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Unveiling the Digital Literacy Landscape: A Decade of Insights from a Scopus Bibliometric Analysis (2013-2023)

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Abstract

The aim of this research is to describe the direction map and development of digital literacy research in articles indexed by Scopus. This research examines all digital literacy publications indexed in the Scopus database between 2013 and 2023 using an analytical bibliometric approach. Utilizing R/R-Studio and Excel in processing data. Visual analysis of the occurrence of document quotes and keywords was carried out with VOSviewer. The specified function, subject, and criteria were met by 1,161 publications found. Based on the study's findings, the largest peak in digital literacy publications will occur in 2023, with a growth rate of 22% each year. The country that contributed the most publications was the United States. The University of Oslo is its largest affiliate. McGrew, S is the most productive writer on the theme of digital literacy. The bibliometric analysis carried out was limited to Scopus data. Other national and international databases were not taken into account in this study. This research presents a brief overview of the literature that can be accessed by researchers working in the field of educational innovation and technology and provides recommendations for future research.

Keywords: Digital Literacy, Bibliometrics, Educational Innovation, Educational Technology

Introduction

In recent years, developments in information and communication technology (ICT) have fundamentally changed the way humans interact with information (Suyatno et al., 2023; Abdurrahmansyah et al., 2011; Pradana, 2011; Hickey et al., 2018) and knowledge (Rizal et al., 2021; Brauner et al., 2022; Tsankov et al., 2019). This recent phenomenon has created an urgent need to understand and develop individual abilities in order to adapt to digital literacy (Susilawati, 2021; Erdat et al., 2023). Digital literacy encompasses a number of skills (Tiradi et al., 2023; Cheung et al., 2023), ranging from the ability to use hardware (Choi et al., 2022; Ko et al., 2019; Traxler, 2017) and digital software (Reichert et al., 2020; Losh, 2014; Thomas, 2014; Hilaby et al., 2023) to expertise in critically evaluating information in networks (McGrew et al., 2022; Breakstone et al., 2022; Tifferet, 2021).

From 2013 to 2023 the discussion about digital literacy becomes increasingly important and complex. Rapid changes in technology, the growth of the internet, and the integration of ICT in various aspects of daily life bring new challenges and opportunities in the development of digital literacy (Gumus et al., 2023; Pathiranage et al., 2023). Along with this, the emergence of research in the field of digital literacy has become increasingly significant (Wong et la., 2023; Stare et al., 2023; Polizzi, 2023).

Bibliometric research as a methodological approach that analyzes literature patterns and research developments can provide an in-depth understanding of the literature on digital literacy (Alagu et al., 2019; Kolle, 2017). This includes an understanding of research trends (Park et al., 2021), the main concepts that dominate (Ha et al., 2023; Perdana et al., 2020), and the development of collaboration between researchers (Simabur et al., 2023; Pan et al., 2022).

Over the last decade various initiatives and policies have been launched at various levels, from government level to educational institutions, to increase digital literacy among the population (Ofori et al., 2023; Gauvreau, 2023; Jones et al., 2022). Therefore, bibliometric research can provide a better view of the effectiveness of these efforts and evaluate the extent

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to which scientific research has contributed to the understanding and development of digital literacy (Paskevicius, 2023; Jiang, 2023; Aguaded et al., 2022).

This research seeks to present a comprehensive picture of the development of digital literacy research over the last 10 years, providing a basis for critical reflection (Kim et al., 2023;Anas et al., 2022; Buckingham, 2020; Polizzi, 2020, identification of knowledge gaps (Paskevicius, 2023; Heena et al., 2022; Darley et al., 2022) and future research directions (Shen et al., 2023; Bicen et al., 2022; Northmole et al., 2022; Lio, 2020) in the field of literacy digital. Thus, it is hoped that this bibliometric research can provide valuable insights for researchers, practitioners and policy makers. Moreover, parties who have an interest in developing digital literacy in this ever-changing era.

Bibliometric indicators are one of the instruments used to assess scientific research findings. In order to see the relationship between science and technology, map scientific disciplines, monitor the progress of new knowledge in certain fields, and serve as an indicator of the future when formulating strategic plans (Belmonte et al., 2020; Boquera et al., 2021; Zheng et al., 2019). Therefore, this research aims to map the development and direction of research on digital literacy in publications indexed by the Scopus database from 2013-2023.

Prior Research

A number of studies on digital literacy have a very important role in society. These studies have provided in-depth insight into the role and impact of digital literacy in various issues (Moynihan et al., 2023; Liu et al., 2023; Tinmaz et al., 2023). These studies also cover various aspects and contexts. Starting from the influence of digital literacy on education (Susilawati, 2021; Paskevicius, 2023; Ali et al., 2023; Lazou et al., 2023; Bilki et al., 2023; Aarsand et al., 2023; Lozano et al., 2023) to its relationship with safety in using social media (Ali et al., 2023; Smith et al., 2023; Arafah et al., 2023).

Nani Pratiwi and Nola Pritanova (2017) in their journal "The Influence of Digital Literacy Education on the Psychology of Children and Adolescents". This article highlights how children and teenagers are accustomed to insulting others and being jealous of others due to poor digital literacy. This results in depression, being carried away by negative comments and getting used to speaking in impolite language (Pritanova, 2017)

Ana Quthratun Nada and Deni Indrawan (2023) wrote a journal entitled "Analysis of Primary School Education Teachers' Digital Literacy Levels". The journal shows the importance of digital literacy among educators (Ana et al., 2023). This can be used as a basis for educating the younger generation about the use of technology.

Several studies also focus on the safety of using social media, such as a journal with the title "The Relationship Between Digital Literacy and the Use of Social Media for Students of the Islamic Religious Education Study Program at the Islamic Religious College (UISU) Pematang Siantar". This research was conducted by Isnaini Syahfira, Yusra Dewi Siregar and Franindya Purwaningtyas (2023). The results highlight the link between digital literacy and users' ability to protect themselves in a complex online world (Isnaini, 2023). Overall, these studies make important contributions to understanding and improving digital literacy in various levels of society.

