

# Rewiring Learning: 25 Years of Digital Literacy Research in South Africa Higher Education

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## EDITORIAL DATES

Received: 20 November 2025

Revised: 25 January 2026

Accepted: 26 January 2026

Published: 12 February 2026

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DOI: [10.38140/ijer-2026.vol8.1.04](https://doi.org/10.38140/ijer-2026.vol8.1.04)

**Abstract:** Digital literacy has become increasingly vital in higher education. The integration of digital literacy into educational environments signifies a fundamental shift towards a more technologically driven approach to teaching and learning. This paper presents a bibliometric review of digital literacy research within the context of South African higher education from 2001 to 2025. A bibliometric analysis was conducted using the Scopus database. The search string utilised was: "digital literac\*" OR "digital technolog\*" OR "digital competenc\*" OR "digital skill\*" AND "higher education" OR universit\* OR college\*, resulting in an initial total of 10,786 documents. Following a multi-stage screening process, 150 documents were identified as final. The dataset indicates a dynamic and rapidly evolving field of study, characterised by a consistent increase in publications over the past 25 years, with a notable acceleration in output since 2017. In light of these shifting themes, higher education institutions should position themselves as agile, digitally empowered, and contextually relevant entities. Institutions ought to leverage advanced digital technologies, regularly update qualifications to align with emerging workforce demands, and reimagine their roles as innovation hubs capable

of addressing complex societal challenges. By embracing digital transformation and facilitating cross-sectoral research, higher education institutions can remain relevant, inclusive, and prepared for the future.

**Keywords:** Bibliometric analysis, digital literacy research, higher education, South Africa.

## 1. Introduction

Digital literacy has emerged as a critical competency in contemporary society, particularly within higher education, where institutions are expected to produce graduates who are not only informed citizens but also equipped to meet the demands of a technology-driven workplace (Strydom, Wessels, & Anley, 2021). This expectation has prompted a re-evaluation of curricula and learning opportunities to ensure that students acquire robust digital competencies. Higher education institutions (HEIs) are tasked with enabling students to engage critically with digital information, assess its credibility, and apply it effectively in academic and professional contexts (Doiraghusoha, 2022).

Digital literacy encompasses a broad spectrum of skills, including the ability to utilise digital devices, access and evaluate information, synthesise data, and create digital content (Kaeophanuek, Na-Songkhla, & Nilsook, 2019). It also involves effective communication in digital environments and an understanding of the ethical, social, and cultural implications of technology use (Ángel et al., 2022). Beyond technical proficiency, digital literacy requires critical thinking, problem-solving, and reflective practice (Ikaningrum & Sarwanti, 2021; Koh et al., 2022).

In the South African higher education context, digital literacy has taken on particular significance due to persistent inequalities in access to technology, uneven institutional resourcing, and historically rooted disparities within the post-apartheid education system (Czerniewicz, 2016; DHET, 2013). South African scholars have emphasised that digital literacy cannot be understood merely as

### How to cite this article:

Maka, L. (2026). Rewiring learning: 25 years of digital literacy research in South Africa higher education. *Interdisciplinary Journal of Education Research*, 8(1), a04. <https://doi.org/10.38140/ijer-2026.vol8.1.04>

a technical skill set but must be situated within broader socio-economic, cultural, and institutional contexts (Manzi & Modise, 2025; Samuels & Singh, 2025). Research conducted in South African universities has highlighted the interrelationships between digital literacy, academic literacies, information literacy, curriculum transformation, and student success, particularly in an era characterised by rapid digitalisation and the expansion of blended and online learning modalities. The COVID-19 pandemic further intensified scholarly engagement with digital literacy in the region, exposing both systemic vulnerabilities and adaptive innovations within higher education institutions (Czerniewicz et al., 2020; Motala & Menon, 2020; Dube, 2020).

Despite this growing body of empirical work, research on digital literacy in South African higher education remains widely dispersed across disciplines, institutional settings, and conceptual frameworks. While valuable, such studies provide limited insight into the structure and dynamics of the research field itself (Zawacki-Richter & Naidu, 2016). There is currently a dearth of comprehensive syntheses that systematically map how digital literacy research in South African higher education has evolved across publication growth, citation influence, collaborative networks, and thematic development (Zawacki-Richter & Naidu, 2016; Donthu et al., 2021). This absence of a field-level overview constrains scholars' ability to assess research impact, identify influential contributors, and recognise underexplored or emerging areas of inquiry (Donthu et al., 2021).

While global research on digital literacy is extensive, studies focusing on higher education in South Africa remain fragmented. This paper addresses this gap through a bibliometric review of 25 years of digital literacy research in South African HEIs, offering a systematic analysis of publication trends, thematic evolution, and collaborative networks. By mapping the research landscape, this study contributes to the discipline by identifying key developments, research gaps, and future directions for scholarly policy and institutional practice.

## **1.1 Problem statement**

Despite the increasing volume of research on digital literacy within South African higher education, the structure and development of this body of scholarship remain insufficiently understood. Existing studies are widely dispersed across disciplines, institutions, and time periods, resulting in a fragmented research landscape that limits cumulative knowledge building. While numerous empirical studies have examined digital literacy competencies, pedagogical approaches, and institutional practices, there has been no systematic synthesis that quantitatively assesses how digital literacy research in South African higher education has evolved in terms of publication growth, citation impact, collaborative authorship networks, and thematic focus.

The absence of a consolidated bibliometric overview constrains scholars' ability to evaluate research influence, identify leading contributors and institutions, and comprehend the intellectual structure underpinning the field. Furthermore, without longitudinal evidence on thematic evolution, it remains challenging to ascertain how research priorities have shifted over time or which areas remain under-explored. Addressing these gaps is essential for advancing theoretical coherence, informing future research agendas, and enhancing the strategic development of digital literacy scholarship in South African higher education. Hence, this study aims to:

- Analyse publication trends in digital literacy research within South African higher education from 2001 to 2025.
- Identify influential authors, institutions, and themes shaping the discourse.
- Examine thematic evolution to understand how research priorities have shifted over time.
- Highlight gaps and propose recommendations for strengthening digital literacy integration in HEIs.

## **2. Literature Review**

This section reviews the literature pertinent to the conceptual and methodological foundations of the study. It begins by examining bibliometric analysis as a research approach for analysing publication patterns, citation impact, and the intellectual structure of scholarly fields. Subsequently, it reviews the literature on digital literacy within educational contexts, with particular focus on higher education, to elucidate how the concept has been defined, operationalised, and explored across various disciplines. Collectively, these strands of literature provide the analytical framework for mapping digital literacy research in South African higher education.

### **2.1 Bibliometric analysis**

A bibliometric analysis is a quantitative research method employed to systematically investigate and assess the body of published scholarly work in a specific field of study (Galán, 2018). This analysis offers a comprehensive overview of the research landscape, identifying key trends, influential publications, and research gaps (Tinmaz et al., 2022). It employs statistical and mathematical techniques to examine publication patterns, citations, authorship, and keywords, providing insights into the field's evolution, impact, and structure (Sáez et al., 2020). By analysing publication trends, citation patterns, and keyword networks, bibliometric studies can identify emerging research areas, influential authors, and seminal works that have shaped the field (Audrin & Audrin, 2022).

Bibliometric studies assess the impact of research, identify emerging trends, and map the knowledge structure within a specific domain. These methods have been employed to investigate research on digital literacy across various fields of study, highlighting its broad-ranging relevance and impact. The technique helps identify the field's most influential publications, authors, and institutions, providing a comprehensive overview of the research landscape. By analysing keyword frequency and co-occurrence, bibliometric analysis can reveal the underlying themes and concepts that drive research in digital literacy, offering valuable insights for researchers and practitioners.

