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TRENDS AND INNOVATIONS IN DIGITAL READING ASSESSMENT: A DECADE OF BIBLIOMETRIC INSIGHTS

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Abstract

The digitalization of reading assessment has become inevitable. The emergence of technology in reading assessment should be seen as an opportunity to improve the quality of students' reading. This study aims to compile various research conducted on digital reading assessment. The method used in this research is a literature review, where the researcher gathers information through literature studies including books, articles, research findings, and others. The researcher then analyzes the collected data using bibliometric analysis. Bibliometric analysis is an approach that employs a range of quantitative methods to measure, analyze, and track scientific literature. The results of this research found 29 articles related to digital-based reading assessment from 2013 to 2023. After analysis, several topics were frequently discussed in these articles, including assessment, computer-based assessment, technology, online testing, and open book. However, there are still some topics that need further development, such as computation design, reading comprehension assessment, cooperative/collaborative learning, and active reading. This research will be highly beneficial for researchers looking to develop digital reading assessments, ensuring that this form of assessment advances in the future and produces the best digital-based reading evaluations.

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INTRODUCTION

Technology at this time has spread to all aspects of human life. Nevertheless, its utilization is difficult for teachers to implement in the classroom, especially in designing assessments. Teachers who are interested in using digital instruments will find a lack of resources and guidance in implementing and designing assessments in their classrooms (Udeozor et al., 2024). Even during COVID-19 three years ago, teachers had to adapt to technology and implement new ways to assess students' abilities. Although some of the limitations used in traditional assessment will be difficult to implement in online or distance learning (Flanagan et al., 2022). However, teachers must ensure that the assessments given to students are quality, effective and measurable (Van Helden et al., 2023).

Learning by utilizing digital instruments will suit the generation of students who are familiar with technology. In fact, many studies reveal that younger generations are more familiar with technology than previous generations (Suárez-álvarez et al., 2022). Therefore, teachers should integrate digital tools in their classroom practices by encouraging students to use technology consistently, especially in communication and information access activities (Estrada-Araoz et al., 2024). Not only communication and information, the use of technology will also make it easier for teachers to assess students' reading learning.

Digital-based reading assessment actually has a myriad of benefits that will be obtained by students and teachers. Based on a study conducted by Leu, electronic reading assessment is

defined as electronic reading literacy by maximizing individual capacity to understand, use, reflect, and engage with texts, which aims to build knowledge and potential, and to participate in a society that is loaded on digital texts (Chang & Huang, 2013). Reading assessment with technology will also help assessors to expand the scope of the assessment scale. Assessments with a wide scale have actually been carried out by several international organizations such as PISA, TIMSS (Progress in International Reading Literacy Study), and PIRLS (Progress in International Reading Literacy Study) by utilizing computers as a medium in carrying out reading assessments (Suárez-álvarez et al., 2022). Even assessments conducted with technology such as computer-based-assessment (CBA) will be easy to conduct various kinds of assessments periodically and provide a quick identification of students' needs in reading learning (Hautala et al., 2020; Virinkoski et al., 2017).

Research on digital reading assessment has been conducted by several researchers. Among them is Rice et al. (2023), who studied inferencing in reading comprehension by examining various definitions, instructional methods, and assessments. The results of the research obtained, namely there are 75 studies that have been reviewed, conclude that there are differences in inference questions between practice and testing in reading assessment. Another study was also conducted by Al-Sulaimi & Al-Shihi (2017) who examined the effect of digital vs printed text in reading comprehension by relying on various literatures to answer the researcher's problems. the results of the research he found were various opinions regarding the positive and negative impacts of the digital reading process. Another research was also conducted by (Dixon et al., 2023) which examines dynamic assessment (DA) which focuses on the potential of learning that will illustrate authentic assessment. Through a literature study, his research found that DA's ability to utilize variance that cannot be explained by ordinary statistical measurements. The three previous studies described above are different from this study. Although they both use literature study as their research method, the topics discussed are very different. The topic discussed in this research is how the development of digital reading assessment from 2013-2023. However, the three studies above only discuss reading inference, digital comparison with textbooks in reading, and the effectiveness of DA to measure reading skills authentically.