As the use of science and technology in human life increases, research on digital literacy becomes very important. Concrete efforts are needed in developing digital literacy. So, through this article, it is hoped that it can make a contribution to future practitioners and researchers.

Method

Bibliometric analysis methods were used in this research. Data was obtained using a Boolean search engine to comb the Scopus database between 2013 and 2023. The search was carried out on December 12 2023 at 20.05 WIB. Researchers used R and Rstudio, VosViewer and Microsoft Excel tools to analyze citations, document content and networks. Researchers took three stages in processing the dataset.

In the first stage, researchers will conduct a literature review of related themes to ensure relevant research is carried out on bibliometric topics. Apart from that, a literature review is useful for determining appropriate keywords that are deemed to represent the scope of the research.

Second stage, at this stage the researcher used the boolean operator TITLE-ABS-KEY (digital AND literacy) to carry out a search on Scopus which produced 16,481 documents. Next, filtration is carried out with the Boolean operators PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Digital Literacy ")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (

LANGUAGE , "English")) to limit only the publication range for 2013-2023, Subject area only social science, article document type, the keywords are only digital literacy, the source documents are only journals and only articles in English, resulting in 1161 final documents.

The third stage, analysis was carried out on the final search documents using Scopus analyzer and R and R-studio to determine the number of documents per year, documents by journal, author, affiliation, country and subject/field. Next, analysis was carried out at the document network level with visualization via VOSviewer and Microsoft Excel data processing.

This research procedure can be seen in Figure 1 below:

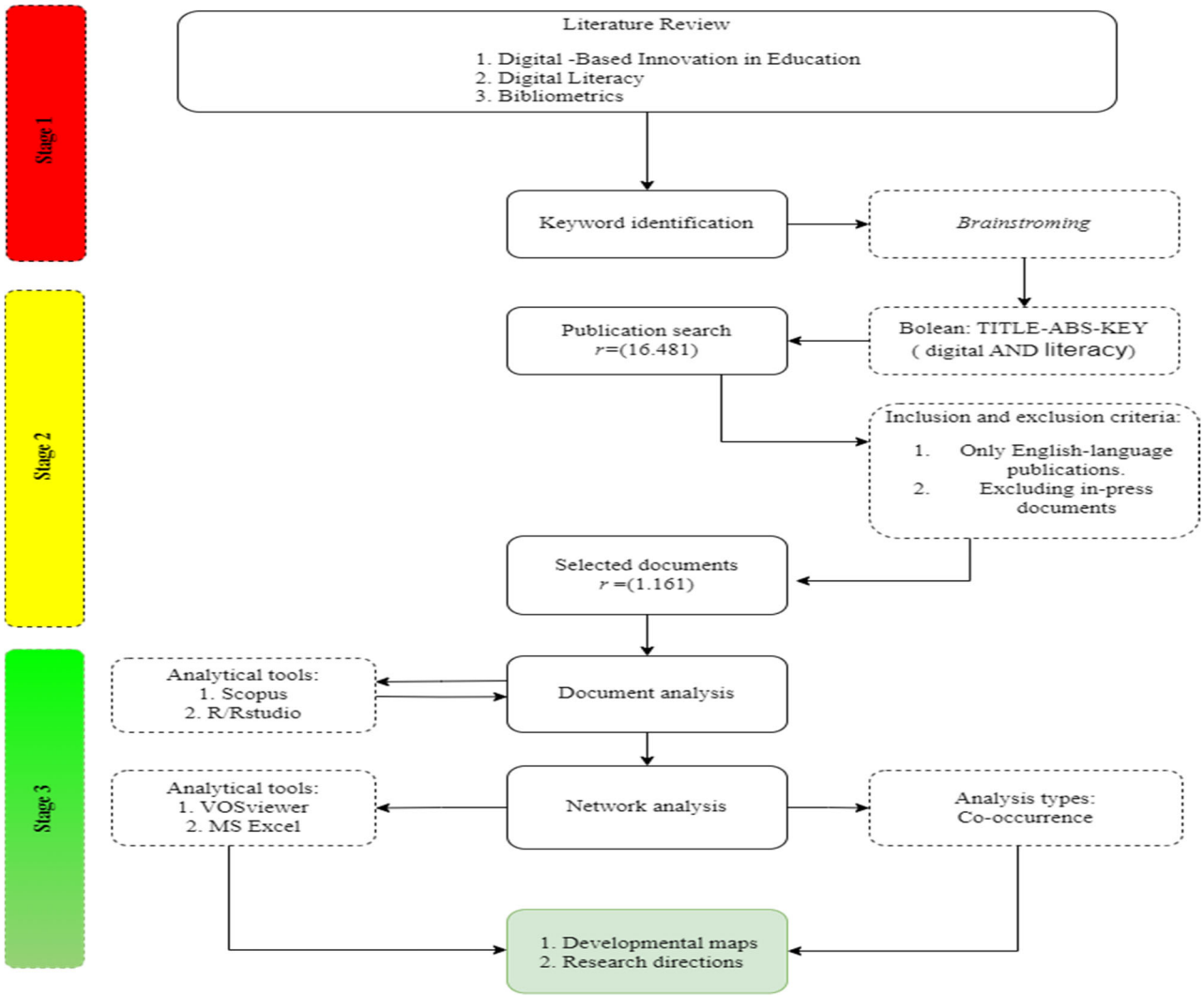

Figure 1. Research procedure

Results And Discussion

Document Analysis

Key Information about Data

Table 1 provides an overview of the 1161 documents collected over 10 years. Includes 2871 authors, 268 single authors, 14.3% international authorship collaboration, 49853 references with an average citation per document of 11.71 citations.

