



FACTORS INFLUENCING DOCTORAL COMPLETION IN SOUTH AFRICAN INSTITUTIONS (1994–2024): A BIBLIOMETRIC ANALYSIS

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ABSTRACT

Aim/Purpose	The study aims to identify the factors influencing doctoral completion rates in South Africa by analyzing publication trends and emerging themes. Insights from this analysis are intended to inform institutional strategies and national policies to enhance doctoral success and address systemic challenges in the higher education system.
Background	Doctoral education plays a pivotal role in advancing research capacity, innovation, and socioeconomic development in South Africa. However, despite increased enrolments post-1994, doctoral completion rates remain suboptimal owing to systemic, institutional, and personal challenges rooted in historical inequities.
Methodology	This study employed bibliometric analysis, using data from the Scopus database, to evaluate research trends, key contributors, and thematic developments related to doctoral completion in South African universities between 1994 and 2024. Tools like Bibliometrix and VOSviewer were used to map and visualize the intellectual landscape, including citation networks and thematic clusters.
Contribution	The bibliometric analysis advances discourse on doctoral completion rates in South Africa by using a unique, data-driven perspective that complements existing qualitative and quantitative research, thereby explicitly identifying gaps and priority areas for future research and policy intervention.

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Findings	Findings highlight supervision quality, financial support, institutional structures, and mental health as crucial determinants. Through thematic mapping, the study reveals ‘doctoral support’ and ‘mental health’ as evolving themes, with a notable increase in publications from 2017, reflecting growing scholarly and policy attention.
Recommendations for Practitioners	Those working in higher education settings should prioritize the creation of comprehensive support structures, such as supervisor training programs and accessible mental health resources, to address the academic and emotional hurdles faced by doctoral candidates. Universities should draw insights from current bibliometric findings to craft targeted measures aimed at improving supervision practices, expanding equitable funding opportunities, and fostering resilience among students.
Recommendations for Researchers	Researchers are encouraged to critically investigate the complex relationship between mental health and doctoral studies, particularly focusing on how tailored interventions can help reduce stress and foster student well-being.
Impact on Society	Boosting doctoral completion rates has the potential to enhance South Africa’s research capabilities, drive innovation, address skills shortages, and contribute to national economic growth. This analysis offers insights for enhancing doctoral completion in South Africa and promoting institutional strategies and policies that can foster an equitable and supportive doctoral education system.
Future Research	Future research should address underexplored areas such as intersectionality, cultural and linguistic diversity, and the integration of emerging ICT tools in supervision.
Keywords	doctoral completion, South African universities, bibliometric analysis, doctoral education, doctoral support

INTRODUCTION

Doctoral education plays a crucial role in fostering innovation, developing research capacities, and contributing to socioeconomic progress. Moreover, the progress and prosperity of a nation are deeply tied to the knowledge and insights contributed by doctoral students, whose research shapes and informs critical science and technology policies (Maheu et al., 2014). However, doctoral completion remains challenging globally; approximately half of candidates do not finish their degrees on time (Breitenbach, 2019; Spaulding & Rockinson-Szapkiw, 2012). Specifically, in South Africa, doctoral education encounters distinct problems arising from the country’s historical legacy, specifically apartheid (Tshuma & Bitzer, 2023). Over the past three decades (1994–2024), South African universities have made efforts to increase doctoral enrolments, but completion rates remain below par (Kuriakose, 2022).

Historical educational injustices continue to affect postgraduate studies, particularly impacting adult learners from township schools (Motseke, 2016). Moreover, student factors, including enrolment mode, academic discipline, nationality, and institutional type, significantly influence completion rates. For instance, part-time students typically take longer to complete their degrees (van Lill, 2024). Furthermore, universities of technology have further challenges in assisting doctoral students, as many students grapple with achieving an equilibrium between their work and academic obligations (Kuriakose, 2022). Consequently, support systems at many universities have proved insufficient, leading to a high number of postponed or unfulfilled postgraduate studies (Mashau & Ravhuhali, 2023). Notwithstanding these challenges, a doctoral degree is seen as essential for fostering national growth.

This is the reason why there is an increasing emphasis on doctoral qualifications to address the requirements of academics, the economy, and society. Therefore, universities should implement doctoral improvement plans derived from national reviews like the Council of Higher Education National Review Manual: Doctoral Qualifications of 2019, and work on continuously capacitating the supervision process and strengthening both support programs and institutional frameworks to promote timely degree completion (Mashau & Ravhuhali, 2023; Tshuma & Bitzer, 2023).