Based on the issues and the importance of digital reading assessment mentioned above, there is a need for various studies that support the optimization of technology in addressing the numerous challenges associated with reading assessment. Existing research on digital reading assessment is insufficient to tackle the multitude of problems in this field. Furthermore, more studies are needed that can cover specific aspects of digital reading assessment. Therefore, a mapping of the existing research discussing digital reading assessment is necessary. This mapping is expected to provide subsequent researchers with an overview of the topics that have already been addressed and those that still require further development. Thus, the research problem can be formulated as: "what are the trends and innovations in digital reading assessment over the past decade?".

RESEARCH METHOD

Research Design

This study adopts a qualitative research approach, utilizing a systematic literature review to provide a comprehensive and detailed description of the research landscape in digital reading assessment. As emphasized by Liberati, a systematic literature review serves as a robust research method that facilitates the identification, critical assessment, and synthesis of prior studies, enabling the researcher to construct a holistic understanding of the topic (Snyder, 2019). This methodological framework ensures that the research encompasses a thorough examination of existing scholarly works, identifying gaps and consolidating knowledge within the field. The literature review process is enriched through bibliometric analysis, a quantitative approach that

measures and tracks scientific literature using various statistical and analytical tools (Rojas-Sánchez et al., 2023). Bibliometric analysis not only quantifies the volume of publications but also reveals patterns, trends, and connections among academic papers, offering valuable insights into the development and structure of research within the field. This method ensures that the data collected is systematically organized, thereby enhancing the reliability and accuracy of the findings.

The bibliometric analysis employed in this study follows a five-step process as outlined by Fahimnia et al. (2015) and Pradana et al. (2023). The initial step involves determining the appropriate keywords that align with the research focus on digital reading assessment. Next, an initial search is conducted to retrieve relevant publications from academic databases. The third step focuses on refining the search results, filtering out irrelevant articles, and ensuring that only high-quality and pertinent studies are selected. This refinement process is crucial to maintaining the integrity of the analysis. Subsequently, statistical data related to publication volume, citation frequency, and authorship are compiled to provide an overview of the research landscape. The final step involves an in-depth analysis of the collected data, mapping the progression of digital reading assessment research and identifying emerging trends and areas requiring further exploration.

Research Object

The research object of this study comprises academic publications that focus on digital reading assessment across various educational levels. To ensure the selection of high-quality and relevant literature, the researcher established four rigorous inclusion criteria. The first criterion mandates that all articles must be published and indexed in Scopus, given that Scopus-indexed articles are widely recognized for their accuracy, credibility, and academic rigor. This criterion ensures that the research draws from authoritative and peer-reviewed sources, enhancing the validity of the study's findings. The second criterion specifies that the articles must explicitly address digital reading assessment, encompassing studies that investigate assessment practices in digital reading at any level of education. This broad scope allows for a comprehensive exploration of the topic, capturing insights from diverse educational settings and contexts. The third criterion restricts the selection to research articles or review papers, thereby excluding opinion pieces, editorials, and other non-research publications. This criterion guarantees that the study focuses on evidence-based literature that contributes to academic discourse and the advancement of knowledge in digital reading assessment.

The final criterion limits the timeframe of publications to those published between 2013 and 2023. This 10-year window reflects the evolving nature of digital reading assessment and ensures that the research accounts for recent developments and emerging trends. By focusing on this period, the study aims to provide an up-to-date perspective on the field, capturing the impact of technological advancements and shifts in educational practices. Together, these criteria create a well-defined and robust research object, forming the foundation for a comprehensive and insightful analysis.

Data Analysis

The data analysis phase of this study involves the systematic examination of publications retrieved through the software tool Publish or Perish. This tool facilitates the identification and collection of academic papers by searching for relevant keywords across multiple databases. Once the initial set of publications is compiled, the data is further analyzed using VOSviewer software, a powerful visualization tool that enables the mapping and clustering of research trends. VOSviewer is instrumental in creating co-authorship networks, co-occurrence maps, and citation-based rankings, allowing the researcher to visualize the relationships and connections between authors, keywords, and publications. By employing VOSviewer, the study can identify key contributors, influential publications, and collaborative networks within the

field of digital reading assessment. This visualization process sheds light on the development trajectory of the research area, highlighting dominant themes, emerging topics, and areas where further investigation is needed.