Table 1. Key information about data

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2013:2023
Sources (Journals, Books, etc)	542
Documents	1161
Annual Growth Rate %	22.14
Document Average Age	3.04
Average citations per doc	11.71
References	49853
DOCUMENT CONTENTS	
Keywords Plus (ID)	1211
Author's Keywords (DE)	3117
AUTHORS	
Authors	2871
Authors of single-authored docs	268
AUTHORS COLLABORATION	
Single-authored docs	292
Co-Authors per Doc	2.76
International co-authorships %	14.3
DOCUMENT TYPES	
Articles	1161

Documents by year

The graph for the last 10 years shows that digital literacy experienced a spike of 112 in 2009 after previously in 2016 to 2017 there was only an increase of 9 documents. From the following figure it can be observed that in the 2013-2023 period there was a peak in publications in 2023 with a total of 229 documents. The increase in publication numbers over the 10 years tends to experience a stable increase except in 2016 which experienced a decrease from the previous year's number of 48 documents to 47 documents, as in Figure 2 below:

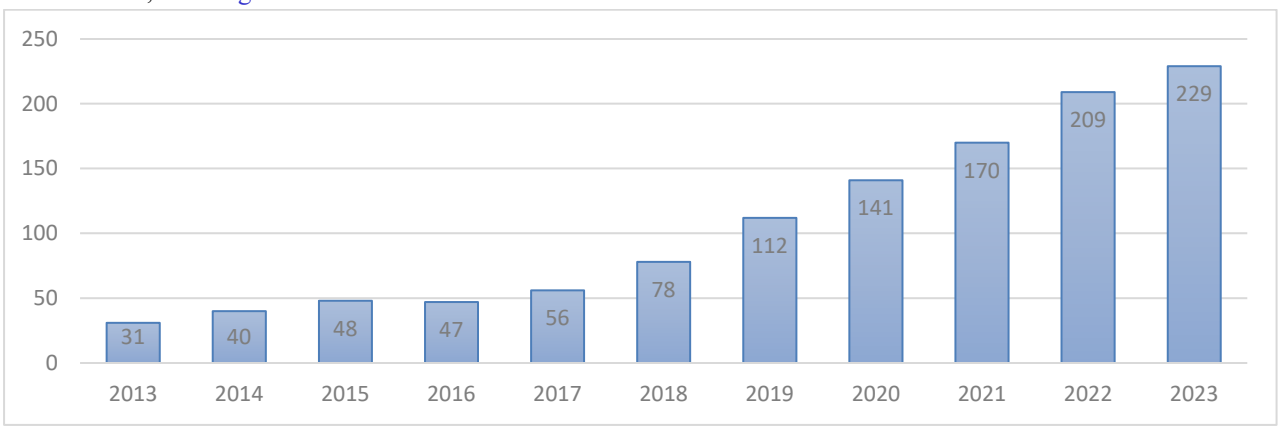

Figure 2. Documents by year

Most relevant authors

Figure 3 shows the ten most influential authors in publications about digital literacy. McGrew, S. leads with the number of publications of 9 documents, followed by Tomczyk, Ł. With a total of 8 documents published and followed by four people with the same number of publications of 6 documents, namely Chaudhary, K., Reddy, P., Sharma, B., Tirado-Morueta, R. Next followed by Aguaded-Gómez, JI, Breakstone, J ., Julien, H. and Kiili, C., all four of whom published 5 documents each.

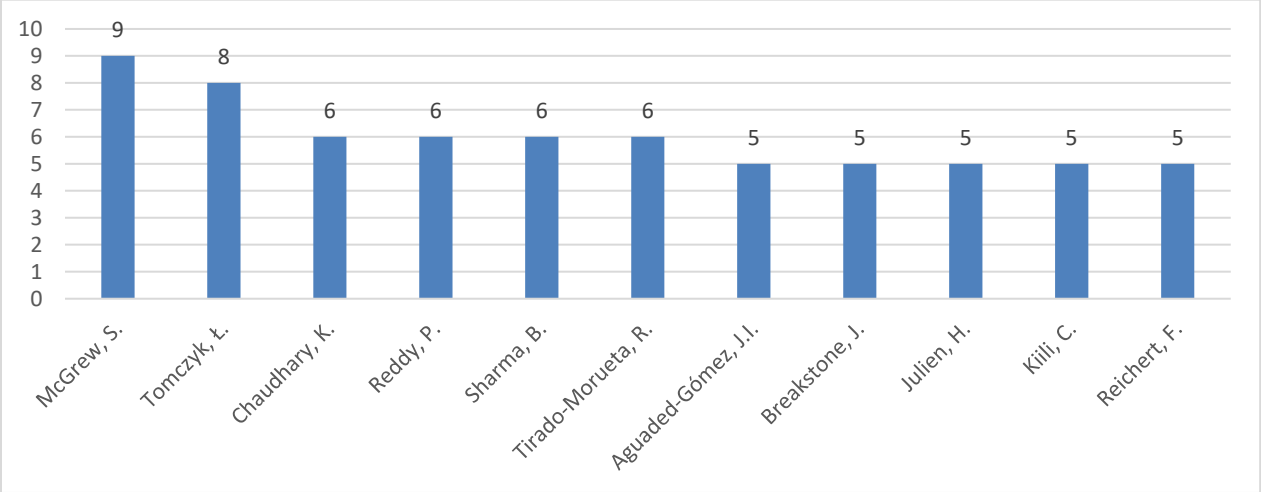

Figure 3. Documents Based on Author

Documents by affiliation

Figure 4 shows the 10 most influential affiliates in publications about digital literacy during 2013-2023. It is known from Figure 3 that Universitetet i Oslo is the affiliate that published the most articles with 16 documents. Followed by 3 institutions with the same number of publications of 11 documents, namely Universidad de Huelva, University of Maryland and Indonesian Education University. Universidad Complutense de Madrid follows with the number of publications of 9 documents, Uniwersytet Pedagogiczny with the number of published articles of 9 documents and next followed by 3 institutions with the number of publications of 8 documents each, namely The University of Hong Kong, Universidad de Oviedo, Stanford University and the University Yogyakarta State.