Bibliometric analysis facilitates the identification of seminal works and influential authors, enabling researchers to build upon established knowledge and contribute to ongoing scholarly conversations. The impact of articles in their fields of study has been assessed through several studies (Xie et al., 2020). Bibliometric analysis is a statistical evaluation that quantifies the impact of scientific articles (Albrahim et al., 2022). It involves analysing scientific literature quantitatively to reveal patterns, trends, and relationships within a specific field (Tian & Chen, 2022). These methods include examining metrics such as publication counts, citation frequencies, and co-authorship networks to uncover patterns and trends in scientific output (Zhou et al., 2022; Kumar et al., 2023; Passas, 2024).

The method employs quantitative approaches rooted in mathematics, statistics, and computer science to extract meaningful insights from large datasets, revealing hidden patterns and relationships (Sun et al., 2022). Citation, co-authorship, and keyword analysis are utilised in bibliometrics to examine the impact of scientific publications. Bibliometric analysis has evolved as a powerful tool for mapping scientific progress, identifying research hotspots, and informing strategic decision-making in various fields, including digital literacy (Herrera-Franco et al., 2021; Mejía et al., 2021; Ho & Luong, 2022). By understanding past research trends and the most influential publications, researchers can build upon existing knowledge and guide the field's progress (Xu et al., 2024). Bibliometric methods offer valuable insights into the dynamics of research fields, enabling researchers to identify emerging trends, assess publication impact, and understand the structure of knowledge (Ding et al., 2022).

### **2.2 Digital literacy in education**

Integrating digital literacy into educational settings signifies a fundamental shift towards a more technologically driven approach to teaching and learning, promoting active learning by engaging

students through technology. Teachers must possess digital literacy to access and understand information from various online sources (Suwarjo et al., 2022). Digitally literate educators can carry out professional activities related to their roles, such as education and teaching, research, and social services (Roza, 2021). In higher education, digital literacy is crucial for both students and teachers, shaping how knowledge is taught, acquired, and shared (Gilster, 1997). Cultivating digital competence and computer science skills should begin early in the educational journey, fostering the effective use of technology and encouraging active engagement as creators rather than passive consumers (Sampson et al., 2025). In addition to technical skills, digital literacy encompasses critical thinking, problem-solving, and decision-making abilities (Darvin, 2018). This broader understanding acknowledges the importance of effectively utilising digital tools and their social, ethical, and cultural implications (Ikaningrum & Sarwanti, 2021).

In higher education, digital literacy extends beyond basic computer skills, incorporating the ability to evaluate online sources critically, comprehend digital ethics, and effectively communicate and collaborate using digital tools (Batanero et al., 2021). Digital literacy is more than just the ability to use digital tools; it involves a deeper understanding of how technology shapes communication, information, and society. It equips individuals with the necessary skills to evaluate online sources critically, understand digital ethics, and engage in effective communication and collaboration using digital tools. This enables more effective and engaging learning experiences, preparing students for the demands of the digital age (Young, 2017; Esteve-Mon, Llopis-Nebot, and Segura, 2020).

Digital literacy equips educators with the competencies to effectively harness digital resources, develop engaging learning experiences, and facilitate students' acquisition of essential digital skills. Integrating digital literacy into higher education curricula requires a comprehensive approach that addresses key areas such as digital communication, content creation, data protection, and user safety (Vaskov et al., 2021). Developing digital literacy skills is essential for students, enabling them to thrive in digitally enhanced project-based work environments (Koh et al., 2022). Students must develop a skill set that goes beyond memorisation and regurgitation of information to prepare them for personal and professional challenges (Ayas & Charles, 2024). It is crucial to foster essential skills beyond rote learning; instead, the curriculum should prioritise the development of critical capabilities to prepare students for the challenges they will encounter in their personal and professional lives (Ayas & Charles, 2024). This approach facilitates collaborative learning and enhances the quality of educational content by integrating multimedia resources and interactive tools.

Digitally literate educators are better equipped to design and deliver engaging learning experiences, assess student learning outcomes, and provide personalised support. Digital literacy competencies empower teachers to enhance the quality of learning, enabling them to prepare graduates with the expected competencies (et al., 2021). Furthermore, students should be well-versed in a range of digital tools and platforms, allowing them to communicate, collaborate, and create content effectively. Therefore, as the volume of information increases and its universal accessibility grows, along with the lack of verification of its authenticity, individuals need to acquire the skills to navigate digital media effectively (Antoniuk & Zasiadivko, 2023). Collaboration, experiential learning, and personal relevance are key to developing digital information literacy (Srivastava & Dangwal, 2021). Digital literacy is inextricably linked to the ability to transfer digital knowledge across various professional domains, facilitating career advancement and adaptability (Hecker & Loprest, 2019). Ultimately, digital literacy is becoming increasingly important for students, as their future success depends on how well they utilise it (Haliq et al., 2023).

### **3. Materials and Methods**

This study employed a bibliometric research design to systematically examine the development and intellectual structure of digital literacy research within South African higher education. Bibliometric

analysis is a quantitative methodology that utilises publication and citation data to assess research trends, scholarly impact, collaborative patterns, and thematic evolution within a specified academic domain. This approach is particularly effective in synthesising substantial volumes of academic literature and in offering a comprehensive, field-level perspective that cannot be attained through empirical or narrative review methods alone.

### 3.1 Data source and search strategy

The bibliographic data for this study were retrieved from the Scopus database, selected for its extensive coverage of peer-reviewed journals and robust citation indexing capabilities. Scopus is widely used in bibliometric research due to its consistency in metadata, advanced filtering options, and suitability for longitudinal analyses across disciplines. The database was accessed on 1 May 2025 to ensure that the dataset reflected the most recent publications available at the time of analysis.

A comprehensive search strategy was developed to capture terminological variation in digital literacy scholarship. The search string combined truncated keywords related to digital literacy concepts: “literac\*” OR “digital technolog\*” OR “digital competenc\*” OR “digital skill\*,” along with higher education identifiers, including “higher education” OR “universit\*” OR “college.” Truncation operators (\*) were deliberately applied to retrieve multiple morphological forms of the keywords (e.g., literacy/literacies; competence/competency), which is standard practice in bibliometric analyses aimed at maximising retrieval sensitivity and reducing lexical bias across disciplines and time periods.

### 3.2 Screening and selection of publications

The initial search yielded 10,786 documents. A multi-stage screening process was employed to refine the dataset in accordance with the study’s scope and objectives. Firstly, the document type was restricted to peer-reviewed journal articles to ensure academic rigour, reducing the dataset to 6,356 records. Secondly, publications were limited to those written in English, resulting in 5,418 documents. Thirdly, a country affiliation filter was applied to retain only studies linked to South Africa, yielding 154 publications. Finally, only articles in their final publication stages (either published or in press) were retained, producing a final dataset of 150 articles.

A manual screening of article titles was subsequently conducted to confirm relevance to digital literacy within higher education contexts, thereby preventing the inclusion of studies unrelated to the study’s conceptual focus. This systematic refinement process ensured that the final dataset was both comprehensive and analytically coherent.

*Table 1: Inclusion and exclusion criteria*

<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
Publications between 2001 and 2025	Publications before 2001 or after 2025
Peer-reviewed journal articles in English	Conference papers, book chapters, reviews, books, and non-peer-reviewed work
Research linked to South Africa	Articles with no connection to South Africa higher education
Publications in the final stages (published or in press)	Drafts, preprints, or incomplete publications

### 3.3 Data analysis procedures

The final dataset was exported in CSV and BibTeX formats and analysed using Biblioshiny, the web-based interface of the Bibliometrix R package (version 4.0). Bibliometrix was selected due to its established use in bibliometric scholarship and its capacity to perform descriptive, evaluative, and relational analyses within a unified analytical environment.

The analysis comprised several stages. Descriptive bibliometric indicators were first generated to examine annual scientific production, citation metrics, authorship patterns, and source distribution. Citation and co-citation analyses were then conducted to identify influential documents, authors, and journals within the field. To explore the conceptual structure of the literature, keyword co-occurrence analysis was applied using author keywords and Keywords Plus. These relationships were visualised through network maps that reveal thematic clusters and linkages.

