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Discussing Critical Reading in Digital Age: Bibliometric Analysis Insights

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Abstract: Digitalization in critical reading is inevitable. The presence of technology in the world of education has changed the structure of reading teaching with more innovative technological features. This study aims to analyze the trend of critical reading research in the digital era by utilizing a bibliometric approach. The researcher uses the literature study method to answer the researcher's problems through a literature review in the form of related research results that have been carried out. After the data is collected, the researcher analyzes it through bibliometric analysis that will be obtained by the number of articles, co-occurrence mapping, number of citations, and co-authorship mapping. The results of this study show that there are 42 research articles related to critical reading in the digital era. Another finding obtained was the existence of various keywords related to critical reading in the digital era that are often used by researchers, namely critical reading, critical thinking, digital/media literacy, and others. However, there are still several topics that still need to be developed, such as critical graph reading, reading strategies, reading comprehension, distance teaching, critical stylistics, and others. It is hoped that the results of this study will provide new insights for researchers who will further develop this critical reading. This research will also be useful for teachers who want to develop their students' critical reading skills.

Keywords: Critical reading, Digital era, Bibliometric analysis

Introduction

In Indonesia, students' reading ability is still an issue that requires serious attention. Based on the PISA (Programme for International Student Assessment) survey report by (OECD, 2023), only a quarter of Indonesian students are able to reach level 2 or higher in reading ability. At this level, students can recognize the main ideas in long texts, find information directly, and explain the purpose of the text clearly. Even more concerning, the percentage of students who reach the superior level (levels 5 and 6) is very low, which is only 0.6%. In contrast, the majority of students (51.7%) are at level 2 (Sultan et al., 2023). Another 75% of 15-year-olds only have reading skills equivalent to level 1, which means they can only understand short, simple texts with literal meanings (Saputra et al., 2024).

This problem is a momentum for reflection for all parties to improve the quality of students' reading ability in Indonesia. The improvement is not only limited to letter recognition, but also includes the ability to understand and criticize the content of the text. Critical reading is a skill formed from the critical thinking ability of a reader. This ability contributes to positive changes in the social structure of society (Halimah et al., 2020), including in the context of critical reading. In the process of critical thinking, critical reading is grouped into six levels: interpretation, analysis, inference, evaluation, explanation, and self-regulation (Facione, 2015; Sultan, 2018). The main purpose of critical reading is to recognize the facts in the text and provide an assessment of those facts. This

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activity involves a deep understanding of reading, the preparation of questions, the assessment of the relevance of information, and the critical evaluation of the content of the text.

In today's digital era, critical reading skills are an urgent need for students. The high volume of information available digitally requires qualified critical thinking skills. With critical reading skills, students can effectively identify, analyze, and evaluate information relevant to their needs. In addition, critical reading also contributes to the development of critical thinking skills indirectly. Trained critical thinking skills enable students to confront the complexities of modern society by carefully evaluating information and making informed decisions (Yousefi & Mohammadi, 2016). Research related to critical reading in the digital era is expected to be able to make a significant contribution in helping students to improve their critical reading skills.

Based on the problems and importance of critical reading skills in the digital era above, various studies are needed that support the maximization of technology in solving various critical reading problems. Existing critical reading studies are not enough to solve the many problems of critical reading in the digital era. Even more research is needed that is able to cover more specific aspects of critical reading in the digital era. Therefore, a mapping of various existing studies that discuss critical reading in the digital era is needed. This mapping is expected to provide an overview to future researchers regarding what topics have been discussed and what they still need to develop. Therefore, the researcher determined the formulation of this research problem, namely "how far has critical reading research developed in the digital era so far?"

Method

This study uses a qualitative research method of literature study that functions to describe the research as a whole and in detail. Liberati stated that *Systematic literature review* can be described as a research method that identifies and critically assesses related research, as well as collecting and analyzing previous research (Snyder, 2019). Then the researcher uses bibliometric analysis in analyzing the data that has been collected. Bibliometric analysis is an approach that uses a number of quantitative methods to measure, analyze, and track scientific literature (Rojas-Sánchez et al., 2023). There are five steps of the bibliometric method, namely the first to determine keywords, the second to the initial search results, the third to improve the initial search results, the fourth to the initial statistical data, and the last step of data analysis (Fahimnia et al., 2015; Pradana et al., 2023).