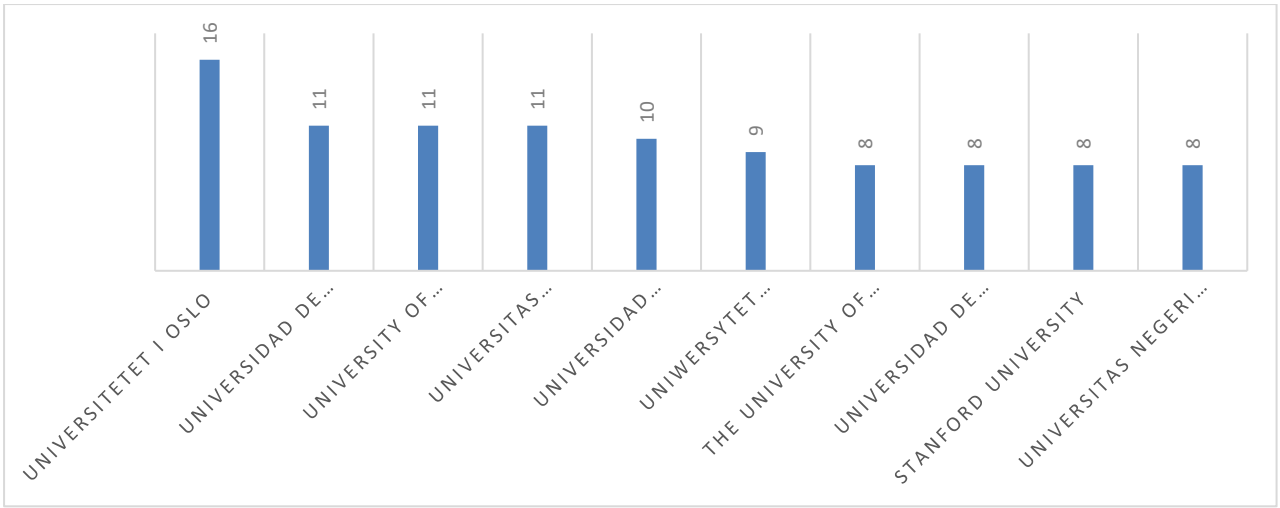

Figure 4. Documents by affiliation

Documents by country

Figure 5 shows publications by country with the theme digital literacy. The United States leads with the number of published articles of 258. Next is followed by the United Kingdom with the number of publications of 97 documents and Spain with 94 documents. Indonesia followed with a total of 91 publications. Next was Australia with a total of 82 publications. Followed by 5 countries with a number of publications under 50 documents each, namely Turkey with 48 documents, Canada with 41 documents, India with 41 documents, China with 30 documents and Germany with published articles totaling 30 documents. Thus, the American continent is the continent with the largest number of published articles about digital literacy. Followed by the continents of Europe, Asia and Australia.