Additionally, thematic mapping and thematic evolution analyses were conducted to assess the development and transformation of research themes over time. Themes were classified into motor, basic, niche, and emerging or declining categories based on their density and centrality, enabling an assessment of both thematic maturity and relevance within the field.

### **3.4 Ethical considerations**

This study did not involve human or animal subjects; therefore, no ethical clearance was required. All data analysed were derived from publicly accessible bibliographic records indexed in the Scopus database. No confidential, personal, or sensitive information was collected or analysed.

## **4. Presentation of Results**

This section presents the findings of the bibliometric analysis in accordance with the study's four research objectives. Firstly, it examines publication trends in digital literacy research within South African higher education from 2001 to 2025, highlighting growth patterns and periods of heightened scholarly activity. Secondly, it identifies influential authors, institutions, and thematic areas by analysing citation impact, institutional affiliations, and keyword prominence, thereby revealing the principal contributors shaping the discourse. Thirdly, the section explores thematic evolution through co-occurrence networks and thematic mapping to illustrate how research priorities and conceptual emphases have shifted over time. Finally, drawing upon these findings, the section highlights research gaps and proposes recommendations to enhance digital literacy scholarship and its integration within higher education institutions.

### **4.1 Data overview**

The dataset in Figure 1 provides a comprehensive overview of a body of academic literature spanning from 2001 to 2025. During this 25-year timespan, 150 documents were published across 112 different sources, including journals, books, and other scholarly outlets. The annual growth rate of documents is 12.25%, indicating a steady upward trend in publication output over time. This aligns with the earlier analysis, which shows an increase in activity, particularly since 2017. In terms of citation impact, the dataset reveals an average of 10.35 citations per document, with a total of 6,912 references across all publications. The average age of the papers is 3.6 years, suggesting that much of the literature is relatively recent and may still be accumulating influence. This aligns with the recent surge in output and indicates growing scholarly attention in the last few years of the dataset.

Regarding document content, there are 296 "Keywords Plus" (terms derived from the titles of cited references) and 562 author-provided keywords. This indicates a diverse thematic scope and a high degree of author engagement in framing research topics, suggesting the possibility of a multidimensional or interdisciplinary field. The data reflects contributions from 415 unique authors, with 37 responsible for single-authored documents. In total, 40 papers are single-authored, indicating that most works involved collaboration. On average, there are 3.07 co-authors per document, demonstrating moderate cooperation. Furthermore, 28% of all publications involve international co-authorships, suggesting a relatively strong global engagement.

Finally, all 150 entries are classified as journal articles, indicating a focus on peer-reviewed academic research rather than books, reports, or conference proceedings. This points to a consistent, formal publication pattern, potentially indicating the field's maturity and academic credibility.



Figure 1: Data Overview

## 4.2 Annual scientific production

Figure 2 below shows a trend that exhibits a classic pattern of initial stagnation, followed by gradual and rapid growth, and ultimately a slight decline after the peak. Statistically, the dataset ranges from 0 to 33, with a mean of approximately 6.92 and a median of 3. The total sum of all values across the years is 173. The most notable inflection point appears around 2017, where the trajectory shifts from inconsistent activity to steady growth, peaking in 2023. Understanding the context behind these values would provide further insight into the factors that influenced these changes over time. The dataset spans 25 years, from 2001 to 2025, and consists of a time series of counts or occurrences per year.

Initially, from 2001 to 2010, the trend shows minimal activity, with only two non-zero values: one in 2001 and another in 2010. This decade-long phase can be described as dormant or inactive, possibly indicating a lack of development or data collection during that period. Between 2011 and 2016, there was a modest increase in activity. The years 2011, 2014, and 2016 show non-zero counts (3, 4, and 4, respectively), but these are still interspersed with years of no activity. This suggests the beginnings of a growth phase, though it remains inconsistent and relatively low-level. It is not until 2017 that a noticeable and steady upward trajectory begins. From 2017 through 2021, there was a consistent year-on-year value increase, rising from 3 to 12. This period marks an accelerated phase of growth, suggesting sustained effort and expansion.

The most significant surge occurs between 2022 and 2023, where values jump from 25 to a peak of 33. This dramatic rise may indicate a breakthrough or the result of scaled operations, increased investments, or other favourable conditions. However, this rapid growth is followed by a decline in the subsequent two years: the count drops to 24 in 2024 and further to 16 in 2025. This recent decline could be due to a variety of factors, such as saturation, resource limitations, a shift in strategy, or external constraints.

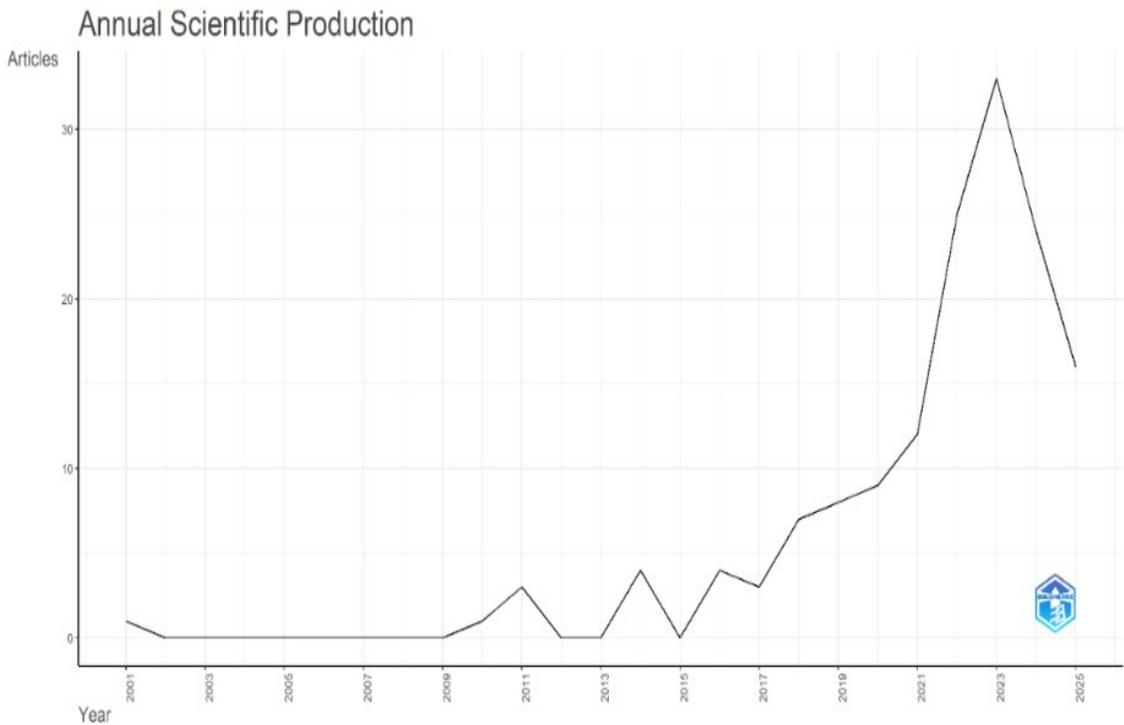


Figure 2: Annual Scientific Production

### 4.3 Most relevant affiliation

The data in Figure 3, which highlights the most relevant affiliations, shows the key institutions contributing to the body of work in this bibliometric collection. The University of South Africa (UNISA) stands out with 35 articles, dominating the landscape and suggesting its central role in the research themes and topics under discussion. The University of Johannesburg (UJ) follows closely with 24 articles, indicating a substantial contribution to the field. The University of the Witwatersrand (Wits) contributes 23 articles, demonstrating its significant involvement. Other prominent South African universities, such as the University of Cape Town (UCT) and the University of Pretoria (UP), contributed 13 and 11 articles, further emphasising the South African context within the academic community. Internationally, the University of Helsinki, with 12 articles, is the only non-South African institution in the top ranks, suggesting its global influence in this area. Other South African institutions, such as the University of the Western Cape (UWC), Vaal University of Technology, and Central University of Technology (CUT), each with 9 to 10 articles, reflect diverse academic involvement from various regions of South Africa. With nine articles, the University of KwaZulu-Natal (UKZN) also makes its mark, highlighting its continued relevance in the field. These affiliations demonstrate a strong local focus, with leading contributions from South African universities and some international influence, particularly from Helsinki, further strengthening the knowledge network.