This study aimed to conduct a bibliometric analysis to ascertain the factors influencing doctoral completion in South African universities. This method allows for a systematic exploration of the factors influencing doctoral completion, providing a foundation for actionable insights. Through an analysis of research published between 1994 and 2024, the study sought to map the intellectual landscape, identify key contributors (authors, institutions, countries, and publications) to discourse in this research area, and explore emerging trends. Based on the results of this analysis, the study seeks to provide insights that can inform national policies and institutional strategies that are intended to improve doctoral completion, particularly considering the historical, socioeconomic, and institutional challenges unique to the country's higher education system. The period under review represents a critical phase in South Africa's post-apartheid educational transformation, making it imperative to examine how doctoral education has evolved in this context. The study was guided by the following research questions:

1. What themes and trends emerged in doctoral education in South Africa from 1994 to 2024, and what shifts can be observed in scholarly focus?
2. Which authors, institutions, countries, and publishers have significantly contributed to the discourse on factors that influence doctoral completion in South Africa?
3. What characterizes the intellectual structure of research on doctoral completion in South African universities from 1994 to 2024?

The rest of the paper is structured as follows. The literature review consists of the historical perspectives on doctoral education within the South African context, doctoral education post the apartheid era, factors affecting doctoral completion, and ways for enhancing doctoral completion. The methodology focuses on the research design, data collection, search string, inclusion and exclusion criteria, and the data analysis. The three research questions guide the findings section. Finally, the findings and study implications (both theoretical and practical) are discussed, and the conclusion is presented.

LITERATURE REVIEW

HISTORICAL PERSPECTIVES ON DOCTORAL EDUCATION IN SOUTH AFRICA

The historical context of doctoral education in South Africa reveals a trajectory marked by systemic challenges and slow progress (Tshuma & Bitzer, 2023). Since 1994, efforts to widen access and promote equity have been substantial, yet doctoral completion remains problematic. More specifically, supervision quality and historical educational inequities have emerged as significant impediments. For instance, historically disadvantaged institutions often grapple with inadequate supervisory capacity, directly affecting student progression and completion (Lategan et al., 2023; Roos et al., 2021). Furthermore, financial constraints exacerbate these challenges, with many candidates unable to secure sufficient funding, despite interventions such as National Research Foundation (NRF) bursaries (Cloete et al., 2015; Reddy, 2017). In addition, institutional support systems remain unevenly distributed, particularly for part-time students who have to balance work and academic commitments (Motseke, 2016). As a result, these historical barriers have left a legacy of inequality and hindered the realization of the ambitious goals outlined in the National Development Plan (van der Berg et al., 2023). Given this historical perspective, it is evident that holistic interventions are necessary to address the financial, institutional, and socio-psychological barriers to doctoral completion in South Africa.

DOCTORAL EDUCATION IN SOUTH AFRICA

Post-1994, the South African higher education sector has undergone significant transformation, with policies aimed at widening access and promoting equity in higher education (Cloete et al., 2015). However, despite these policy efforts, doctoral completion remains problematic due to barriers like inadequate supervision and ethical concerns in student progress assessments (Roos et al., 2021). Moreover, studies show that while doctoral enrolments have increased substantially, completion has stagnated or even declined in some instances (Cloete et al., 2015). In response to these challenges, the National Development Plan (NDP) 2030 outlines ambitious goals for increasing the number of doctoral graduates. It seeks to enhance doctoral graduation rates to 5,000 annually by 2030, but systemic challenges continue to hinder progress (van der Berg et al., 2023). Numerous challenges obstruct the fulfillment of this target.

FACTORS AFFECTING DOCTORAL COMPLETION

Quality supervision remains a cornerstone of doctoral success, providing candidates with the guidance and feedback necessary for academic progression. However, in South Africa, discrepancies in supervision quality, particularly in historically disadvantaged institutions (HDIs), exacerbate completion challenges (Roos et al., 2021). It is important to recognize the South African historical context of HDIs to understand this issue. Specifically, HDIs are institutions (universities and colleges) that were systematically underfunded and marginalized during the apartheid era (colonial era) (Africa & Mutizwa-mangiza, 2018). Notably, these institutions primarily served black, colored, and Indian students, who were denied access to well-resourced, predominantly white institutions. As a result, HDIs faced significant challenges, including inadequate infrastructure, limited research capacity, and a lack of resources to support postgraduate education, such as doctoral programs (Abed & Ackers, 2022). Despite post-apartheid reforms, many HDIs still face resource challenges, affecting their ability to provide adequate supervision and infrastructure for doctoral students. This has contributed to lower doctoral completion rates, perpetuating inequalities in South Africa's higher education system (Cloete et al., 2015).

Effective mentorship fosters resilience, academic growth, and timely completion, yet many supervisors lack adequate training or resources to meet these demands (Lategan et al., 2023). Similarly, the financial burden of pursuing a doctorate is one of the most cited reasons for attrition in South African universities. While schemes like NRF bursaries offer some relief and alleviate some of these financial pressures, their limited scope still leaves many candidates struggling to balance research with part-time employment (Reddy, 2017). Consequently, inadequate funding affects not only students' academic engagement but also their mental health (Casey et al., 2024), highlighting the urgent need for comprehensive financial support policies.