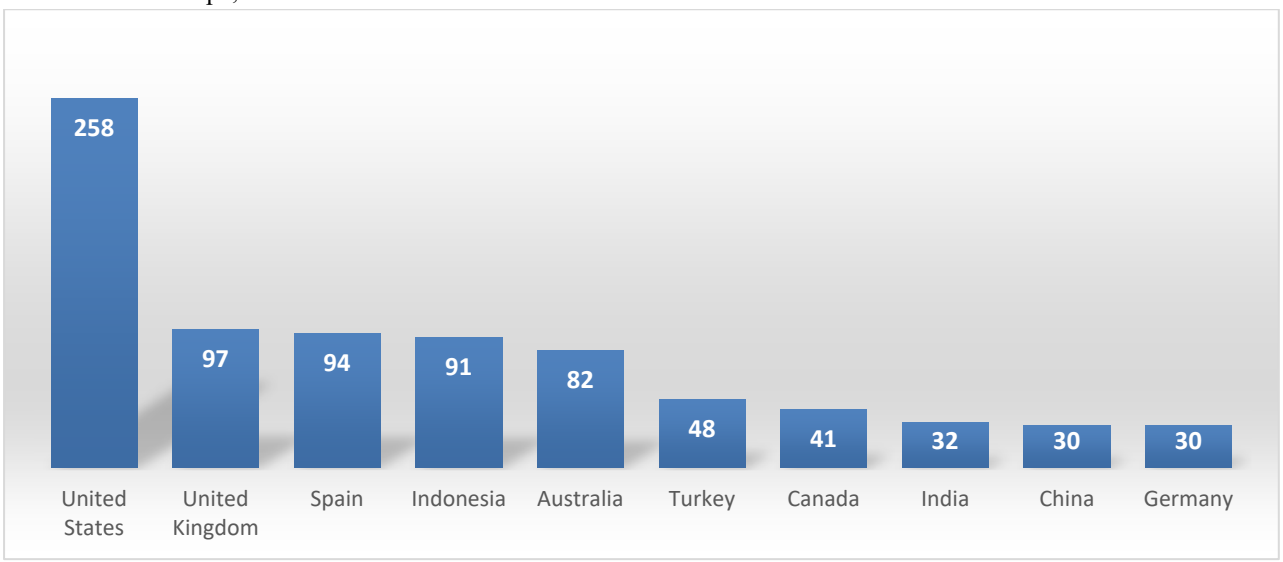

Figure 5. Documents by country

Three-Field Plot

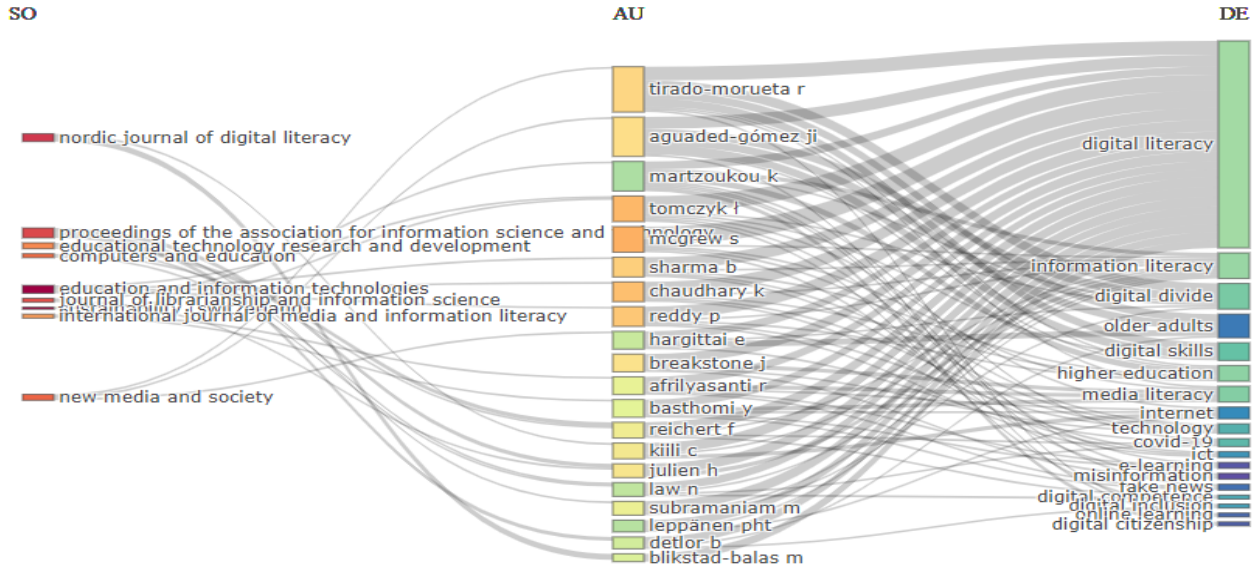

Figure 6. Three Field Plots

Figure 6 includes the name of the journal publication, author's name and theme/topic used. The three elements are then connected by gray plot lines that relate to each other. Based on the name of the journal, each journal shows which authors most

frequently contribute to its publications, especially those that raise the theme of digital literacy.

The size of the plot indicates how many publications relate to that theme. Based on the picture above, there are 9 journals. The journal that publishes the most research on the theme of digital literacy is Education and Information Technologies which is shown in dark red and is linked to several authors such as Tomczyk L, Sharma B, Chaudary K and Reddy P.

There are 20 authors based on the image above. The size of the bar chart shows how many research publications each author has published. Among the 20 authors who wrote the most articles on the theme of digital literacy were Martzouku K, Tirado Morueta R, Tomczyk L and Aguaded Gomez Ji.

In the third element, each research topic is connected to an author who has written extensively on the topic of digital literacy. From the results of the analysis, there are 105 digital literacy keywords in the top position. This shows that the word is very closely related to research related to digital literacy.

Corresponding Author's Countries

The authors with the largest digital literacy theme came from the USA who collaborated with authors from other countries (Multiple Country Publication) totaling 14 authors, while individual authors (Single Country Publication) from the USA were also the largest with 158 authors. Next followed by the United Kingdom with 12 authors collaborating with other countries and 58 individual authors. In next place is Indonesia, with 6 writers collaborating with writers from other countries and 61 individual writers. The continent with the largest number of writers on the theme of digital literacy is America. Followed by Europe, Asia and Australia.

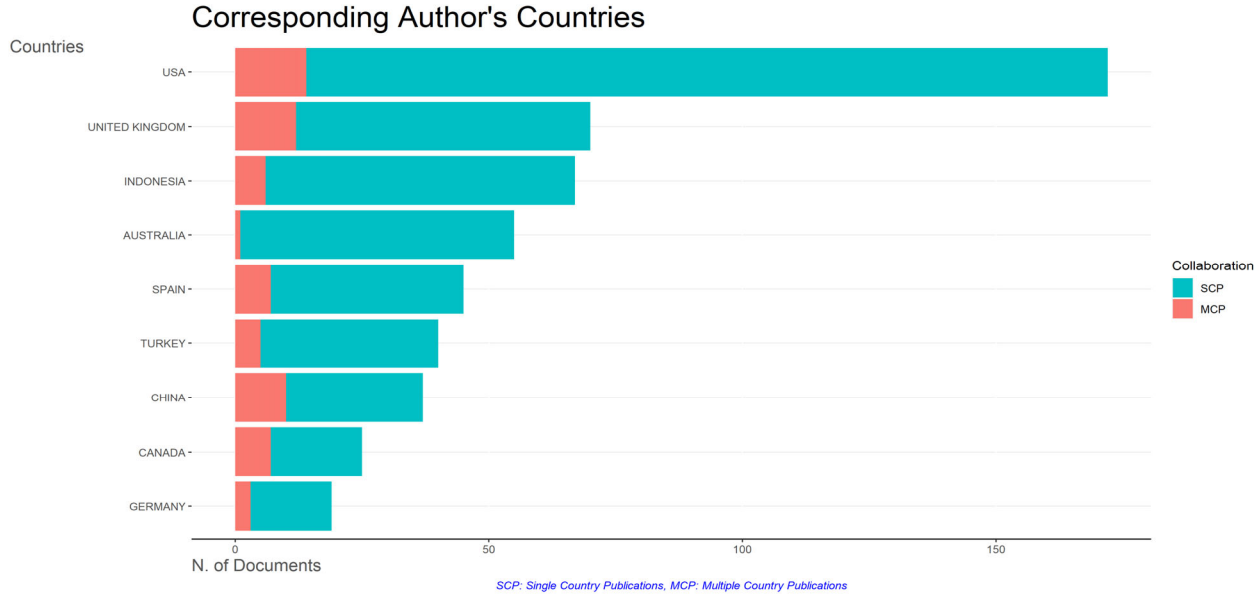

Figure 7. Collaborative and Individual Writers

Most Global Cited Document

Voogt J, 2013 is the document with the largest total citations of 282 citations. The document with the next largest citations is Jones-Jang Sm, 2021 with 239 citations and Falloon G, 2020 with 237 citations. The document with the largest number of citations per year is Jones-Jang Sm, 2021, which has 79.67 citations/year. Followed by Falloon G, 2020, Mcgrew S, 2018 and Pettersson F, 2018.