The analysis focuses on three key dimensions: co-authorship, co-occurrence, and citation metrics. Co-authorship analysis examines the collaborative relationships between researchers, revealing patterns of academic partnership and the extent of interdisciplinary collaboration. Co-occurrence analysis identifies frequently used keywords and their interconnections, providing insights into the thematic structure and evolving vocabulary within the field. Citation metrics assess the impact and visibility of individual publications, ranking articles based on the number of times they have been cited by other researchers. This multidimensional approach to data analysis ensures a comprehensive understanding of the research landscape, facilitating the identification of knowledge gaps and future research directions.

RESEARCH FINDINGS AND DISCUSSION

Research Findings

Development of Digital Reading Research

In searching for documents in publish or perish, researchers first apply keywords that will find researchers related to digital reading assessment. There are three keywords that researchers use, the words "reading" and "assessment" are placed in the tittle column and the word "digital" is placed in the keywords column. The initial search results based on these three keywords found 47 documents in the form of articles, book chapters, conference papers, and reviews. After filtering based on the criteria determined by the researcher, 29 articles were filtered that were in accordance with the objectives of this study. The articles show that there is an upward trend in the number of studies related to digital reading from 2013 to 2023. This can be shown in the line diagram below.

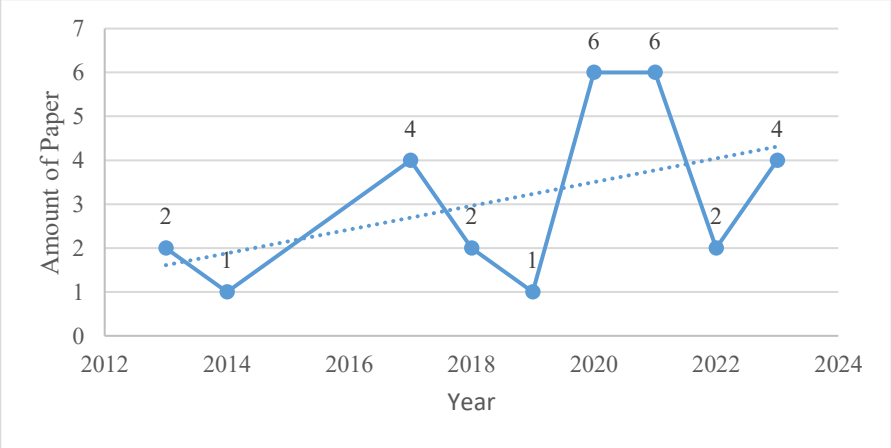

Figure 1. Graph of the progress of digital reading assessment research

The diagram above shows a positive increase in research on digital assessments of reading skills. Research began in 2013 with two studies conducted by Frønes et al., (2013) and Chang & Huang, (2013). Then until 2023 research on digital reading assessment continued to grow. Interestingly, in 2020 and 2021 research on reading assessment experienced a significant increase, producing 6 articles each. This is certainly inseparable from the influence of COVID-19 which requires learning to be carried out online including reading assessment. In 2019, there was a very significant decrease in the number of publications, namely only 1 publication that examined digital reading assessment. Similar conditions also occurred in 2014 which also produced one publication. Even in 2015-2018, there was not a single publication that discussed digital reading assessment. This is very different from the years before and after which there

was still a publication even though only one. Nevertheless, since the beginning of the emergence of research discussing digital reading assessment until 2023, the quantity has continued to increase. This proves that, in the future, research related to digital reading assessment will grow and grow. Coupled with the inevitable flow of technology, this kind of research will be increasingly in demand.

Author Development Map (Co-Authorship) in Digital Reading Assessment Research

The author's development map can be seen from the 29 documents that have been collected and analyzed using the help of the vos viewer application. The documents that researchers have obtained in publish or perish are then stored in the form of RIS (Research of Information Systems) so that all documents can be read by vos viewer. Then the RIS document is opened in the vos viewer application and gets the results as in the table below.