Moreover, institutional support encompasses access to resources, infrastructure, and academic development programs that are crucial for doctoral success. Notably, institutions offering robust support systems, such as accessible supervision and resources, typically report higher doctoral completion rates (Lategan et al., 2023). Therefore, a concerted effort to enhance institutional support mechanisms, particularly in under-resourced institutions, can significantly improve doctoral outcomes and bridge systemic inequities in higher education. In addition, intrinsic motivation and the ability to persevere through setbacks are key determinants of doctoral success. Research shows that students with low self-efficacy are more prone to procrastination and burnout than others, which often leads to attrition (Roos et al., 2021; Williams et al., 2024). As a result, interventions that bolster self-confidence and equip candidates with coping strategies can significantly improve persistence rates, enhancing chances for doctoral completion.

Balancing academic, personal, and professional responsibilities is especially challenging for part-time doctoral students who work full-time. The competing demands of research deadlines, family obligations, and work-related tasks often lead to burnout and prolonged completion times (Rockman et al.,

2022). Moreover, a student's research preparedness, encompassing conceptualizing the problem, literature knowledge, methodological knowledge, academic writing skills, and familiarity with ethical research practices, significantly influences their doctoral journey. Comprehensive training programs, including workshops on research design and academic writing, can bridge these gaps and enhance candidates' readiness (Nwosu et al., 2024). Ultimately, such initiatives would increase the likelihood of doctoral completion.

Additionally, the mental health of doctoral students is increasingly recognized as a critical factor in academic success. High levels of stress, anxiety, burnout, and depression are prevalent among candidates, often stemming from the pressures of research and financial instability (Kismihók et al., 2022). If left unaddressed, these mental health challenges can significantly hinder academic progress. Therefore, integrating mental health support within academic frameworks can significantly enhance student well-being and promote a supportive research environment. Similarly, social and academic integration is essential for doctoral success, as a sense of belonging can mitigate feelings of isolation and disconnection often experienced during this journey (Mishra, 2020). Academic networks, family support, peer collaborations, and supportive supervisor relationships foster a positive environment in which students can thrive (Roos et al., 2021). Often, the resultant support derived from such initiatives can carry a doctoral student towards completion. Finally, female candidates may encounter gender-specific challenges, such as balancing motherhood and academic responsibilities, which require targeted institutional interventions (Bireda, 2015). By addressing these various challenges through structured interventions, universities can create a more inclusive and supportive environment, ultimately improving doctoral completion rates.

DIRECTIONS FOR ENHANCING DOCTORAL EDUCATION IN SOUTH AFRICA

The future success of doctoral education in South Africa lies in adopting comprehensive strategies that address the systemic, institutional, academic, and personal challenges faced by doctoral candidates. Increasingly, there is recognition that enhancing the doctoral journey requires not only financial and infrastructural support but also interventions that consider mental health and well-being (Casey et al., 2024; Kismihók et al., 2022). In addition, emerging research highlights the potential of digital transformation and AI-driven tools to enhance doctoral supervision and streamline administrative processes, thereby alleviating burdens on both students and institutions (Moncayo Cueva et al., 2024). Moreover, fostering inclusive academic environments through tailored support for students from diverse linguistic, cultural, and gender backgrounds is imperative. Gender-specific challenges, such as balancing motherhood and academic responsibilities, further emphasize the need for customized institutional policies (Bireda, 2015). Looking forward, South African universities should prioritize equity and innovation in doctoral education, ensuring that interventions are data-driven and contextually relevant.

METHODOLOGY

RESEARCH DESIGN

Bibliometric analysis involves the use of quantitative techniques to evaluate the academic output within a given research domain, providing insights into publication trends, authorship patterns, and thematic developments (Donthu et al., 2021). This method is particularly suited to mapping the intellectual landscape and identifying the most influential research contributions on a given topic, such as doctoral completion. A comprehensive overview of research on factors influencing the completion of doctoral studies in South Africa was obtained through a bibliometric analysis. Within the field of bibliometric analysis, two main techniques were used: (1) performance analysis, which encompasses publication trends, top contributing authors, top contributing journals, top contributing institutions, and top contributing countries (Sudakova et al., 2022), and (2) science mapping, which encompasses relationships, co-occurrences, and network analysis (Mejia et al., 2021).

DATA COLLECTION AND SEARCH STRING

Given the multidisciplinary focus of this study, we selected the Scopus academic database from among several well-known indexing and abstracting platforms. Notably, Scopus is widely regarded as a reliable, robust, and reputable resource, making it an ideal choice for capturing diverse and multidisciplinary research (Maguraushe et al., 2024). Furthermore, the search was conducted on 14 October 2024 to ensure comprehensive coverage. It included both local and international journals, which ensured that the analysis captured not only global perspectives on doctoral education in South Africa but also those produced in South Africa. The search string used was:

(TITLE-ABS-KEY ('doctoral completion' OR 'PhD completion' OR 'doctoral attrition' OR 'PhD attrition' OR 'doctoral success' OR 'doctoral persistence') AND ('factors' OR 'determinants' OR 'influences' OR 'barriers' OR 'drivers' OR 'challenges') AND TITLE-ABS-KEY ('South Africa' OR 'South African universities') AND PUBYEAR > 1993 AND PUBYEAR < 2025).