Based on the data in Table 2, it can be understood that a large number of total citations (TC) does not always have an effect on the total citations per year (TC per Year). Voogt J, 2013 as the largest TC with 282 citations, it turns out the total citations are relatively small, only 25.64. The largest TC per year is Jones-Jang Sm, 2021, whose number of citations is below Voogt J, 2013.

The year the document was published does not always affect the number of citations. In 2013 the number of Voogt J

citations was indeed the largest with 282 citations, but in the following years it was dynamic and showed an up-and-down graph. Greene Ja, 2014 and Schreurs K, 2017 the number of citations is low. Pettersson F, 2018, Hargittai E, 2017, Falloon G, 2020 and Jones-Jang Sm, 2021 continue to increase. So a conclusion can be drawn that documents that are published first do not necessarily receive greater citations.

Table 2. Most global cited document

Paper	Total Citations	TC per Year
Voogt J, 2013, J Comput Assisted Learning	282	25.64
Jones-Jang Sm, 2021, Am Behav Sci	239	79.67
Mcgrew S, 2018, Theory Res Soc Educ	237	39.50
Falloon G, 2020, Educ Technol Res Dev	232	58.00
Mohammadyari S, 2015, Comput Educ	222	24.67
Meyers Em, 2013, Learn Media Technol	202	18.36
Pettersson F, 2018, Educ Inf Technol	186	31.00
Hargittai E, 2017, Can J Educ Commun	169	24.14
Greene Ja, 2014, Comput Educ	159	15.90
Schreurs K, 2017, Can J Educ Commun	153	21.86

Most Locally Cited Documents

Table 3. Most Locally Cited Documents

Documents	Local Citations	Global Citations	LC/GC Ratio (%)
Meyers Em, 2013, Learn Media Technol	24	202	11.88
Greene Ja, 2014, Comput Educ	22	159	13.84
Mohammadyari S, 2015, Comput Educ	20	222	9.01
Shopova T, 2014, J Effic Responsib Edu Sci	19	85	22.35
List A, 2019, Comput Educ	18	73	24.66
Falloon G, 2020, Educ Technol Res Dev	15	232	6.47
Mcgrew S, 2018, Theory Res Soc Educ	15	237	6.33
Tang Cm, 2016, Electron J E-Learning	14	105	13.33
Lankshear C, 2015, Nord J Digit Lit	12	50	24.00
Hargittai E, 2017, Can J Educ Commun	11	169	6.51

The number of 24 local citations for Meyers Em, 2013 makes it the document with the largest local citations. Next is Greene Ja, 2014 with 22 local citations, Mohammadyari S, 2015 with 20 local citations and followed by Shopova T, 2014 with 19 local citations.

Based on the data in Table 3, local citations have no effect on global citations. For example, with at least 11 local citations, Hargittai E, 2017 was able to get 169 global citations. A total of 18 local citations belonging to List A, in 2019 only received 73 global citations. So it can be concluded that a small number of local citations does not guarantee that the global citations are also small. Likewise, if the local citation is high, it is not a guarantee that the local citation will be large.

Thematic MAP

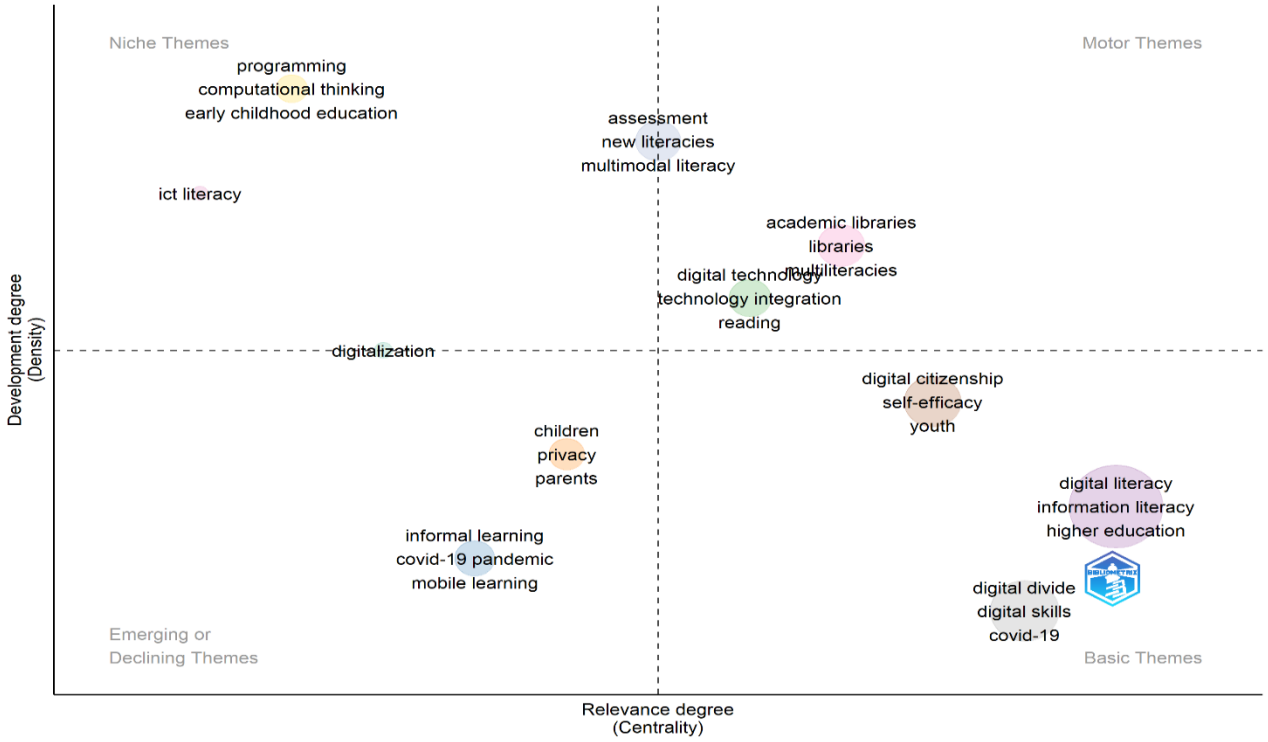

Figure 8. Thematic Map

The image above explains the theme mapping which consists of Basic Themes, Motor Themes, Basic Themes, Niche Themes, Emerging or Declining Themes. Basic Themes consists of themes that are the basis or central ideas of previous research or publications. In the data provided, the "Digital Literacy" cluster is an example of a basic theme. The main theme that often appears in the articles or research studied is digital literacy. Researchers pay close attention and often focus their studies on basic topics.