To find relevant publications, researchers determine four criteria that must be met. First, articles that have been published must be indexed by Scopus. This is because articles indexed by Scopus have a higher level of accuracy than other indexations. Second, the article should discuss critical reading in the digital age for all levels of education. Third, the document is a research and review article. Fourth, the publication used is an article that has been published in related journals.

The next step is the publication results that have been obtained through publish or perish and then analyzed using Vosviewer software. This software will describe a map of the development of digital reading assessment research in terms of co-authority, co-occurrence, and publication ranking based on the number of citations. Based on this mapping, researchers can find out the extent of the development of digital reading assessment research.

Results and Discussion

Development of Critical Reading Research in the Digital Era

In conducting a document search in publish or perish, the researcher first applies keywords that will find researchers related to digital reading assessment. There are three keywords used by the researcher, the words "critical" and "reading" are placed in the title column and the word "digital" is placed in the keywords column. The initial search results based on the three keywords found 61 documents in the form of articles, book chapters, conference papers, and reviews. After conducting a screening based on the criteria that have been determined by the researcher, 42 articles that are in accordance with the purpose of this research are filtered. These articles show that there is an upward trend in the number of research related to digital reading from 2012 to 2024. This can be shown in the line diagram below.

Figure 1 shows a positive increase related to critical reading research in the digital era. The research began in 2010 with one study conducted by Eshet-Alkalai and Geri (2010). Then, until 2014, research on critical reading in the digital era continued to increase.

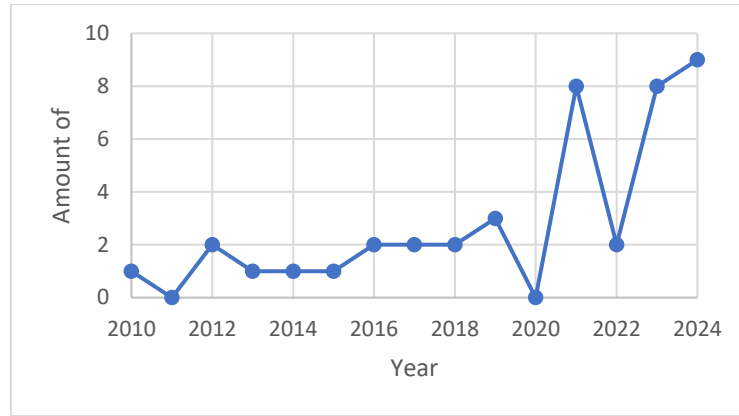


Figure 1. Graph of the progress of critical reading in digital era research

Interestingly, in 2021 the research on reading assessment experienced a significant increase, producing 8 articles. This is certainly inseparable from the influence of COVID-19 which requires learning to be carried out online, including critical reading learning. In 2020, publications related to critical reading in the digital era did not exist. A similar condition also occurred in 2011 which also did not produce a single publication. In 2022, there was a significant decrease in the number of publications from 2021, which only produced two journals. This is really different from the years that followed, where the number of publications increased significantly. However, since the beginning of research that discusses digital reading assessments until 2024, the quantity has continued to increase. This proves that, in the future, research related to critical reading involving digital elements will grow and become more numerous. Coupled with the inevitable flow of technology, this kind of research will be increasingly in demand.

Author Development Map (Co-Authorship)

The author's development map can be seen from 42 documents that have been collected and analyzed using the help of vos viewer software. Documents that have been obtained by researchers 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 viewers. Then the RIS document is opened in the vos viewer software and gets the results as in the table below.

Author	Documents	Total link strength
Kyung Sun Chung	1	6
Carla M. Firetto	1	6
Linda H. Mason	1	6
P. Karen Murphy	1	6
Liwei Wei	1	6
Ferry Darmawan	1	5
Septiawan Santana Kurnia	1	5
Ratri Rizki Kusumalestari	1	5
Maya Amalia Osman Palapaah	1	5
Atie Rachmiatie	1	5
Yenni Juniati	1	5

Based on the search results on Vos Viewer, the researcher found 92 authors spread across 42 publication documents related to critical reading in the digital era. The table above contains 11 authors who have the most documents and total link strength. It can be seen that the top three authors Kyung Sun Chung, Carla M. Firetto, and Linda H. Mason have 1 publication each related to critical reading in the digital age. For the mapping of 92 authors can be seen in Figure 2.

The image above maps 92 authors spread across 42 publications related to critical reading in the digital age. The total clusters found were 42 clusters that were different and unrelated to each other. Each cluster in the map above has 1-7 related authors. This means that interrelated authors have research publications connected to each other. The cluster with the most writers is the cluster with red has 7 authors. Then the cluster with the fewest authors is the cluster with gray color each having 1 writer.