INCLUSION AND EXCLUSION CRITERIA

To ensure the relevance and quality of the data, the inclusion criteria were peer-reviewed journal articles, books, book chapters, and conference papers published in English from 1994 to date. Duplicate entries were removed, and only those studies directly related to doctoral education and completion in South African universities were retained for analysis.

DATA ANALYSIS

The collected data was analyzed using Bibliometrix and VOSviewer, the software tools designed for bibliometric mapping and visualization. Bibliometrics was applied for an in-depth bibliometric evaluation, covering citation analysis, thematic mapping, and the identification of research trends, while VOSviewer was used to create visual representations of co-authorship, co-citation, and keyword co-occurrence networks (McAllister et al., 2022). Since this study used secondary literature data, there are minimal ethical concerns.

FINDINGS

A total of 112 journal articles, book chapters, and conference papers were retrieved from the Scopus database. Furthermore, an annual growth rate of 17.68%, with an average citation rate of 14.82, and a total of 8,381 references were noted. In addition, a total of 315 authors were involved, with 24 articles having single authors. Moreover, the rate of co-authorship per document was recorded at 3.02, and an international co-authorship of 24.11% of all studies published on the topic. Table 1 depicts a summary of these results. Although the study focused on publications from the post-apartheid era (i.e., 1994 to date), publications on this subject matter resulted in the period of 2009–2024 being the active publication period.

Table 1. Results of the overview analysis

Description	Results
Timespan	2009–2024
Annual growth rate %	17.68
Document average age	3.61
Average citations per doc	14.82
References	8381
Keywords plus (ID)	180
Authors' keywords (DE)	353
Authors	315

Description	Results
Authors of single-authored docs	24
Single-authored docs	24
Co-authors per doc	3.02
International co-authorships %	24.11
Journals (93), conference papers (13), books and book chapters (6)	112

A more detailed analysis is discussed below with reference to the three research questions.

RQ1: What themes and trends emerged in doctoral education in South Africa from 1994 to 2024, and what shifts can be observed in scholarly focus?

Understanding the themes and trends in doctoral education in South Africa from 1994 to 2024 is essential to identify the persistent challenges and effective practices that influence doctoral completion rates.

Figure 1 shows the number of publications related to doctoral completion in South African universities from 2009 to 2024. It shows a consistent upward trend, with a noticeable increase in 2017 and 2023. Specifically, a notable increase in publications is noted between 2020 and 2021, with 2021 having the highest leap in figures, from 8 to 17. The search was conducted on 14 October 2024, which left a couple of months before the end of the year, in which more publications could have appeared, yet figures were already high. This year saw the highest number of publications (n=23) on doctoral studies within the period under investigation. The growth in publication volume suggests increasing scholarly attention to this issue, probably driven by national and institutional efforts to enhance doctoral success rates.

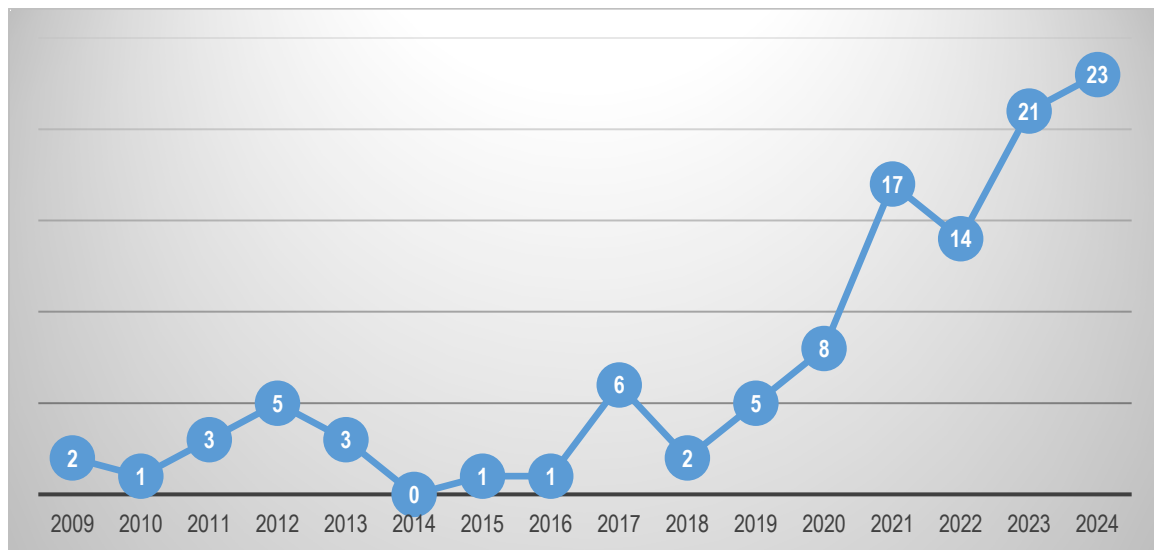


Figure 1. Publication trends

In addition, thematic mapping analysis was conducted to provide insights into the diverse subtopics researched by authors over the years and the general trend of studies on this topic. A thematic map provides a visual representation of the co-occurrence of keywords across the analyzed data (Syed et al., 2023), highlighting connections between key themes. Figure 2 depicts the thematic map conducted in this study.