Table 1
Author (Co-Authorship) of Digital Reading Assessment Research

Author	Documents	Total link strength
Brendan Flanagan	3	10
Rwitajit Majumdar	3	10
Hiroaki Ogata	3	10
John Sabatini	2	7
Juha Matti Latvala	2	6
Chih Ming Chen	2	4
Tove Agner	1	7
Richard Brans	1	7
Karen C. Carrol	1	7
Caterina Foti	1	7

Based on the search results in Vos Viewer, researchers found 96 authors spread across 29 publication documents related to digital reading assessment. The table above contains 10 authors who have the most documents and total link strength. It can be seen that the top three authors Brendan Flanagan, Rwitajit Majumdar, and Hiroaki Ogata have 3 publications each related to digital reading assessment. The mapping of 96 authors can be seen in the figure below.

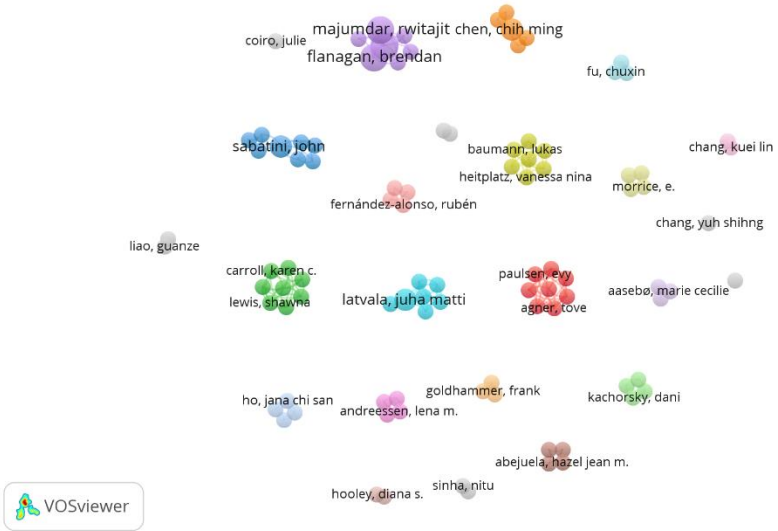

Figure 2. Network Visualization on Co-authorship

The figure above maps 96 authors spread across 29 publications related to digital reading assessment. A total of 24 clusters were found, which are different and unrelated to each other. Each cluster in the map above has 1-8 interlinked authors. This means that the interrelated authors have research publications linked to each other. Clusters that have the most authors are clusters with red and blue, each of which has 8 authors. Then the clusters with the least authors are clusters with gray color with 1 author each.

Keyword Map (Co-Occurance) in Digital Reading Assessment Research

Data in the form of 29 publication documents that have been saved in the form of RIS, then opened through Vos Viewer to find out what keyword maps are used by the author. Keyword mapping is needed to see what research topics are developing in digital reading assessment. In this mapping, it will also be known how many keywords are used by researchers. The relationship between keywords will also be mapped by the vos viewer application. Based on the data that has been analyzed, the following is the number of keywords used by the author related to digital reading assessment research.

Table 2
Keywords (co-occurance) of Digital Reading Assessment Research

Term	Amount of Co-Occurance
Assessment	5
Computer-based assessment	3
Reading comprehension	3
Digital reading	3
Reading behavior	3
Comprehension	2
Technology	2
Reading assessment	2
Online testing	2
Open book	2