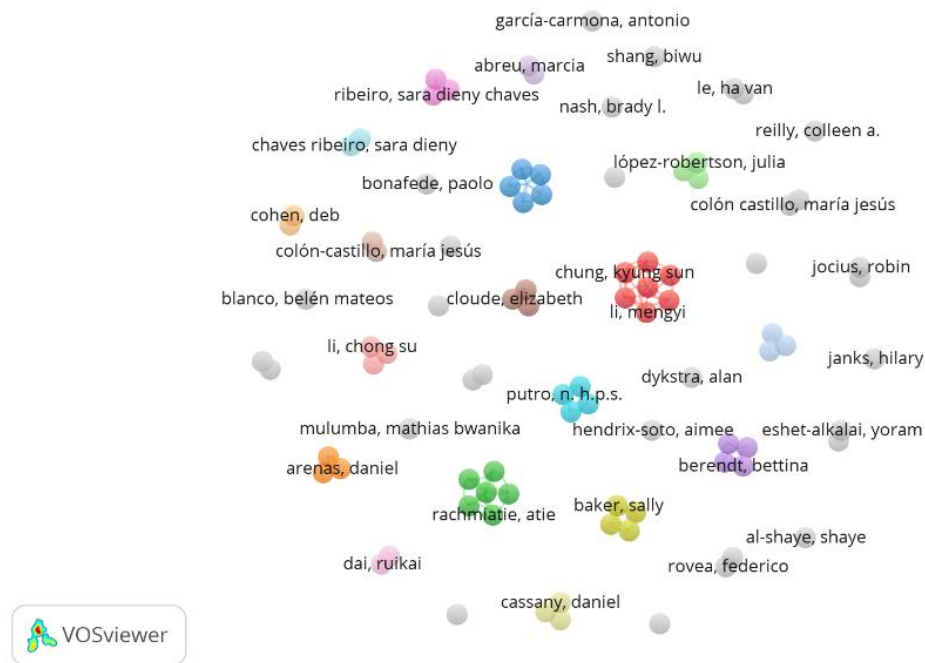


Figure 2. Network visualization on co-authorship

Keywords Map (Co-Occurrence)

The data is in the form of 42 publications that have been saved in the form of RIS, then opened through Vos Viewer to find out what keyword maps the authors use. Keyword mapping is very necessary to see the development of what research topics are developing related to critical reading in the digital era. In this mapping, it will also be known how many keywords the researcher uses. The linkages 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 the digital reading assessment research.

Table 2. Keywords (co-occurrence)

Term	Amount of Co-occurrence
Critical Reading	8
Digital/Media Literacies	7
Critical Thinking	6
2-Childhood	4
3-Early Adolescence	4
4-Adolescence	4
Literature	3
New Literacies	3
Critical Literacy (Theoretical Perspectives)	3
Instructional Strategies	3
Reading Strategies	3

The table above shows the distribution of keywords spread across 42 publications that have been found through vos viewer. From the search results, 229 keywords were found from all documents related to critical reading in the digital era. However, only 26 keywords are used by more than one publication. This means that the topics raised from the 42 articles studied are mostly unrelated to each other. Based on the table above, the most frequently used keyword throughout this article is "critical reading". This keyword is used by 8 different publications. Of course, this is commonplace, because indeed the topic of this research is related to critical reading. The next keywords are digital/media literacy, critical thinking, 2-childhood, 3-early adolescence, 4-adolescence, literature, new literacy, critical literacy, instructional strategies, and reading strategies are used more or equal to the three publications.

The keywords that have been found are then mapped through visualization in the form of network, overlay, and density using vos viewer software. This visualization aims to find out the nets that show the relationship between keywords. A bibliometric network in the form of a node or circle describes the keywords that appear. Meanwhile, networks in the form of edges or line nodes represent relationships or relationships between nodes or keywords. Through these two forms, it will be illustrated how the relationship between keywords and their influence on each other will be drawn. After entering the data into the vos viewer software, the following image below is the result of keyword mapping from 42 publications related to critical reading in the digital era.