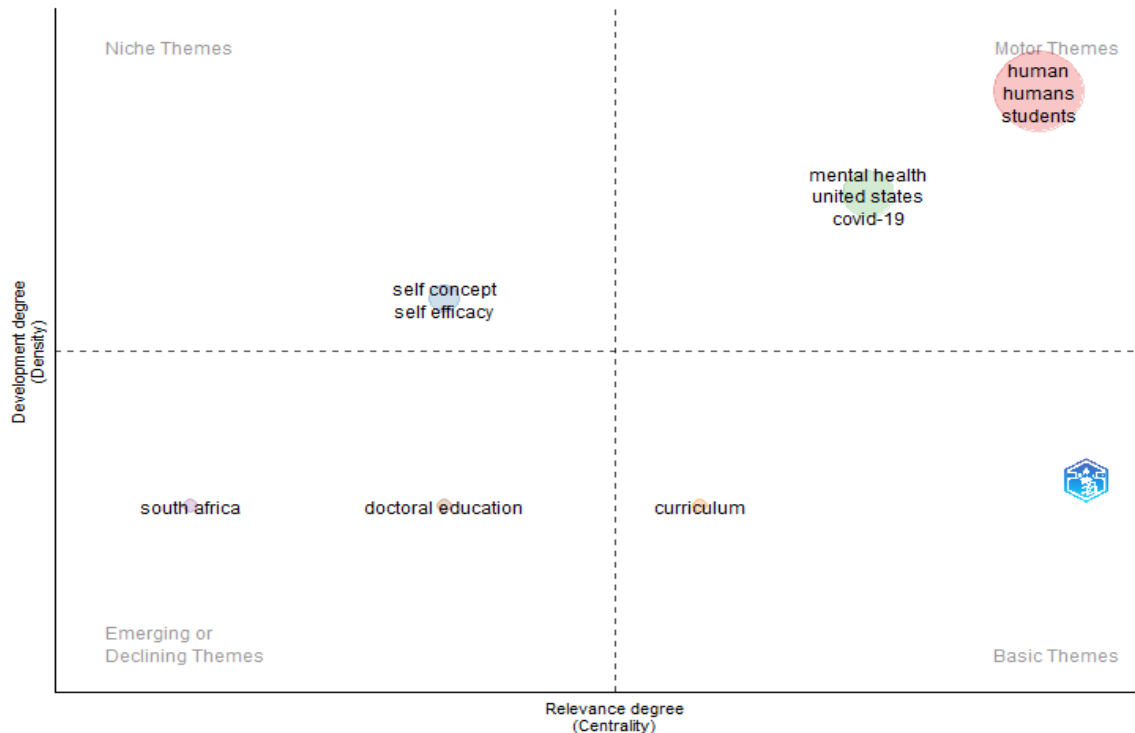


Figure 2. Thematic map (keyword co-occurrence network)

The X-axis shows centrality (degree of relevancy), and the Y-axis shows density (degree of development). The four quadrants were used to map the behavior of themes according to four classifications: basic themes, emerging or declining themes, niche themes, and motor themes (Agbo et al., 2021; Fosso Wamba et al., 2021). Centrality determines the significance of the themes, whereas density evaluates their growth (Wang et al., 2022). Themes in the motor themes quadrant, located on the upper right side, constitute the fundamental elements of the field of study (Maguraushe & Ndayizigamiye, 2024). In this study, these are ‘students’, ‘humans’, ‘mental health’, ‘Covid-19’, and ‘United States’.

The upper left of the theme map depicts the themes in the niche quadrant, which are indicative of advanced development (Wang et al., 2022). In this study, these themes were ‘self-concept’ and ‘self-efficacy’. The themes in the emerging or declining quadrant – in the lower left corner – are both underdeveloped and peripheral to the research topic (Fosso Wamba et al., 2021). These include ‘South Africa’ and ‘doctoral education’.

Lastly, the basic themes quadrant, situated in the lower right of the theme map, denotes areas with elevated centrality values and diminished density values, indicating that they are underdeveloped yet significant within the research domain (Agbo et al., 2021). This resonates with ‘curriculum’, a concept that has been over-discussed yet is central to the theme of doctoral completion rates. Emerging trends can also be revealed by word frequency analysis, which in this case showed the most-used terms in studies on doctoral completion. As Figure 3 shows, the word ‘human’ showed dominance from 2021 onward. The word ‘male’ dominated the doctoral research domain from 2012 but was overtaken by ‘human’ in 2023. The concept of ‘mental health’ seems to have driven the discourse since 2012, with a notable increase from 2019.