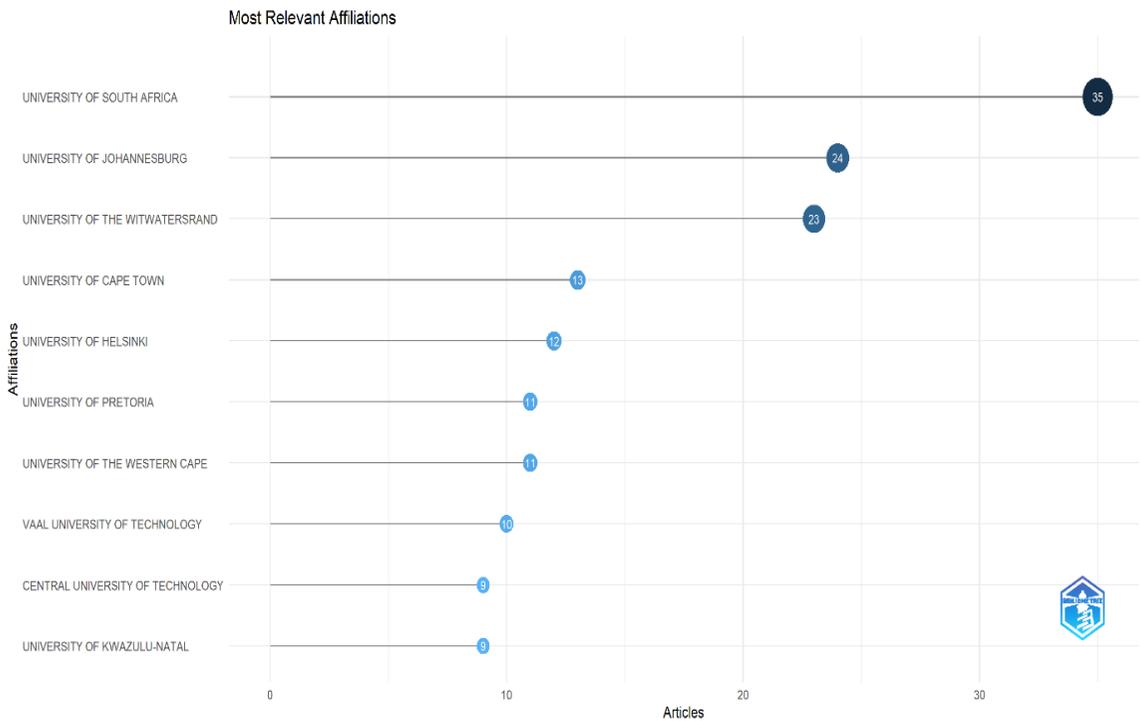
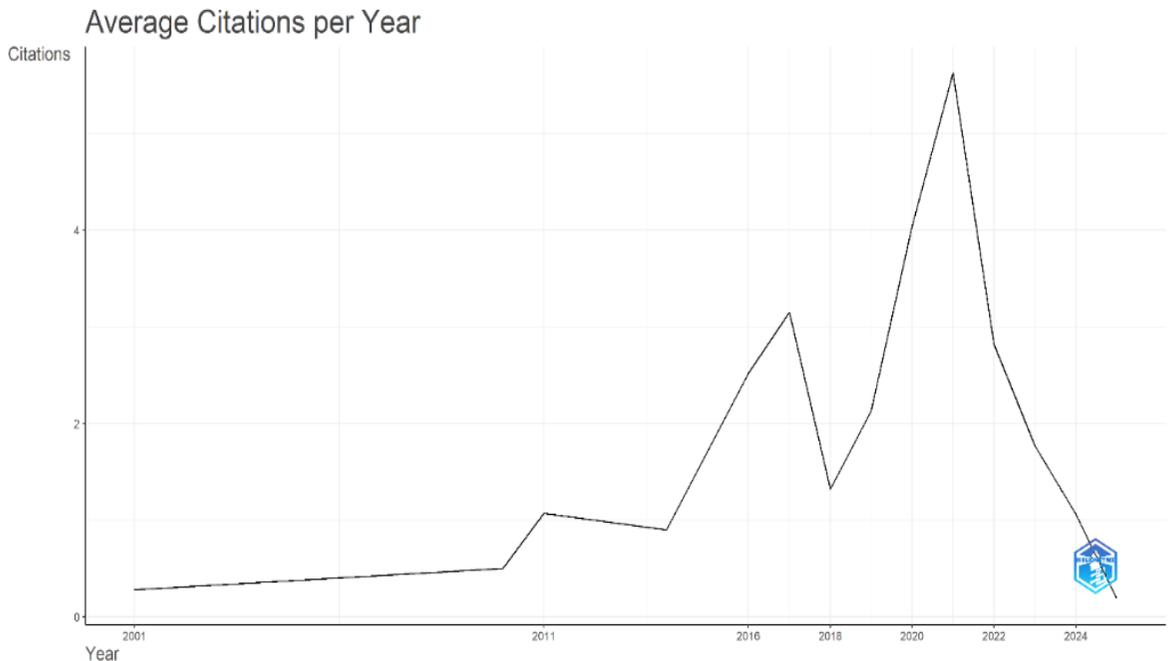


Figure 3: Most Relevant Affiliations

#### 4.4 Average citations per year

Figure 4 below displays the average number of citations per year, offering insight into the scholarly impact and citation trajectory of documents published between 2001 and 2025. The earliest publications, in 2001 and 2010, show relatively low average annual citation rates (0.28 and 0.50, respectively), likely due to limited early activity and visibility. However, the impact began to increase in 2011, when three documents achieved a citation rate of 1.07 per year. By 2016 and 2017, there was a marked rise in both output and scholarly influence. In 2016, the average total citations per article was 25.25, with an average of 2.52 citations per year. In 2017, this increased to 28.33 citations per article and 3.15 citations per year. These figures suggest a growing recognition and relevance of the work produced during this period. The peak in average citations per year occurs in 2021, with 12 articles averaging 5.63 citations annually. This indicates strong publication output and high scholarly uptake, likely due to the field's maturation and the increased relevance of the subject matter. Interestingly, while 2022 maintained a high output with 25 publications, the average number of citations per year dropped to 2.82, indicating that newer publications, although numerous, are still accumulating citations and may not yet have reached their peak influence. An apparent declining trend has been evident in recent years (2023–2025). In 2023, although 33 documents were published—the highest count across all years—the average citations per year dropped to 1.77, likely because these documents had accumulated citations for only three years or fewer. The 2024 and 2025 publications, which are the most recent, predictably have even lower average citations per year (1.06 and 0.19, respectively), primarily because they have been available for a shorter time.



**Figure 4: Average Citations Per Year**

#### 4.5 Most local cited documents

Table 2 below shows that the most locally cited documents reveal a nuanced picture of influence within this bibliometric collection. Kajee's 2011 article in *South African Linguistics and Applied Language Studies* leads in raw local citations (4) and boasts 32 global citations, yielding a moderate LC/GC ratio of 12.5%, but solid normalised local and global scores (3.00 and 2.00, respectively), underlining its dual strength in both the local network and wider scholarship. Lubinga's 2023 piece in the *Journal of Cultural and Value Education*, despite being very recent, has achieved 2 local citations and 28 global citations – resulting in an LC/GC ratio of 7.14%. However, its high normalised local citation score (16.50) signals rapid uptake among peers in the collection. Several studies demonstrate a high normalised local impact despite having a low global reach. For instance, Faloye (2022) in the *African Journal of Science, Technology, Innovation and Development* has only one local citation but a remarkable normalised local score of 25.00, reflecting its importance within the specific corpus context, despite accruing 25 global citations. Similarly, Oyetade's two 2023 articles show divergent patterns: one in the *International Journal of Learning, Teaching and Educational Research* has an LC/GC ratio of 16.67% with modest global citations, while the other in the *OIDA International Journal of Sustainable Development* has a perfect 100% LC/GC ratio but only one global citation – highlighting a work that, while not broadly cited outside, resonates strongly within the network.