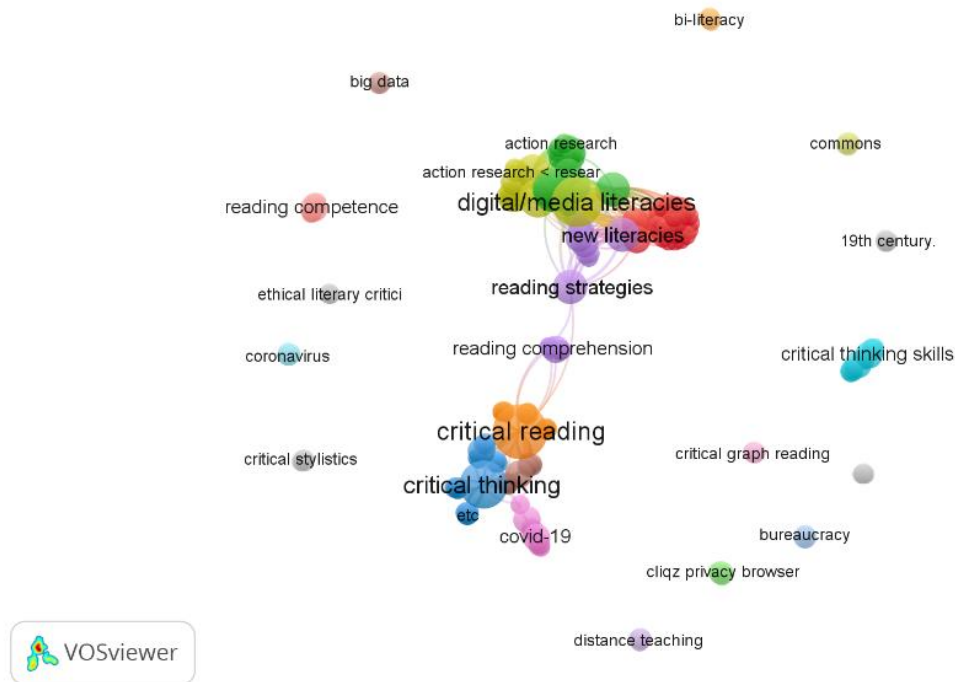


Figure 3. Network visualization on co-occurrence

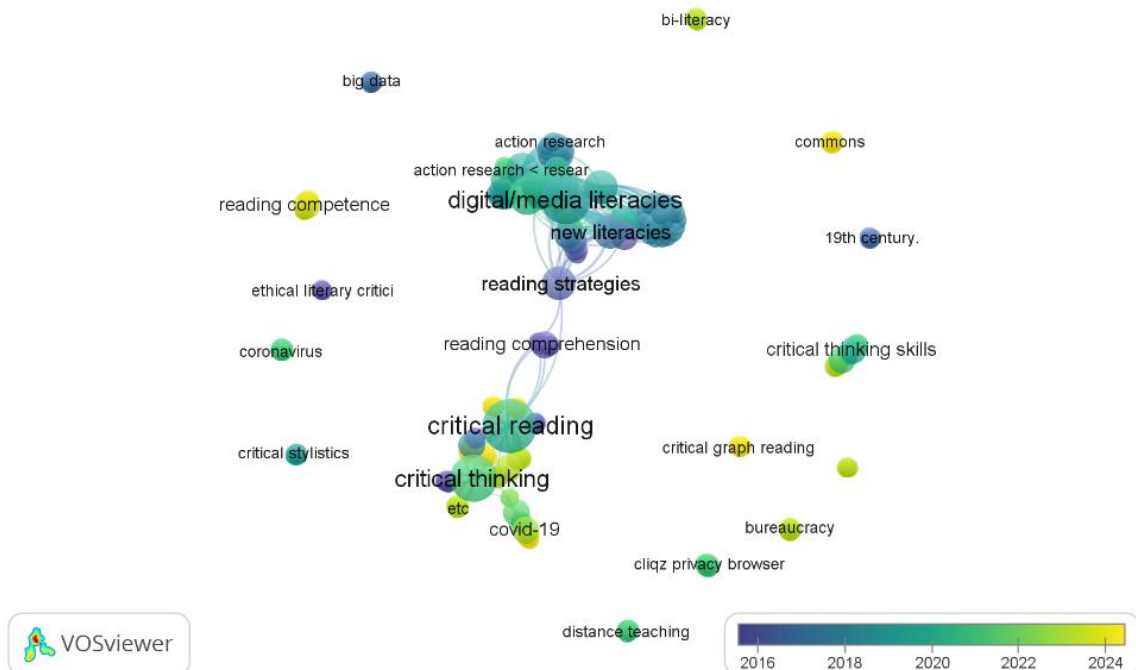


Figure 4. Visualization of overlay on co-occurrence

Figure 3 shows a mapping in the form of network visualization on co-co-occurrence which explains the relationship between keywords through nodes and edges with different colors. The search results show that there are 22 clusters and 1507 networks that connect between keywords. Some clusters do not show a correlation with