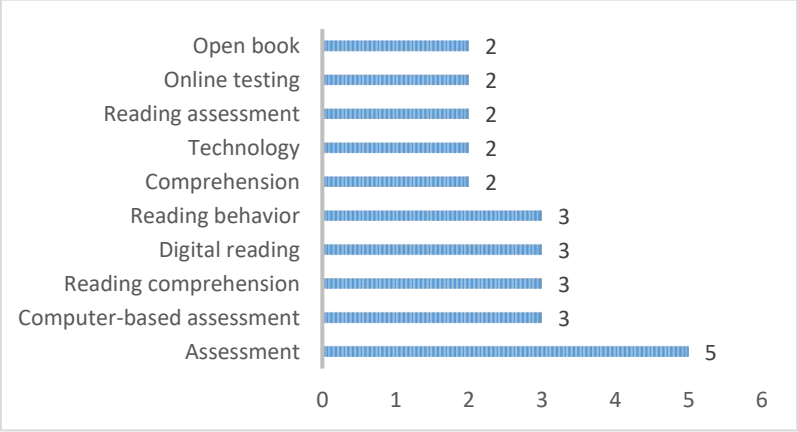

Figure 3. Chart of Keywords for Digital Reading Assessment Research

The table and diagram illustrate the distribution of keywords across 29 publications identified using VOSviewer. The search yielded 132 keywords from documents related to digital reading assessment. However, only 10 keywords appeared in more than one publication, indicating that most topics addressed in the 29 articles are diverse and not directly interconnected. According to the table and diagram, the most frequently occurring keyword is "assessment," which appears in 5 publications. This is expected, as the primary focus of the research pertains to assessment. Following this, the keywords "computer-based assessment,"

"reading comprehension," "digital reading," and "reading behavior" are each present in three publications. Additionally, four other keywords, including "comprehension," "technology," "reading assessment," "online testing," and "open book," each appear in two publications.

The identified keywords are subsequently visualized through network, overlay, and density mapping using VOSviewer software. This visualization process highlights the connections and relationships between keywords. In the bibliometric network, nodes (or circles) represent individual keywords, while edges (or lines) indicate the connections between these nodes. This visual representation provides insight into how keywords relate to one another and the extent of their influence within the research landscape. Upon inputting the data into VOSviewer, the resulting visualization reveals keyword mapping from the 29 publications on digital reading assessment. This mapping offers a clearer understanding of the relationships between frequently used keywords and the broader thematic structure of the field.

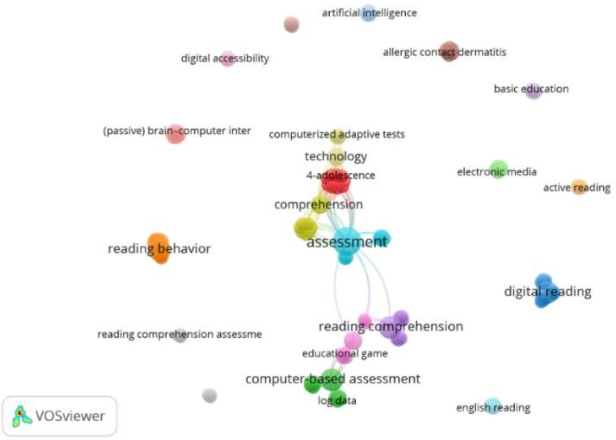

Figure 4. Network Visualization on Co-occurence

The figure above presents a network visualization of co-occurrence, illustrating the relationships between keywords through nodes and edges distinguished by different colors. The search results reveal the existence of 20 clusters and 287 networks connecting various keywords. Notably, some clusters lack connections to others, as indicated by the absence of linking edges. This suggests significant opportunities for future research to bridge gaps between these isolated clusters. Conversely, several clusters are interconnected within the mapping. Specifically, 7 clusters exhibit strong interconnections. These include cluster 1 (red), cluster 2 (green), cluster 4 (dark yellow), cluster 5 (dark purple), cluster 6 (light blue), cluster 9 (light purple), and cluster 13 (pale yellow). The keyword "assessment" plays a pivotal role in connecting the majority of these clusters, highlighting the centrality of assessment-focused research within this field. The interconnected clusters reflect a concentration of research exploring various aspects of assessment, while the isolated clusters represent areas that have yet to be thoroughly integrated into the broader research network. This visualization underscores the existing fragmentation within the field and points to potential avenues for future investigation, emphasizing the importance of expanding keyword interconnections to foster a more cohesive research landscape.