Older papers, such as Brown (2016) and Oyedemi (2018), exhibit strong global visibility (37 and 29 citations) but low LC/GC ratios (2.70% and 3.45%), suggesting they have influenced the wider field more than the specific collection. Conversely, Teer Tomaselli's 2016 article, with three global citations and one local, yields a high LC/GC ratio (33.33%) but low normalised global impact (0.12), marking it as a niche yet locally integrated study. The interplay between local and global citation metrics highlights which works serve as foundational cornerstones within this corpus and which have a broader disciplinary reach. The table below reflects a typical citation lifecycle: older documents (especially those from the mid-2010s) have had more time to accumulate citations and demonstrate lasting impact, while newer publications are still in the early stages of their citation trajectory. The field appears to have grown not only in quantity but also in influence from around 2016 to 2021, after

which a decline in average citations per article may suggest either that newer topics are still gaining traction or that impact is diluted by the high publication volume.

**Table 2: Most local cited documents**

Document	DOI	Year	Local Citations	Global Citations	LC/GC Ratio (%)	Normalised Local Citations	Normalised Global Citations
KAJEE L, (2011). SOUTH AFR LINGUIST APPL LANG STUD	10.2989/16073614.2011.633365	2011	4	32	12,50	3,00	2,00
LUBINGA S, (2023). J CULT VAL EDU	10.46303/jcve.2023.5	2023	2	28	7,14	16,50	5,28
FALOYE ST, (2022). AFR J SCI TECHNOL INNOV DEV	10.1080/20421338.2021.1983118	2022	1	25	4,00	25,00	2,22
OYETADE K, (2023). INTL J LEARN TEACH EDU RES	10.26803/ijlter.22.9.33	2023	1	6	16,67	8,25	1,13
OYETADE K, (2023). OIDA INT J SUSTAINABLE DEV		2023	1	1	100,00	8,25	0,19
MPHAHLELE R, (2021). J LEARN DEV		2021	1	14	7,14	12,00	0,50
OYEDEMI T, (2018). AFR EDUC REV	10.1080/18146627.2016.1264866	2018	1	29	3,45	7,00	2,74
TEER-TOMASELLI R, 2016, J AFR MEDIA STUD	10.1386/jams.8.2.205_1	2016	1	3	33,33	2,00	0,12
BROWN C (2016). LEARN MEDIA TECHNOLOGY	10.1080/17439884.2015.1107097	2016	1	37	2,70	2,00	1,47
OYEDEMI T, (2014). COMMUNICATIO	10.1080/02500167.2014.907191	2014	1	11	9,09	4,00	1,02

#### 4.6 Co-occurrence network

The co-occurrence network presented in Figure 5 elucidates the interconnectedness of research themes within the domain of higher education, particularly in relation to digital transformation. Key nodes, including 'higher education' (exhibiting a high betweenness centrality score of 227.200) and 'digital technologies' (44,000), occupy central positions within the network, thereby underscoring their critical role in shaping the discourse and bridging various research areas. Other themes, such as 'digital technology,' 'the COVID-19 pandemic,' and 'blended learning,' demonstrate lower centrality scores, which suggests that, while these topics are pertinent, their integration into broader research discussions remains somewhat constrained. Themes such as 'e-learning,' 'teaching and learning,' and 'technology integration' are categorised within a secondary cluster, characterised by moderate betweenness and closeness scores, indicating a significant yet slightly peripheral role in higher education research. The lockdown and emphasis on digital literacies within this secondary cluster further illuminate the temporal and social factors that influence the academic trajectory, particularly in the context of the pandemic. The network analysis reveals the predominant influence of core themes related to digital technologies and higher education, whilst simultaneously highlighting opportunities for the further integration of specialised topics, such as e-learning and technology integration, into the broader landscape of educational research.

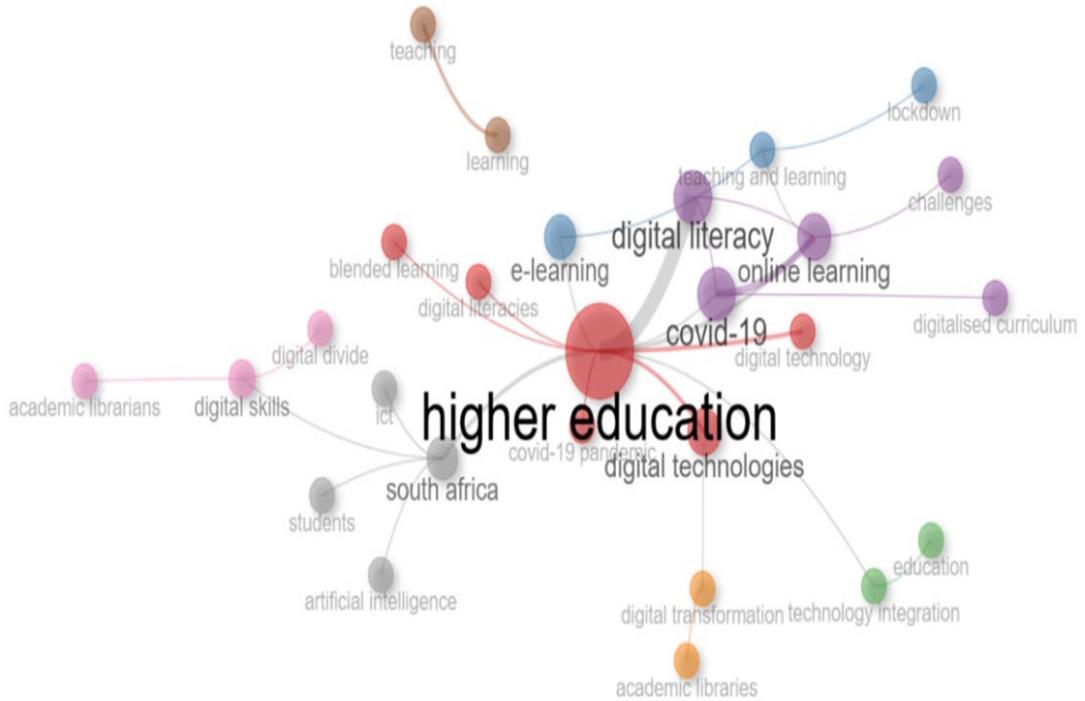


Figure 5: Co-occurrence Network

#### 4.7 Thematic map

Figure 6 below presents a thematic map that elucidates key research directions in higher education from 2001 to 2025, based on theme development (density) and relevance (centrality). Motor themes, such as human studies, COVID-19, and South Africa, are well-developed and central, indicating a robust research focus on human-centred approaches, the pandemic's impact, and region-specific analyses. Closely associated are substantial methodological and technology-driven topics, including controlled studies, adolescents, digital technology, and data analysis, which underpin the current innovation trajectory in higher education. In contrast, basic themes such as digital technologies, e-learning, and student engagement are highly relevant but underdeveloped, representing foundational pillars that necessitate further interdisciplinary exploration to enhance educational outcomes and learner support in digital environments. Meanwhile, niche themes, including sustainable development, goals, and digitisation, exhibit thematic maturity but remain peripheral, suggesting a degree of specialisation without broader integration. Emerging or declining themes, such as surveys, design, and Nigeria, are low in both centrality and development, indicating underexplored opportunities or waning scholarly attention. Strategically advancing basic and niche themes into the mainstream and linking them to global education priorities, such as digital equity and the Sustainable Development Goals (SDGs), could substantially enhance the future relevance and impact of higher education research.