other clusters which indicates the absence of a net connecting between clusters. This means that there is still a lot of room for other researchers to connect between the clusters. Then several clusters are also interconnected in this mapping. The interconnected clusters in the mapping are 8 clusters consisting of cluster 1 which is red, cluster 2 which is green, cluster 4 which is dark yellow, cluster 5 which is dark purple, cluster 3 which is light blue, cluster 9 which is light purple, and cluster 8 which is brown and cluster 7 which is orange. Of course, the keywords critical reading and digital/media literacy play a role in connecting most of the clusters. This shows that the research that has been carried out is mostly related to critical reading and digital/media literacy.

Figure 4 is in the form of a keyword mapping based on the year of publication of the research starting from 2010 to 2024. The more purple the nodes in the image, the more the research was published before 2016. Likewise, the more yellow the nodes in the image, the research conducted will be 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 vos-viewers, there are several nodes that have purple color, namely ethical literacy, reading comprehension, reading strategies, new literacies, and others. It can be concluded that some of the keywords that have the purple color have been done or published before 2016. However, the blue and green nodes are also widely visible from the map above. For example, the blue nodes are children's research, critical pedagogy, decoding, expressive language, critical stylistic, digital/media literacies and others that have been eliminated since 2017-2021. Recently, the research that has been hotly discussed recently can be seen in nodes that are green to yellow. Interestingly, the node consists of several keywords, namely critical thinking, academic literacy, critical news literacy, critical graph reading, pragmatic networks, and others published above 2021.