Motor Themes is a category that includes themes that are the driving force behind research development. The "Academic Libraries" cluster is an example of a motor theme in this data. The issue of academic libraries is one of the issues that is actively studied and has an impact on future trends and directions in digital literacy research. Over time, motor themes often shape the direction of research and publications. Compared to basic and motor themes, niche themes are less general and more specialized. An example of a niche theme in this data is the “Programming” cluster. Programming themes fall into the niche theme category. Because programming themes may have less research or may only be of interest to a certain research community, they fall into the niche theme category.

Emerging or Declining Themes includes themes that are emerging or declining in popularity in research or publications. In this data, the "Informal Learning" theme can be categorized as an emerging theme because the number of incidents and its relevance in research is still significant, but the number is not as large as the "Digital Literacy" or "Academic Libraries" themes. On the other hand, there are several themes with a lower number of occurrences, such as "Children" and "Programming", which can be categorized as declining themes because the number of research or publications related to these themes tends to decrease.

We can understand the distribution and pattern of themes in currently available study or publication data by carrying out analysis based on this classification. This classification helps identify prominent themes that dominate a particular field of study, as well as new themes and subjects that require further focus and investigation.

Network Analysis

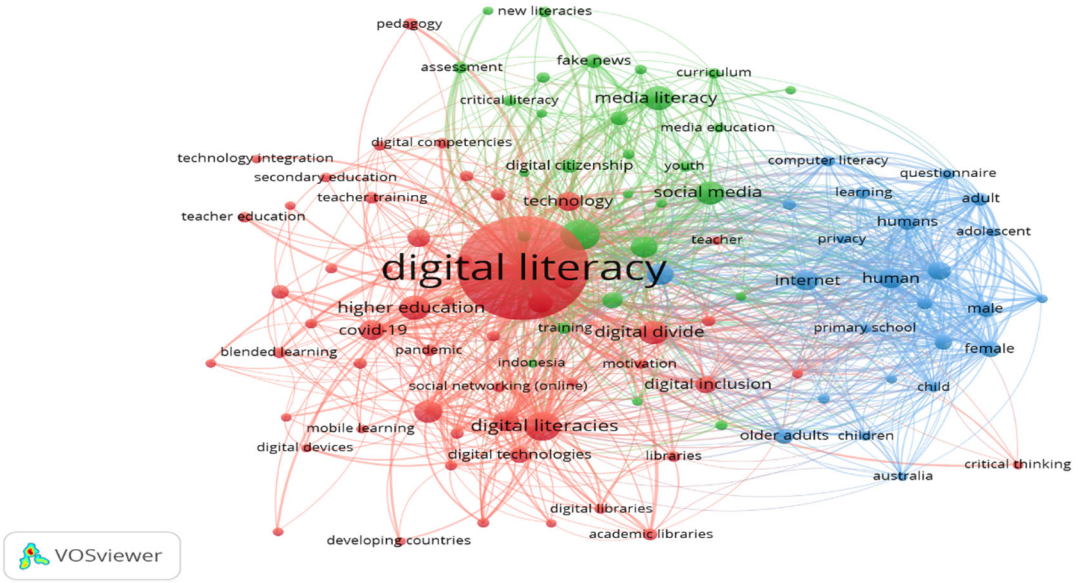

Figure 9. Network analysis Network

The image above is an occurrence analysis from research on digital literacy with a minimum cluster size of 40. There are 3 clusters formed. The first cluster contains 104 items, the second cluster contains 51 items and the third cluster contains 49 items. The keyword "digital literacy" is the dominant keyword with an occurrence of 1161.