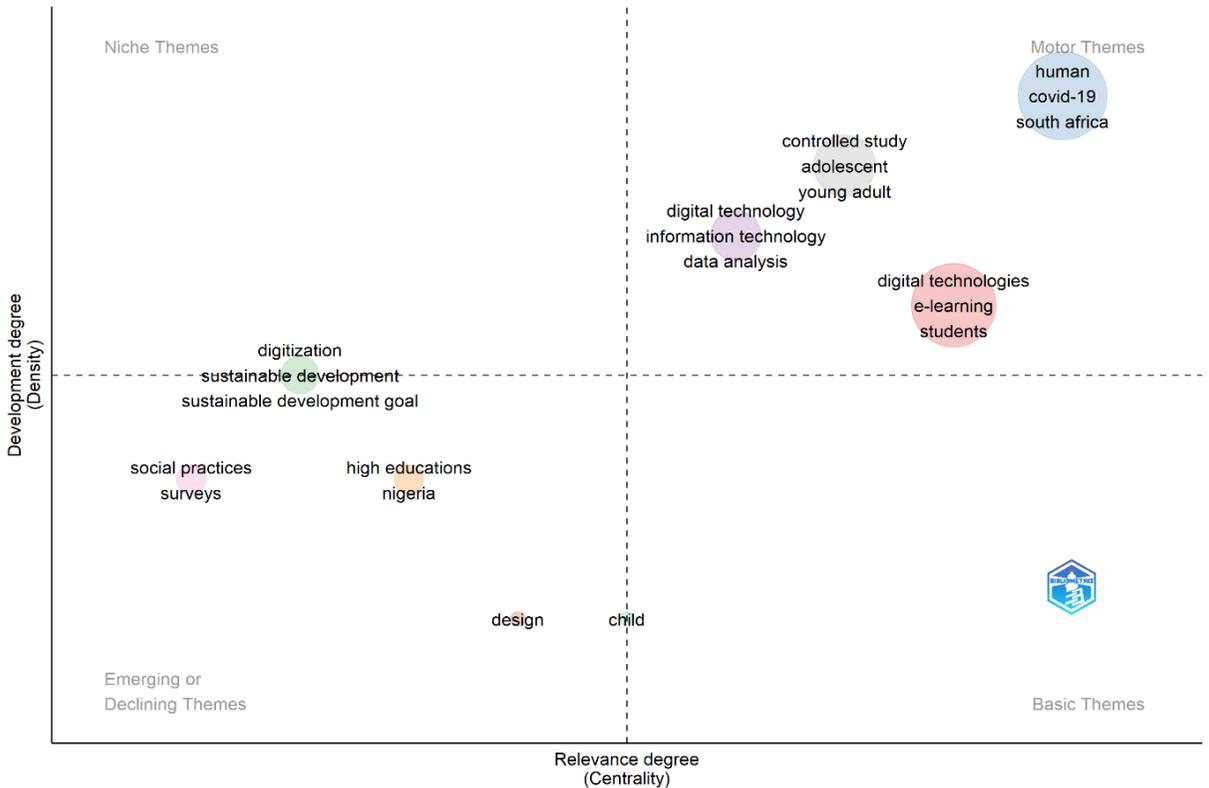


Figure 6: Thematic map

#### 4.8 Thematic evolution

The thematic evolution diagram illustrates a scholarly shift from foundational themes such as "higher education" and "digital literacy" (2001–2019) towards more context-specific, technologically driven discussions, influenced by global events such as the COVID-19 pandemic. From 2020 to 2021, the emergence of "Africa," "online learning," and "COVID-19" marks a regional and crisis-responsive turn, with digital literacy and online learning becoming central. In 2022–2023, themes like the "COVID-19 pandemic," "digital technologies," and the "Fourth Industrial Revolution" reflect a broadening of focus towards digital transformation in education. These themes remain persistent through 2024, with strong continuities observed in "digital literacy" and "COVID-19," while "learning" evolves into "digital technologies" and "e-learning," indicating a more integrated tech-pedagogy nexus. By 2025, the themes converge into "higher education," suggesting a reintegration of digital advancements and pandemic lessons into the broader discourse, underscoring a cyclical yet progressive pattern of knowledge development. This evolution highlights a scholarly trajectory moving from broad themes of education and digitisation to more nuanced, region-specific applications, especially in African contexts and pandemic-affected environments. It showcases the persistence of themes and the adaptive transformation in response to social, technological, and global health developments.

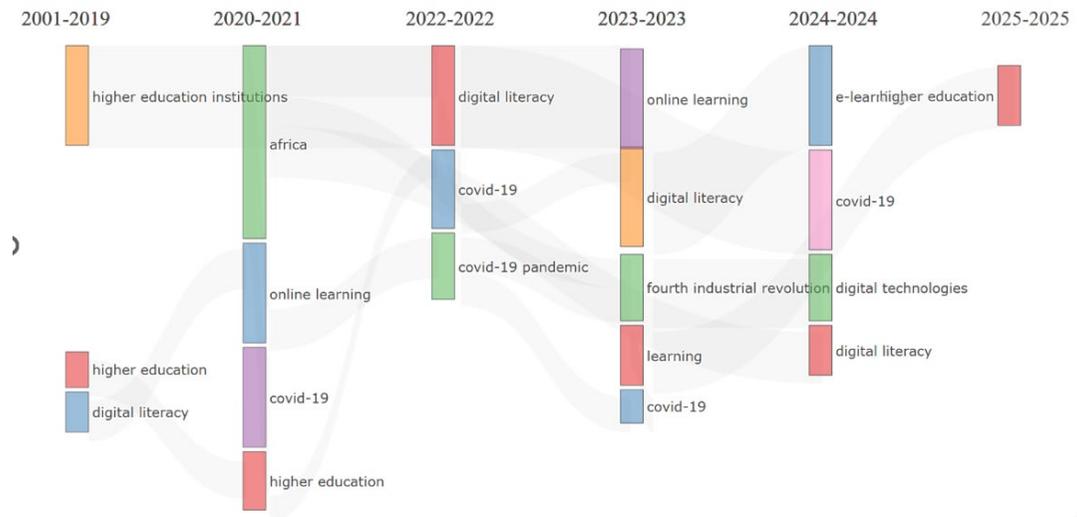


Figure 7: Thematic evolution

## 5. Discussion of Findings

The analysis of publication trends indicates a gradual and fragmented emergence of digital literacy research within South African higher education during the early 2000s, followed by a pronounced acceleration from approximately 2017 onwards. This growth trajectory suggests a period of conceptual consolidation and an increasing scholarly focus, coinciding with broader institutional digitalisation initiatives and national priorities pertaining to technology-enhanced learning. The significant increase in output between 2020 and 2023 reflects the catalytic impact of the COVID-19 pandemic, which necessitated the rapid transition of higher education institutions to online and blended learning environments. The subsequent decline observed in 2024 and 2025 is likely attributable to citation lag effects and the partial maturation of recent publications, rather than a substantive decline in scholarly interest. Overall, these trends indicate that digital literacy has evolved from a marginal topic into a well-established and nationally significant research area within South African higher education (Shibambu & Mojapelo, 2025).

The findings reveal a concentration of scholarly influence within a limited number of South African universities, notably the University of South Africa, the University of Johannesburg, and the University of the Witwatersrand. This institutional dominance suggests the existence of established research hubs with a sustained capacity for digital literacy scholarship. Concurrently, the relatively lower contribution from historically under-resourced institutions highlights structural inequalities in research production within the higher education sector. Citation analysis further indicates that influence is shaped not only by publication volume but also by network positioning, with specific authors and institutions occupying strategic roles within collaborative and citation networks. The prominence of themes such as higher education, digital technologies, and e-learning underscores the field's strong institutional and pedagogical orientation. Meanwhile, the presence of interdisciplinary keywords reflects the multifaceted nature of digital literacy research (Nel, 2025).