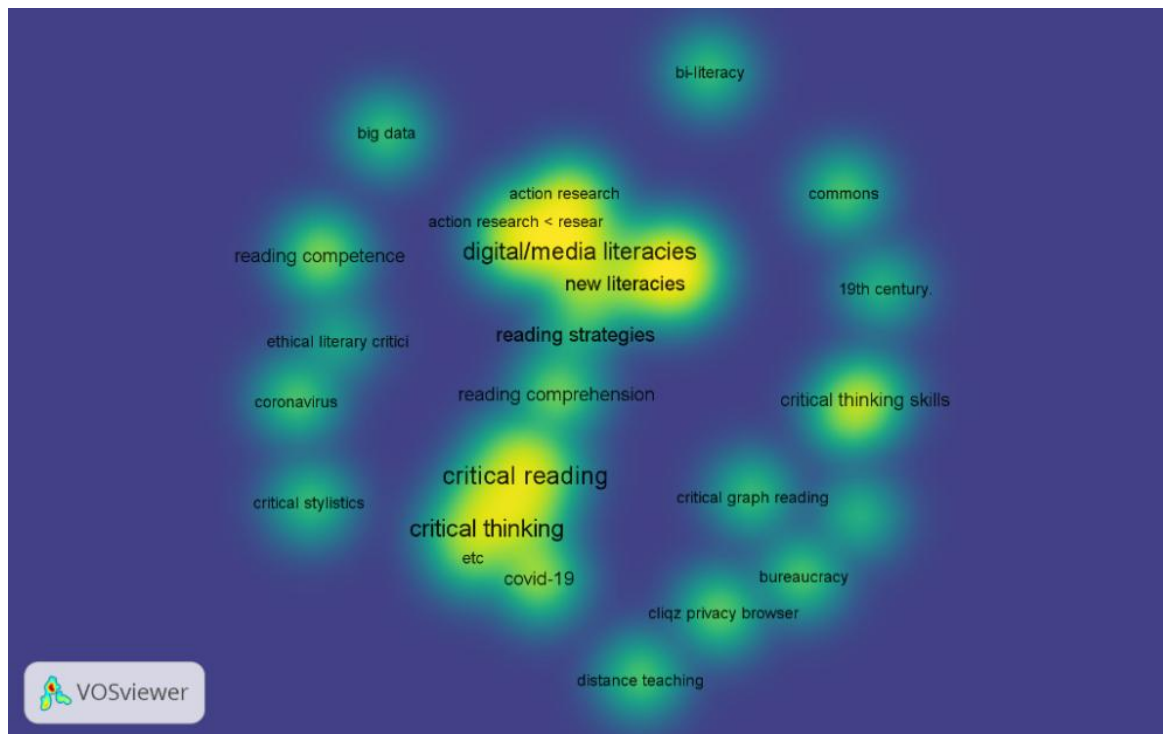


Figure 5. Density visualization on co-occurrence

The image above is a density visualization produced by vos viewer software based on 42 critical reading publications in the era. This mapping is useful to see how many researchers use a keyword. The more people use a keyword, the more yellow the visualization will be. But the fewer researchers use a keyword, the more the yellow color of the node decreases. For example, keywords that have been widely used are critical reading, critical thinking, digital/media literacy, and others. These keywords can be considered by researchers who want to research these topics because they have been discussed by more than one study. Then the keywords that are still rarely used by researchers are critical graph reading, reading strategies, reading comprehension, distance teaching, critical stylistics, and others. Keywords that are rarely used can be an opportunity for researchers to be present to fill spaces that are still rarely noticed. With the massive research on critical reading in the digital era in the future, problems in this field will be solved and answer future challenges.

Publication Rankings Based on Number of Citations

Publications with a large number of citations show the credibility of the research that has been conducted. Critical reading research in the digital era, which only amounts to 42 articles, makes publications in this field will always be used as a reference for other researchers. This is because there is little research that is used as a reference for researchers in conducting critical reading research using technology. Of the 42 publications that have been filtered by researchers through publish and perish software, here are the 10 publications that have the most citations.

Table 3. Publication ranking on co-citation

Ranking	Author/Year	Heading	Citations
1	(de los Ríos, 2018)	Toward a Corridista Consciousness: Learning From One Transnational Youth's Critical Reading, Writing, and Performance of Mexican Corridos	57
2	(Janks, 2019)	Critical Literacy and the Importance of Reading With and Against a Text	33
3	(Li et al., 2016)	Promoting reading comprehension and critical-analytic thinking: A comparison of three approaches with fourth and fifth graders	33
4	(Jocius & Shealy, 2018)	Critical Book Clubs: Reimagining Literature Reading and Response	22
5	(Given, 2013)	Adolescents' constructively responsive reading strategy use in a critical internet reading task	21
6	(Shang, 2014)	The rise of a critical theory: reading introduction to ethical literary criticism	16
7	(Van et al., 2022)	Critical reading in higher education: A systematic review	15
8	(García-Carmona, 2021)	Learning about the nature of science through the critical and reflective reading of news on the COVID-19 pandemic	15
9	(Al-Shaye, 2021)	Digital storytelling for improving critical reading skills, critical thinking skills, and self-regulated learning skills	13
10	(Gobbi & People, 2021)	Distance teaching and teaching "as" distance. a critical reading of online teaching instruments during and after the pandemic	13

Context in Indonesia

Studies that utilize digital technology to improve students' critical reading skills in Indonesia have begun to be carried out by several researchers in Indonesia. Based on the results of a search on *google scholar* through *publish or perish software*, researchers found 26 studies that utilize digital technology in critical reading. These related studies began in 2014 with only 1 study. In 2021, research linking critical reading with digital technology began to increase sharply, namely as many as 6 studies. Then in 2024, the number of research publications discussing this topic will reach an all-time high of 11 studies. Of course, the covid-19 factor plays an important role in forcing researchers to utilize technology in learning critical reading.

Digital technology used in critical reading research in Indonesia has begun to diversify. Some of the ones used are social media, artificial intelligence, online media and the creation of digital or electronic-based teaching materials. For example, research conducted by Himawan et al. (2023) which develops electronic-based critical and creative reading books. Of course, this is something positive, considering that students in Indonesia have coexisted with existing digital technology. The presence of these various studies will answer various problems for students when reading critically in today's digital era.

Conclusion

Based on the results of the research and discussion above, it can be concluded that research related to critical reading by utilizing digital technology is still small, namely 42 article publications. Through this bibliometric analysis, it is known that the highest publication occurred in 2024. This indicates that there will be more and more research related to critical reading by utilizing digital technology in the coming years. Then it was found that there were still many researchers who were not connected to each other. Opportunities to work together are still wide

open to produce innovative research by connecting various unrelated keywords. Research on critical reading in the digital era is expected to grow in line with the rapid development of technology that is no longer inevitable. This mapping will be an illustration for future researchers to be used as reference material when researching critical reading in the digital era.

Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in EPESS Journal belongs to the authors.

Conflict of Interest

* The authors declare that they have no conflicts of interest

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