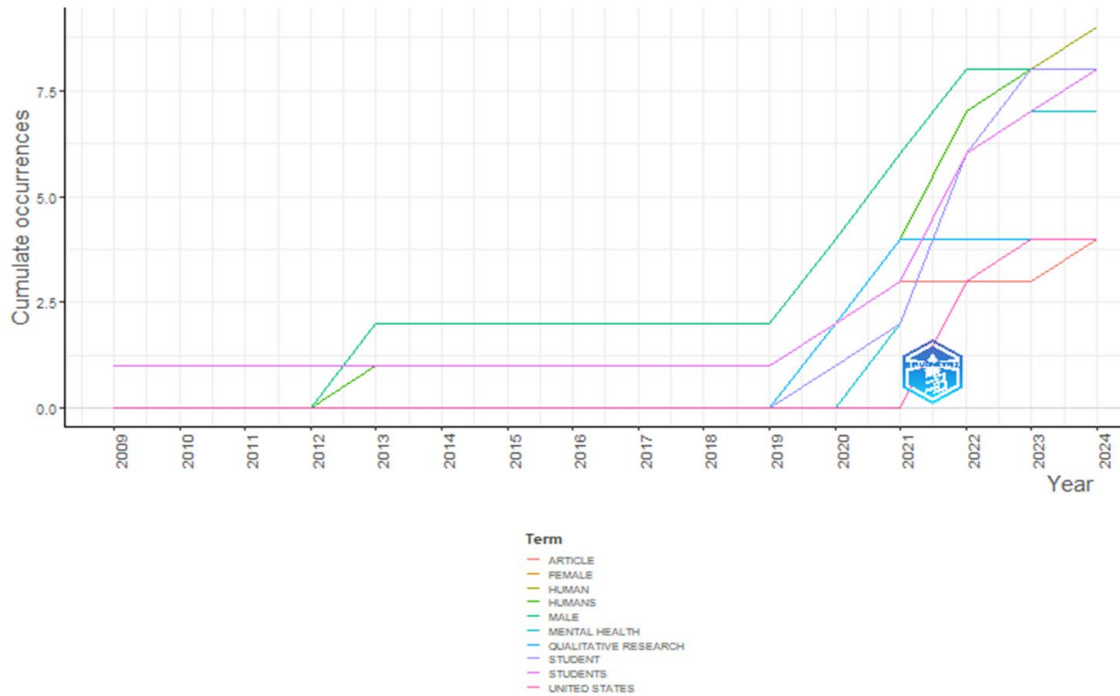


Figure 3. Most frequently used words

The distribution of articles on doctoral completion across journals helps to identify the core journals that have been published on this topic. This helps to answer the question of which journals are the most influential in the discourse on doctoral completion in South Africa. Figure 4 illustrates Bradford's Law, indicating that a small core of journals, such as the *International Journal of Doctoral Studies* and *Perspectives in Education*, accounts for a large proportion of highly relevant articles in the domain. The visualization confirms the concentrated influence of a few journals in disseminating impactful research on doctoral completion rates, while a broader set of peripheral sources contributes less frequently yet diversely.

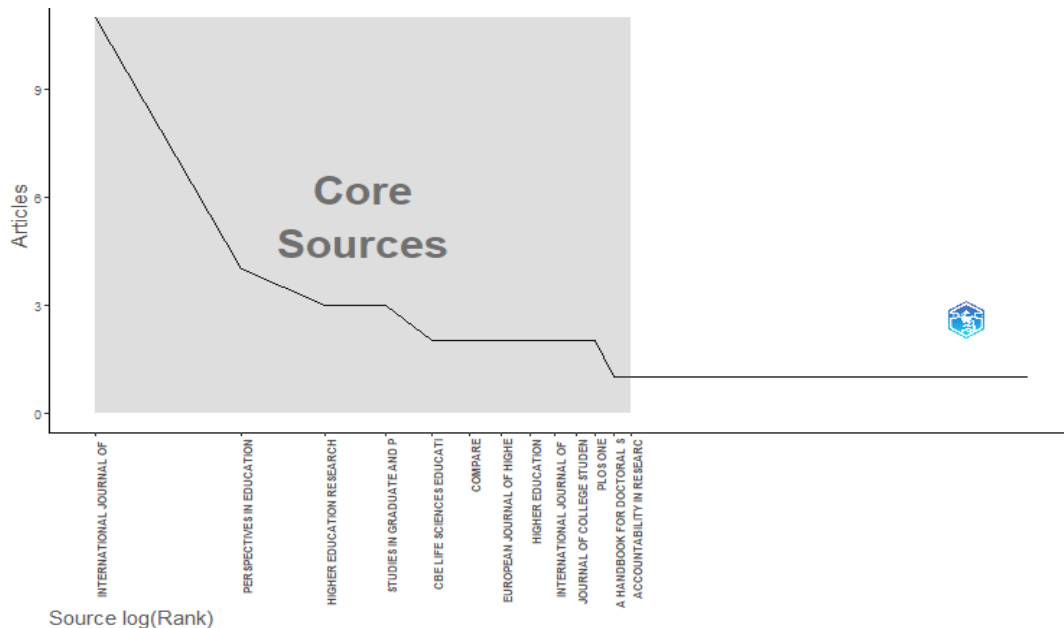


Figure 4. Sources of the literature on doctoral completion, illustrating Bradford's Law

