or blurred the color, the less frequently the topic has been researched. Conversely, brighter or yellow colors indicate topics that have been frequently studied.

In Figure 9, rarely researched topics are circled in white, indicating that the base color of these six topics tends to fade and is nearly invisible. This suggests that topics like educator, higher education, effectiveness, application, work, and factors can contribute new insights if further explored. On the other hand, topics with keywords such as student assessment, comprehensive assessment, development, school, level, teacher, skills, model, and process show saturation in research due to extensive examination, as seen in the bright yellow color in the visualization. Overall, the results of this visualization can assist researchers in identifying research directions that still hold potential for novelty, as well as in pinpointing topics that may require different perspectives or approaches to deepen understanding in Comprehensive Assessment.

DISCUSSIONS

In global education, comprehensive assessment has become a key trend in supporting more holistic learning. This approach involves measuring various aspects of student learning, such as cognitive, behavioral, and emotional dimensions, to provide a comprehensive view of their learning experience (Murphy & Ferrara, 2023). Research shows that cognitive engagement, which involves how students process information, active participation in learning activities, and positive emotional attitudes toward the educational environment, directly correlates with academic achievement and student readiness to face future challenges (Fredricks et al., 2004).

The importance of this topic in educational research can be seen in efforts to develop more inclusive and in-depth evaluations that go beyond traditional academic assessments. According to several studies, using comprehensive assessment approaches in education can enhance students' understanding of subject matter and provide better opportunities to overcome learning difficulties. Furthermore, research in this field also focuses on how

comprehensive assessment approaches can be applied in various educational contexts, whether at the primary, secondary, or higher levels (Livingstone, 2012).

Technology plays a vital role in the development of comprehensive assessment. Digital tools like interactive simulations and technology-based responses allow students to engage more deeply with content, offering insights that traditional methods cannot reach (Putri, 2024; Rochmat et al., 2025). For example, students can manipulate variables in science experiments through simulations, helping assess their critical thinking abilities. Additionally, technology-based surveys measure students' curiosity, motivation, and interests, providing valuable information for schools to create a more adaptive learning environment (Alam et al., 2023; Siswanto, 2024).

This approach also plays a vital role in supporting the development of student agency, which is the ability to learn independently and take responsibility for their learning process. An (OECD., 2022). report emphasizes that education must be more responsive to social and technological changes by leveraging data from comprehensive assessments to support inclusive and evidence-based educational policies. Moreover, these assessments contribute to reducing social gaps by providing richer insights into the needs of students from diverse backgrounds (Alghiffari et al., 2024). Finally, comprehensive assessment is not just a measurement tool but also a strategy that supports learning relevant to the challenges of the 21st century. This approach encourages innovation in education systems, ensures the holistic development of students, and provides essential data for policymakers to create more inclusive and sustainable education.

CONCLUSION

Based on the publication trends of articles related to comprehensive assessment in the field of education from year to year, interest in this topic has consistently increased, with the highest surge occurring in 2024. This is also evident in the annual citation trends related to comprehensive assessment, showing a consistent rise in attention from 2012, peaking in 2023. This study identifies three main focuses within the topic of Comprehensive Assessment: the development of education, the analysis of the teacher's role, and the role of students in the assessment process. These findings contribute to a more comprehensive understanding of the direction of research in the field of Comprehensive Assessment in education. With three complementary clusters, this study opens opportunities for further research to deepen understanding or expand the application of comprehensive assessment in various educational contexts.

Furthermore, this study shows the development of the research topic of Comprehensive Assessment through keyword usage analysis over time. The colors used help identify new themes such as educator, model, effectiveness, and implementation, indicating growing interest in recent years. The absence of direct connections between previous main themes and new keywords suggests opportunities to develop research bridging these topics. Finally, the density visualization depicts the intensity of research on various topics within the Comprehensive Assessment, showing opportunities for new exploration and innovation in this field. The fading colors on topics such as educator, higher education, effectiveness, application, work, and factor indicate that these topics still need to be explored, presenting the potential for new contributions. In contrast, topics like student assessment, comprehensive assessment, development, school, level, teacher, skills, model, and process have reached saturation, as seen in the bright yellow color, suggesting that these topics have been extensively studied. Therefore, this study is expected to serve as a reference for future research innovations related to Comprehensive Assessment.

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