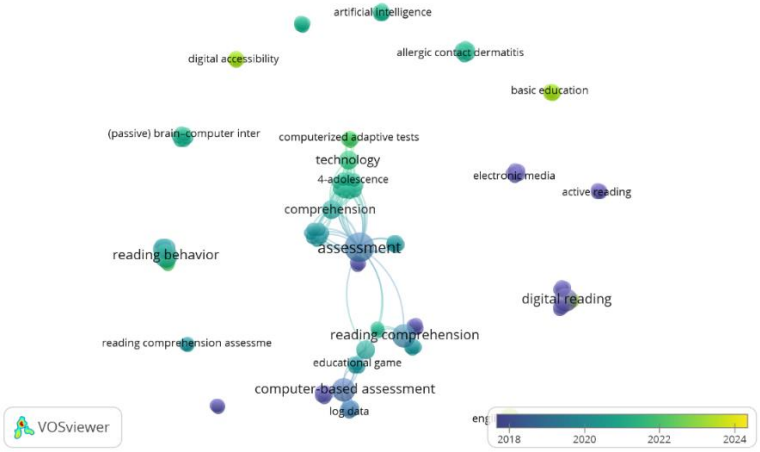

Figure 5. Visualization of Overlay on Co-occurence

The figure above is a mapping of keywords based on the year of publication of research starting from 2013 to 2023. The more purple-colored the nodes in the figure, the research conducted has been published before 2018. Vice versa, the more yellow the nodes in the picture, the research conducted was published closer to 2024. This is certainly very useful for researchers who want to know what research topics are trending related to digital reading assessment.

Based on the results of the analysis conducted by vosviewer, there are several nodes that have purple color, namely digital reading, electronic media, active reading, academic text, computation design, digital literacy, and others. It can be concluded that some of the keywords that have purple color have been done or published before 2017. However, blue and green colored nodes are also widely visible from the map above. For example, the blue-colored nodes are assessment, educational games, artificial intelligence, and others that have been researched from 2018 to 2022. However, the research that is being discussed lately is seen in the green to yellow nodes. These nodes contain the keywords basic education, digital accessibility, computer adaptive test, early warning prediction, reading assessment system, and others published above 2022.

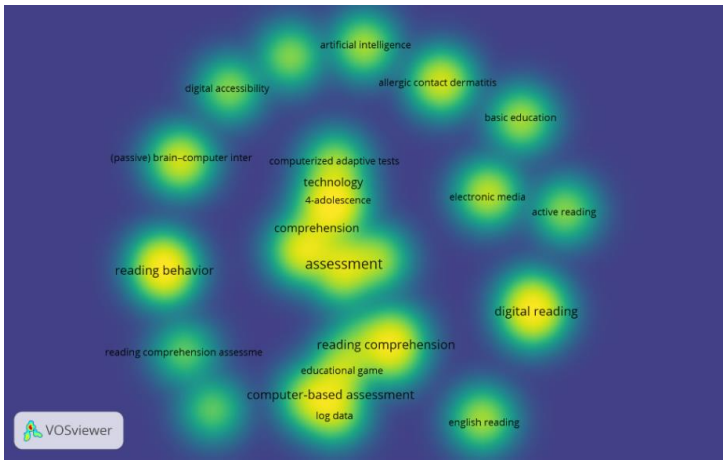

Figure 6. Density Visualization on Co-occurrence

The figure above is a density visualization generated by vos viewer software based on 29 digital reading assessment research documents. This mapping is useful to see how many researchers use a keyword. The more who use a keyword, the more yellow the visualization. However, the fewer researchers who use a keyword, the less yellow the color of the node. For

example, keywords that have been widely researched are assessment, reading comprehension, digital reading, computer-based assessment, 4-adolescent, and others. These keywords can be considered by researchers who want to research these topics because these topics have been covered by more than one study. Then the keywords that are still rarely used by researchers are computation design, reading comprehension assessment, cooperative/collaborative learning, active reading, and others. Keywords that are rarely used can be an opportunity for researchers to be present to fill the spaces that are still rarely noticed.

Ranking Publications Based on Number of Citations

Publications with a large number of citations show the credibility of the research that has been conducted. Digital reading assessment research, which only amounts to 29 articles, makes publications in this field will always be used as a reference for other researchers. This is because there are few studies that are used as references by researchers in conducting digital reading assessment research. Of the 29 publications that have been filtered by researchers through publish and perish software, the following are the 10 publications that have the most citations.