The thematic evolution analysis reveals a pronounced shift in research priorities over time. Early studies predominantly focused on broad conceptual issues related to digital literacy and higher education, reflecting foundational definitional work. From 2020 onwards, there has been a marked transition towards context-specific, crisis-responsive themes, including online learning, COVID-19, and digital transformation. The emergence of themes pertinent to Africa and the Fourth Industrial Revolution indicates a heightened emphasis on regional relevance and future-oriented skills development. By 2024-2025, the reintegration of digital literacy themes into the broader higher

education discourse suggests a maturation of the field, wherein digital competencies are increasingly regarded as integral rather than peripheral to teaching, learning, and institutional strategy. This progression illustrates a dynamic and adaptive research field that is responsive to social, technological, and policy shifts (Mugunzva & Manchidi, 2025).

Despite significant growth, the bibliometric findings reveal notable gaps in the literature. Fundamental themes such as student engagement, curriculum integration, and e-learning, while highly central to the research network, remain underdeveloped, indicating opportunities for deeper theoretical and empirical exploration. The relative marginalisation of themes related to sustainability, equity, and long-term institutional transformation further suggests areas that require greater scholarly attention. These gaps highlight the necessity for more coordinated, cross-institutional research efforts that extend beyond crisis-driven responses. For higher education institutions, the findings underscore the importance of embedding digital literacy across curricula, fostering interdisciplinary collaboration, and strengthening research capacity at institutions that are currently underrepresented in the literature. Addressing these gaps is essential for advancing a more inclusive, coherent, and contextually grounded digital literacy research agenda in South African higher education (Mateko et al., 2025; Shibambu & Mojaelo, 2025; Mabidi, 2024; Nel, 2025).

## **6. Conclusions and Recommendations**

This study aimed to address the deficiency of a consolidated, field-level understanding of digital literacy research within South African higher education by employing bibliometric analysis on publications from 2001 to 2025. In response to this gap, the findings provide a systematic mapping of publication trends, citation impact, collaborative networks, and thematic development, thereby elucidating the field's intellectual and social structure. The results indicate that digital literacy research in South African higher education has progressed from a marginal and fragmented area of inquiry into a more established and interconnected research domain, particularly following the acceleration of digitalisation after 2017 and during the COVID-19 pandemic.

This study contributes distinctly to the literature by presenting the first longitudinal, South Africa-focused bibliometric synthesis of digital literacy research in higher education. By integrating publication analysis, citation metrics, co-authorship networks, keyword co-occurrence, and thematic evolution, the study offers empirical evidence of how knowledge in this field has been produced, disseminated, and shaped over time. In doing so, it enhances scholarly understanding of the field's maturity, identifies dominant research actors and themes, and highlights underdeveloped areas necessitating further investigation.

Based on the identified gaps and thematic patterns, the study recommends enhanced coordination of digital literacy research across institutions, particularly to bolster participation from historically underrepresented universities. Future research should prioritise foundational yet underdeveloped themes such as curriculum integration, student engagement, and e-learning, advancing these into more theoretically robust and empirically grounded scholarship. Additionally, greater conceptual alignment and standardisation of keywords related to digital literacy, digital competence, and information literacy would improve the visibility and coherence of future studies.

This study is subject to certain limitations. Firstly, it relies exclusively on the Scopus database and includes only English-language, peer-reviewed journal articles, potentially omitting relevant research published in other outlets or languages. Secondly, bibliometric indicators capture patterns of publication and citation but do not evaluate the substantive quality or pedagogical effectiveness of individual studies. Lastly, citation data for the most recent years may be influenced by time-lag effects. Future bibliometric studies could extend this analysis by incorporating additional databases, such as the Web of Science, or by conducting comparative analyses across African regions or Global South contexts. Further research could also integrate bibliometric mapping with qualitative reviews

or content analysis to deepen the understanding of theoretical frameworks and methodological approaches within digital literacy scholarship in higher education.

## 7. Declarations

**Funding:** This research did not receive any external funding. However, the Article Processing Charge (APC) was covered by the Directorate for Institutional Research and Academic Research (DIRAP) at the University of the Free State.

**Acknowledgements:** The author declares no acknowledgements.

**Conflicts of Interest:** The author declares no conflict of interest.

**Data Availability:** This review is based entirely on publicly available data and information sourced from peer-reviewed articles, reports, and other academic publications cited in the manuscript. No new primary data were generated or analysed during this study. Readers may refer to the cited sources for detailed information.

## References

- Agnusdei, G. P., Elia, V., & Gnoni, M. G. (2021). Is digital twin technology supporting safety management? A bibliometric and systematic review. *Applied Sciences*, *11*(6), Article 2767. <https://doi.org/10.3390/app11062767>
- Al, S. E. (2021). Digital literacy competencies of mechanical engineering vocational education teacher candidates. *Türk Bilgisayar ve Matematik Eğitimi Dergisi*, *12*(6), 2119–2132. <https://doi.org/10.17762/turcomat.v12i6.4817>
- Albrahim, M., Aljasser, M., Alrumayyan, A., Alshaalan, H., & Alharbi, A. (2022). Bibliometric overview of the top 100 most cited articles on hydrocephalus. *Surgical Neurology International*, *13*, Article 176. [https://doi.org/10.25259/sni\\_115\\_2022](https://doi.org/10.25259/sni_115_2022)
- Ángel, N. G., González-González, C. S., & Infante-Moro, A. (2022). Digital literacy in the university setting: A literature review of empirical studies between 2010 and 2021. *Frontiers in Psychology*, *13*, Article 896800. <https://doi.org/10.3389/fpsyg.2022.896800>
- Antoniuk, L., & Zasiadivko, V. (2023). Digital literacy and technologies for education: Principles and tools. *Graal of Science*, (26), 249–255. <https://doi.org/10.36074/grail-of-science.14.04.2023.044>
- Audrin, C., & Audrin, B. (2022). Key factors in digital literacy in learning and education: A systematic literature review using text mining. *Education and Information Technologies*, *27*(6), 7395–7420. <https://doi.org/10.1007/s10639-021-10832-5>
- Ayas, I., & Charles, T. (2024). Tech-integrated curriculum development. *Open Access Library Journal*, *11*(6), 1–12. <https://doi.org/10.4236/oalib.1111714>
- Batanero, J. M. F., Román-González, M., & Serrano-Rodríguez, R. (2021). Digital teaching competence in higher education: A systematic review. *Education Sciences*, *11*(11), Article 689. <https://doi.org/10.3390/educsci11110689>
- Bharuthram, S. (2012). Making a case for the teaching of reading across the curriculum in higher education. *South African Journal of Education*, *32*(2), 205–214. <https://doi.org/10.15700/saje.v32n2a557>
- Czerniewicz, L. (2016). Inequality as higher education goes online. In N. B. Dohn, S. Cranmer, J.-A. Sime, M. de Laat, & T. Ryberg (Eds.), *Proceedings of the 10th International Conference on Networked Learning* (pp. 95–102). Networked Learning Conference.
- Czerniewicz, L., Agherdien, N., Badenhorst, J., et al. (2020). A wake-up call: Equity, inequality and Covid-19 emergency remote teaching and learning. *Postdigit Sci Educ*, *2*, 946–967. <https://doi.org/10.1007/s42438-020-00187-4>
- Darvin, R. (2018). Social class and the unequal digital literacies of youth. *Language and Literacy*, *20*(3), 26–43. <https://doi.org/10.20360/langandlit29407>
- Department of Higher Education and Training. (2013). *White paper for post-school education and training: Building an expanded, effective and integrated post-school system*. DHET.
- Ding, H., Liu, J., Chen, Y., & Wang, J. (2022). A bibliometric analysis of CD38-targeting antibody therapy in multiple myeloma from 1985 to 2021. *Translational Cancer Research*, *11*(4), 772–785. <https://doi.org/10.21037/tcr-21-1962>