Figure 5 provides a density visualization of keyword co-occurrences found in the literature, from the analysis conducted through VOSviewer. As Figure 5 shows, high-density areas included the keywords ‘doctoral education’, ‘postgraduate supervision’, ‘resilience’, ‘persistence’, ‘attrition rate’, ‘peer support’, ‘mentoring’, ‘self-efficacy’, ‘academic procrastination’, ‘anxiety disorder’, ‘academic workload’ and ‘family business’, reflecting the importance of these factors in the literature. It is also interesting that coaching and mentorship received very little attention. This visualization illustrates the multifaceted approach scholars take in examining doctoral success, in which academic, social, and personal factors are all recognized as influential.

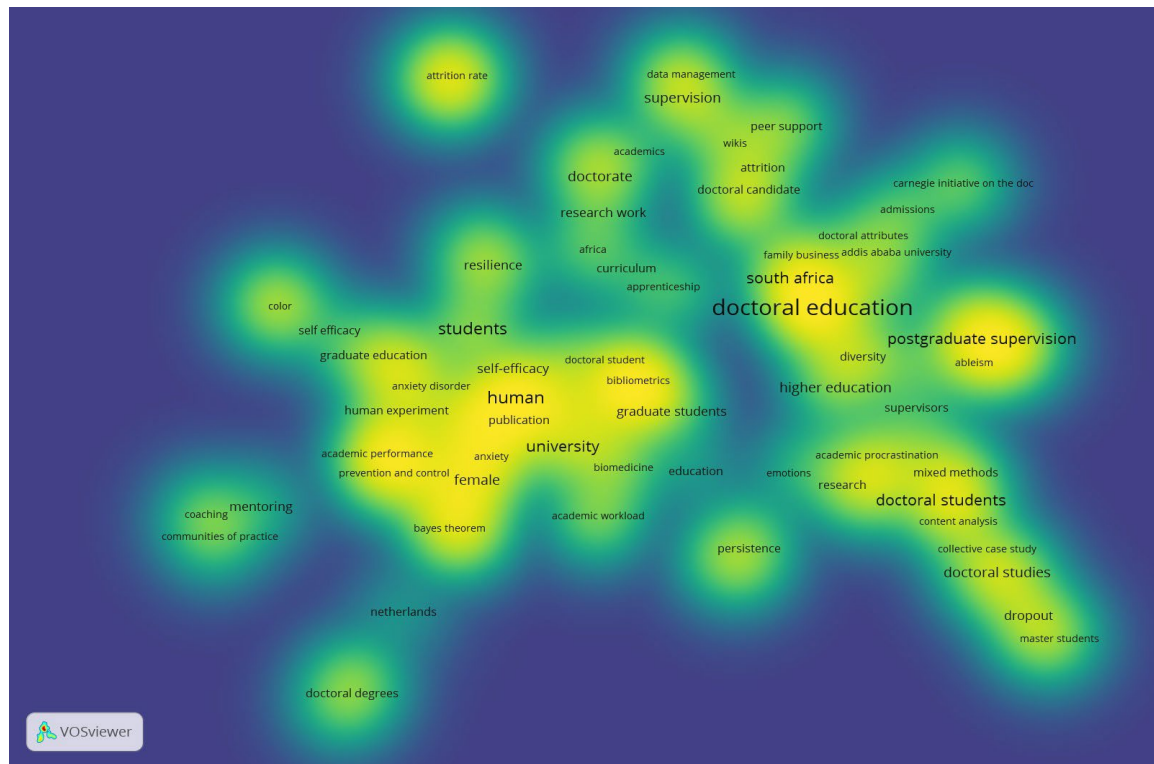


Figure 5. Density visualization of keyword co-occurrence

RQ2: Which authors, institutions, countries, and publishers have significantly contributed to the discourse on factors that influence doctoral completion in South Africa?

Substantial effort was also made in this study to reveal the leading scholars/authors, affiliations/institutions, countries, and journals/publications on doctoral completion in South Africa. The results of this search provided insights into the authors who contributed most frequently to the literature on doctoral completion in South Africa.

Figure 6 shows the authors who have published the most on doctoral completion. Pythalto K. stands out, with six publications on doctoral completion in the South African context. Anttila H., Jansen E.P.W.A., Matheka, H.M., and McKenna S. follow, with three publications each, indicating their central role in advancing research in this area. These authors have been influential in shaping the discourse on doctoral completion.