Table 3
Publication Ranking on Co-citation

Ranking	Author/Year	Title	Amount of Citation
1	Julie Coiro (2021)	Toward a Multifaceted Heuristic of Digital Reading to Inform Assessment, Research, Practice, and Policy	99
2	Morrice et al., (2017)	Assessment of the Apple iPad as a low-vision reading aid	32
3	Hautala et al., (2020)	Identification of Reading Difficulties by a Digital Game-Based Assessment Technology	29
4	Sabatini et al., (2020)	Engineering a Twenty-First Century Reading Comprehension Assessment System Utilizing Scenario-Based Assessment Techniques	25
5	Chen et al., (2021)	A collaborative reading annotation system with formative assessment and feedback mechanisms to promote digital reading performance	20
6	Andreessen et al., (2021)	Toward neuroadaptive support technologies for improving digital reading: a passive BCI-based assessment of mental workload imposed by text difficulty and presentation speed during reading	15
7	Walia & Sinha, (2014)	Changing trend in reading habits of teenagers in Delhi an impact assessment of demographic and environmental variables	12
8	(Gammel et al., 2021)	Comparison of an Automated Plate Assessment System (APAS Independence) and Artificial Intelligence (AI) to Manual Plate Reading of Methicillin-Resistant and Methicillin-Susceptible Staphylococcus aureus CHROMagar Surveillance Cultures	7
9	Yüksel et al., (2021)	Value of photo assessment in late patch test readings—A multicenter study from six European patch test clinics	7
10	(Serafini et al., 2020)	Incorporating Multimodal Literacies Into Classroom-Based Reading Assessment	7

Based on the table above, the publication with the highest number of citations was achieved by Coiro (2021)with 99 citations. The research he did was related to how heuristics determine various definitions of digital reading through the systematic review method. Then the research with the lowest rank was conducted by Chang & Huang (2013) with not a single citation. The research he conducted discussed how the construction of digital reading for adolescents in Taiwan. However, research that has not had a single citation is not only Chang & Huang (2013), other researchers such as Liu et al (2018), Flanagan et al. (2020), Lin & Liao (2023), Ho et al. (2023), and Wüst et al. (2023) also experienced the same thing.

Discussion

The research findings on the development of digital reading assessment studies reveal a fluctuating trend between 2013 and 2023. A significant increase in publications during the period from 2020 to 2021 highlights the growing interest and necessity for further exploration in this field. This surge can be directly linked to the COVID-19 pandemic, which acted as a catalyst for accelerating digitalization in educational assessments. With schools and institutions transitioning to remote learning environments, the demand for effective digital assessment tools became imperative, thereby driving research and publications in this area.

The visualization of co-authorship reveals diverse patterns of collaboration among authors engaged in digital reading assessment research. The mapping illustrates that while some researchers are actively collaborating, a substantial number of authors have yet to form connections with others in the field (Al-sulaimi & Als-shihi, 2017; Chang & Huang, 2013). This lack of collaboration presents significant opportunities for researchers to establish new partnerships, fostering interdisciplinary approaches to digital reading assessment. Encouraging greater collaboration, especially between small and large research clusters, could enhance both the quality and quantity of research outputs. By facilitating joint publications, knowledge sharing, and cross-institutional projects, the field could advance more cohesively.

Despite the growing number of authors interested in digital reading assessment, the study highlights limited interconnections between them. This fragmentation underscores the need for dedicated platforms or forums that promote the exchange of ideas and collaborative initiatives. Establishing international conferences, webinars, and collaborative digital hubs could provide the necessary space for researchers to connect, share findings, and develop cohesive research agendas that address common challenges in digital reading assessment (Chen et al, 2021; Dixon et al., 2023). The co-occurrence mapping results further emphasize the fragmented nature of digital reading assessment research. The presence of 20 distinct clusters points to the evolving and diverse landscape of this field. The lack of standardized terminology, methods, and frameworks reflects the varied approaches adopted by researchers, influenced by differing educational contexts, technological tools, and target demographics (Coiro, 2021; Flanagan et al., 2020). This divergence signifies that while digital reading assessment is gaining traction, it remains an area in need of greater cohesion and methodological alignment.