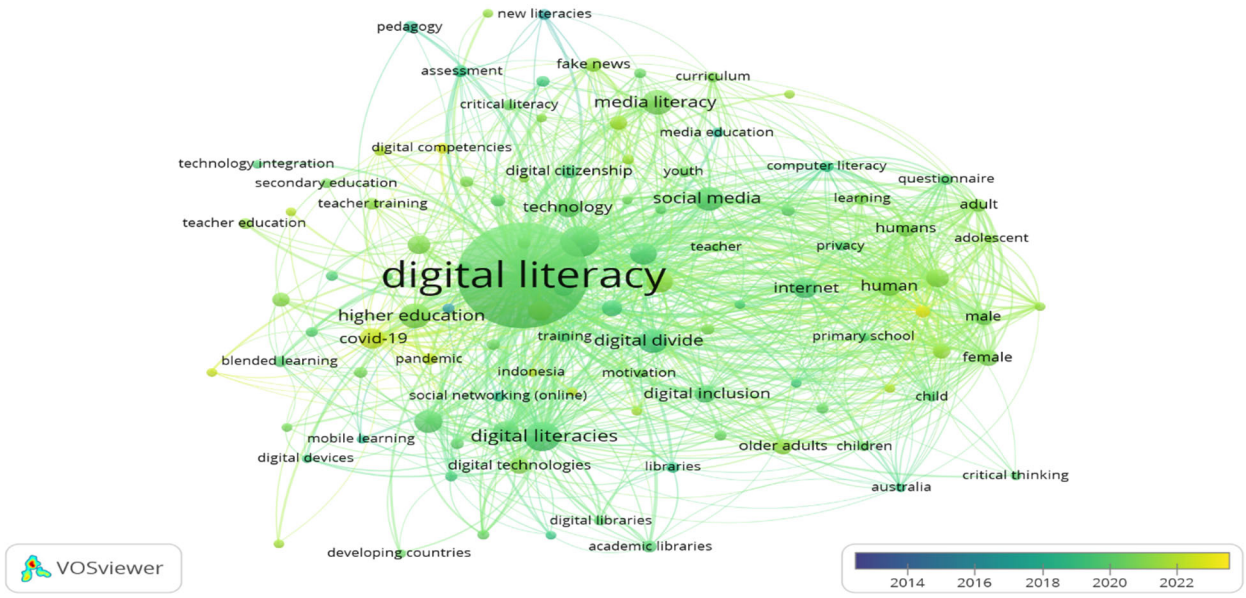

Figure 10. Overlay Network Analysis

The image above shows keyword network analysis based on overlay. It can be seen that the keywords covid-19, digital competencies, internet literacy are keywords that have been used in 2022. Meanwhile, the keywords new literacy, informal learning and multimodal literacy are keywords that have been used for a relatively long time since 2012.

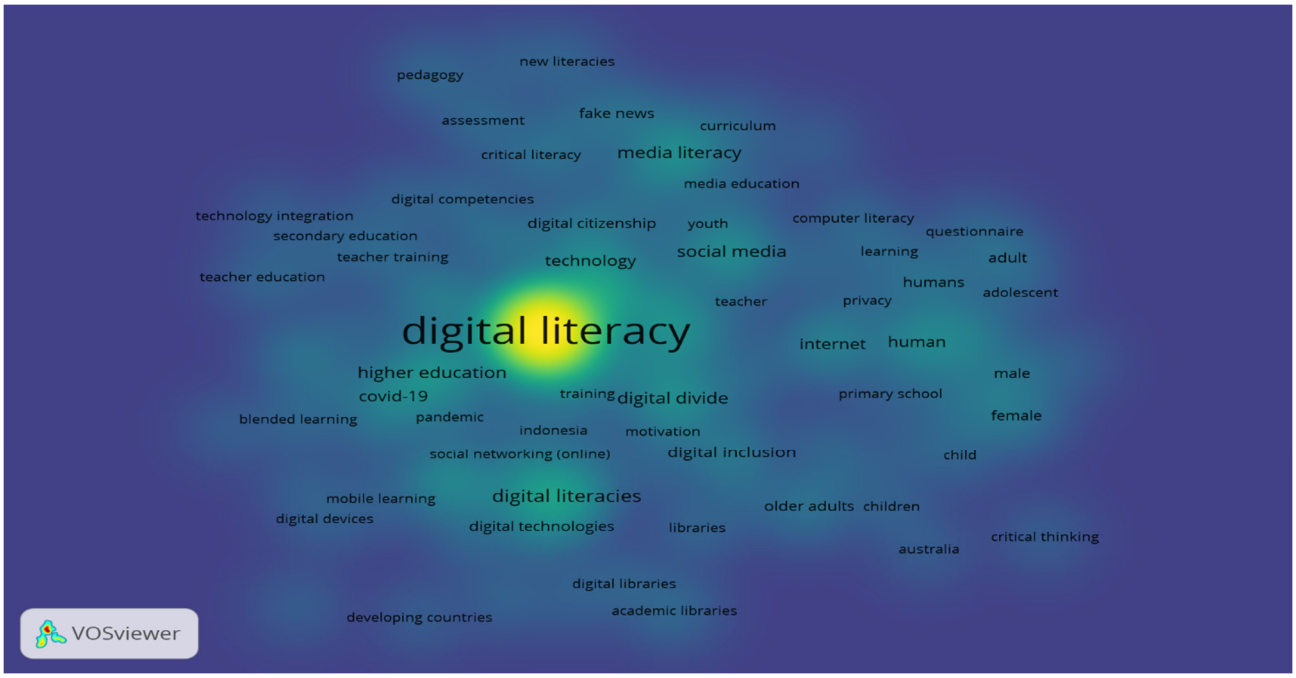

Figure 11. Density Visualization

Keywords that have a high density indicate that they have been widely researched and keywords that still have blurry images indicate that they have rarely been researched (Petkovski et al., 2023; Blake et al., 2022; Guo et al., 2023; Ouyang et al., 2022). The keyword that has high density is digital literacy. These keywords have been widely studied by researchers. Key words that are still rarely researched include; digital libraries, digital devices, digital competencies, blended learning and computer literacy.

Table 4. Cluster Categorization

keywords	Occurrences	Clusters
1. Digital Literacy	1161	1. Digital Technologies
2. Digital Divide	62	
3. E-Learning	54	
4. Technology	40	
5. Digital Competence	36	
2. Information Literacy	101	2. Education and Media Literacy
3. Media Literacy	64	
4. Social Media	59	
5. Education	48	
6. Teaching	29	
1. Literacy	51	3. Internet Literacy
2. Human	46	
3. Internet	45	
4. Articles	38	
5. Internet Literacy	15	

The table above shows the occurrence of each cluster which represents the main theme in research in the field of digital literacy. The theme in the first cluster is "Digital Technologies", the theme in the second cluster is "Education and Media Literacy". The theme in the third cluster is "Internet Literacy".

Conclusion

The number of publications centered on digital literacy peaked in 2023 during the 2013–2023 period. McGrew, S is the author with the most publications, numbering nine. Universitet i Oslo has 16 publications, making it the affiliate with the most publications overall. The United States leads in publications on digital literacy with 258 documents. The United States has the largest MCP. Voogt J, J Comput Assisted with 282 citations in 2013, Learn is the document with the most citations. "Digital literacy" is the dominant keyword with a total link strength of 2653. The keywords covid-19, digital competencies, internet literacy are keywords that will be used in 2022. Keywords that are still rarely researched include; digital libraries, digital devices, digital competencies, blended learning and computer literacy.

This research has several limitations. Among them are only exploring publications indexed by Scopus. Other global indexations were not involved in this study. The types of articles are also limited to English language journals. Hopefully it will contribute to future research.

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