- Doiraghusoha, M. (2022). Pedagogical strategies for fostering digital literacy and online research skills in higher education. *Interdisciplinary Journal Papier Human Review*, 3(2), 1–10. <https://doi.org/10.47667/ijphr.v3i2.228>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Dube, B. (2020). *Rural online learning in the context of COVID-19 in South Africa*. *Research in Social Sciences and Technology*, 5(2), 77–89.
- Esteve-Mon, F. M., Llopis-Nebot, M. A., & Segura, J. A. (2020). Digital teaching competence of university teachers: A systematic review of the literature. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, 15(4), 399–406. <https://doi.org/10.1109/RITA.2020.3033225>
- Fakhrudin, A., & Haryanto, H. (2023). Digital literacy analysis of primary school students. *KnE Social Sciences*, 8(8), 1–12. <https://doi.org/10.18502/kss.v8i8.13280>
- Galán, J. G. (2018). Media education as a theoretical and practical paradigm for digital literacy: An interdisciplinary analysis. *arXiv*. <https://doi.org/10.48550/arxiv.1803.01677>
- George, G. R. (1992). One moment, please. *PubMed*, 82(1), 37–39. <https://pubmed.ncbi.nlm.nih.gov/1499783>
- Gilster, P. (1997). *Digital literacy*. Wiley.
- Haliq, A., Rahman, F., & Ningsih, S. (2023). Self-access in digital literacy: Evaluating the quality of information and reliability of sources in writing an academic essay. *Interference Journal of Language, Literature and Linguistics*, 4(1), 86–95. <https://doi.org/10.26858/interference.v4i1.44561>
- Hecker, I., & Loprest, P. (2019). *Foundational digital skills for career progress*. Urban Institute. <https://files.eric.ed.gov/fulltext/ED601774.pdf>
- Herrera-Franco, G., Montalván-Burbano, N., & Mora-Frank, C. (2021). Worldwide research on geoparks through bibliometric analysis. *Sustainability*, 13(3), Article 1175. <https://doi.org/10.3390/su13031175>
- Ho, H. T. N., & Luong, H. T. (2022). Research trends in cybercrime victimization during 2010–2020: A bibliometric analysis. *SN Social Sciences*, 2, Article 16. <https://doi.org/10.1007/s43545-021-00305-4>
- Ikaningrum, R. E., & Sarwanti, S. (2021). Students' digital literacy in online reading class: A critical reflection on English language learners. *LEKSEMA Jurnal Bahasa dan Sastra*, 6(1), 1–11. <https://doi.org/10.22515/ljbs.v6i1.2939>
- Kaeophanuek, S., Na-Songkhla, J., & Nilsook, P. (2019). A learning process model to enhance digital literacy using critical inquiry through digital storytelling (CIDST). *International Journal of Emerging Technologies in Learning*, 14(3), 22–37. <https://doi.org/10.3991/ijet.v14i03.8326>
- Khan, M. Y. (2018). New technologies and digital literacy in education: A shifting paradigm. *Pakistan Social Sciences Review*, 2(1), 108–116. [https://doi.org/10.35484/psr.2018\(2-i\)09](https://doi.org/10.35484/psr.2018(2-i)09)
- Koh, K., Tan, C., & Lim, C. (2022). Making virtual project-based learning work during the COVID-19 pandemic. *International Journal of Education*, 10(2), 1–14. <https://doi.org/10.5121/ije.2022.10201>
- Kumar, A., Pandey, A., & Singh, B. (2023). Multifaceted applications of biochar in environmental management: A bibliometric profile. *Biochar*, 5(1), Article 13. <https://doi.org/10.1007/s42773-023-00207-z>
- Mabidi, N. 2024 A systematic review of the transformative impact of the digital revolution on higher education in South Africa. *S. Afr. J. High. Educ.* [online]. 2024, 38(3), .97-113. <https://doi.org/10.20853/38-3-6366>.
- Manzi, W.I., & Modise, M.A. (2025). Educational technology for equity in South Africa: Promise and challenge. *International Journal of Research in Business and Social Science*, 14(7), 437–446. <https://doi.org/10.20525/ijrbs.v14i7.4446>
- Mateko, F.M., Dowelani, M. & Sinamano, R. Digital Inequality and Transformation in South African Higher Education During COVID-19: A Comparative Analysis of Historically Disadvantaged and Historically Advantaged Universities. *High Educ Policy* (2025). <https://doi-org.ufs.idm.oclc.org/10.1057/s41307-025-00416-0>
- Mejía, C., Wu, M., Zhang, Y., & Kajikawa, Y. (2021). Exploring topics in bibliometric research through citation networks and semantic analysis. *Frontiers in Research Metrics and Analytics*, 6, Article 742311. <https://doi.org/10.3389/frma.2021.742311>
- Monteiro, A., & Leite, C. (2021). Digital literacies in higher education. *Revista de Educación a Distancia*, 21(65). <https://doi.org/10.6018/red.438721>

- Motala, S., & Menon, K. (2020). *In search of the "new normal": Reflections on teaching and learning during COVID-19 in a South African university*. *Southern African Review of Education*, 26(1), 80–99.
- Mugunzva, F. I., & Manchidi, N. H. (2025). Mapping Digital Literacy Thresholds in South African Higher Education and the Implications for Entrepreneurship Education in an Industry 4.0 Paradigm. *Administrative Sciences*, 15(10), 396. <https://doi.org/10.3390/admsci15100396>
- Nahdi, D. S., Jatisunda, M. G., & Cahyaningsih, U. (2022). Pre-service elementary teachers' digital literacy with cognitive style and self-regulated learning. *International Journal of Educational Innovation and Research*, 1(1), 19–29. <https://doi.org/10.31949/ijeir.v1i1.1862>
- Nel, M. (2025). Integrating digital literacy into South African academic literacy: An autoethnographic exploration of evolving interventions. *Journal for Language Teaching*, 59(1), Article 6330. <https://doi.org/10.56285/jltVol59iss1a6330>
- Ninkov, A., Frank, J. R., & Maggio, L. A. (2021). Bibliometrics: Methods for studying academic publishing. *Perspectives on Medical Education*, 11(3), 173–176. <https://doi.org/10.1007/s40037-021-00695-4>
- Passas, I. (2024). Bibliometric analysis: The main steps. *Encyclopedia*, 4(2), 1014–1027. <https://doi.org/10.3390/encyclopedia4020065>
- Quraishi, T., Khan, S., & Ahmed, R. (2024). Empowering students through digital literacy: A case study of successful integration in a higher education curriculum. *Journal of Digital Learning and Distance Education*, 2(8), 667–679. <https://doi.org/10.56778/jldle.v2i8.208>
- Roza, V. (2021). English lecturers' digital literacy and their scientific publication: Seeking the correlation. *Lingua Cultura*, 15(2), 223–230. <https://doi.org/10.21512/lc.v15i2.7627>
- Sáez, F. T., González, J. M., & Ramírez, A. (2020). *Learning and educating in the digital age: Reference frameworks*. University of Granada.
- Sampson, D. G., et al. (2025). Towards high-quality informatics K–12 education in Europe: Key insights from the literature. *Smart Learning Environments*, 12(1), Article 7. <https://doi.org/10.1186/s40561-025-00366-5>
- Samuels, A.B., & Singh, U. (2025). Education reimaged: South Africa's journey through the 4IR and beyond. *Transformation in Higher Education*, 10(0), a482. <https://doi.org/10.4102/the.v10i0.482>
- Shibambu A, & Mojapelo S.M. (2025). The status of digital and information literacies in South Africa from 2016 to 2022: a literature review. *Global Knowledge, Memory and Communication*, Vol. 74 No. 7-8 pp. 2572–2584, doi: <https://doi-org.ufs.idm.oclc.org/10.1108/GKMC-04-2023-0142>
- Zawacki-Richter, O., & Naidu, S. (2016). *Mapping research trends from 35 years of distance education*. *Distance Education*, 37(3), 245–269. <https://doi.org/10.1080/01587919.2016.1185079>

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