The disconnected clusters in the co-occurrence mapping suggest that researchers are exploring digital reading assessment from vastly different perspectives, contributing to the proliferation of niche studies rather than fostering unified advancements. To address this, Flanagan et al. (2022) inform that studies should aim to establish clearer links between existing clusters, fostering integration and coherence in the field. One approach could involve the creation of comprehensive literature reviews or meta-analyses that synthesize findings across different studies, drawing connections between disparate research strands and identifying overarching themes (Hautala et al., 2020; Ho et al., 2023). Furthermore, the interconnectedness among seven key clusters identified in the mapping serves as a promising foundation for expanding collaborative efforts. These clusters, representing areas of overlap and shared focus, can act as entry points for initiating partnerships that bridge gaps between isolated research areas. By leveraging these existing connections, researchers can contribute to the formation of

a more integrated theoretical framework for digital reading assessment, ultimately enhancing the depth and applicability of findings.

A related area of concern revealed by the research is the significant disparity in citation counts among digital reading assessment articles. As illustrated in findings, there exists a pronounced gap between highly cited works, such as Coiro's (2021) article with 99 citations, and numerous other publications that have yet to receive any citations. This disparity reflects broader issues within the field, including the relevance and visibility of certain research topics to the academic community. The uneven citation distribution suggests that some articles may not resonate with readers or fail to address pressing questions within the field. To mitigate this issue, authors of under-cited works could adopt more proactive dissemination strategies. Presenting research findings at international conferences, engaging in interdisciplinary collaborations, and participating in academic workshops are effective ways to enhance visibility and relevance (Sabatini et al., 2020; Suarez-alvarez et al., 2022). Additionally, expanding the accessibility of publications through open-access platforms and leveraging social media for knowledge dissemination can broaden the reach of digital reading assessment research.

Moreover, fostering connections between highly cited and under-cited works can help redistribute attention and promote lesser-known studies. Collaborative citation practices, where authors reference a diverse range of studies within their publications, can contribute to a more equitable distribution of recognition across the field. Creating citation networks that encourage reciprocal engagement among researchers may further amplify the impact of emerging studies (Taskin, 2024; Aspinosa-Rada et al., 2024). It is also essential for researchers to focus on aligning their studies with current trends and pressing challenges within digital reading assessment. By addressing gaps identified through cluster mapping and responding to the evolving needs of educational institutions, authors can enhance the relevance and applicability of their work (Oppenlaender, 2024). This alignment not only increases the likelihood of citations but also ensures that research outputs contribute meaningfully to the advancement of digital reading assessment as a whole.

The research on digital reading assessment highlights both promising developments and significant areas for improvement. The increasing volume of publications, driven in part by the pandemic, underscores the growing importance of this field. However, the fragmentation evident in co-authorship patterns, cluster mapping, and citation distribution points to the need for greater collaboration, methodological standardization, and proactive dissemination strategies. By addressing these challenges, the field can achieve greater cohesion and impact, ultimately contributing to more effective digital reading assessment practices across educational contexts.

CONCLUSION

Based on the research findings and discussion above, it can be concluded that studies related to digital reading assessment are still limited, with only 29 published articles. Through this bibliometric analysis, it was found that the highest number of publications occurred in 2020 and 2021. This increase was due to the COVID-19 pandemic, which necessitated that learning, including reading assessment, be conducted with the aid of technology or digitally. Additionally, it was discovered that many researchers in digital reading assessment have yet to connect with one another. There are still ample opportunities for collaboration to produce innovative research by linking various keywords that have not yet been associated. Keywords that are still underutilized by researchers and require further development include computation design, reading comprehension assessment, cooperative/collaborative learning, and active reading. It is hoped that research on digital reading assessment will continue to evolve in line with the rapid advancement of technology, which has become unavoidable in human society. This mapping will serve as a reference for future researchers conducting studies on digital reading assessment.

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