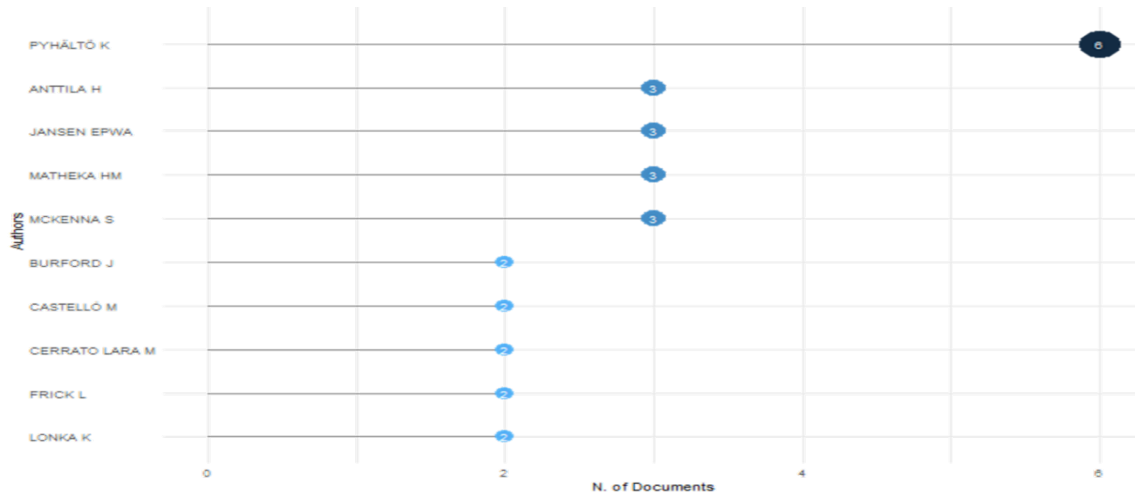


Figure 6. Most relevant authors

Table 2 highlights the top academic sources contributing to research on doctoral completion rates.

Table 2. Leading publications/sources

Source	h-index	g_index	m_index	TC	NP	PY_start
International Journal of Doctoral Studies	7	11	0.539	121	11	2012
Perspectives in Education	4	4	0.286	69	4	2011
Compare	2	2	0.400	19	2	2020
European Journal of Higher Education	2	2	0.667	8	2	2022
Higher Education	2	2	0.333	56	2	2019
Higher Education Research and Development	2	3	0.250	101	3	2017
International Journal of Learning	2	2	0.133	6	2	2010
Journal of College Student Retention: Research, Theory and Practice	2	2	0.667	8	2	2022
PLOS One	2	2	0.167	98	2	2013
A Handbook for Doctoral Supervisors	1	1	0.125	17	1	2017

Table 3 presents institutions with the highest contribution to publications on doctoral completion in South Africa. Table 2 shows that the *International Journal of Doctoral Studies* is the leading source, reflected by a high h-index of 7, a g-index of 11, and a total citation count (TC) of 121. It is followed by *Perspectives in Education*, which, while having a lower h-index of 4, maintains a strong regional focus on South African doctoral challenges and a TC of 69. Other journals such as *Compare* and the *European Journal of Higher Education* have lower h-indices ($n = 2$) but show potential for growth, since these publications started only recently, in 2020 and 2022, respectively. The m-index values indicate the rate of citation growth, with the *European Journal of Higher Education* and *Journal of College Student Retention: Research, Theory and Practice* having the highest m-index ($n = 0.6667$), suggesting rapid citation accumulation relative to these publications' start years. Notably, *A Handbook for Doctoral Supervisors* (with an h-index of 1) addresses supervisory practices, a recurring theme in the literature. The presence of

diverse, highly cited journals illustrates a multidisciplinary engagement with doctoral completion, integrating educational theory, higher education policy, and supervisory practices.

Table 3. Most relevant affiliations

Affiliation	Articles
University of Helsinki	10
University of South Africa	10
Stellenbosch University	7
University of Arkansas, Fayetteville	7
University of Western Cape	7
James Cook University	6
University of Groningen	6
University of Nevada	6
Vrije Universiteit Brussel	6
Indiana University Bloomington	5

The University of Helsinki and the University of South Africa (UNISA) lead with 10 publications each, suggesting a strong institutional focus on this research area, possibly owing to both universities' dedication to improving doctoral outcomes through strategic research initiatives. In South Africa, Stellenbosch University and the University of the Western Cape, with seven articles each, demonstrate a concentrated regional commitment to understanding completion rates. International institutions such as the University of Arkansas, Fayetteville, and Vrije Universiteit Brussel contributed notable volumes, which signals growing global collaboration in doctoral education research, particularly in contexts with unique socio-political challenges like South Africa. These affiliations indicate both a strong domestic research base and the rising interest of international institutions in South African doctoral education.

Table 4 shows the distribution of the corresponding authors' countries, based on Single-Country Publication (SCP), Multiple-Country Publication (MCP), and Percentage of Multiple-Country Publications (MCP%). The corresponding authors' countries reflect the institutional affiliation of the lead researcher(s) and highlight where research interest and expertise in doctoral completion studies are concentrated.

Table 4. Corresponding authors' countries

Country	Articles	Articles %	SCP	MCP	MCP %
South Africa	19	16.96	16	3	15.79
USA	9	8.04	7	2	22.22
Australia	6	5.36	6	0	0.00
Finland	5	4.46	0	5	100.00
United Kingdom	5	4.46	4	1	20.00
Ghana	3	2.68	1	2	66.67
India	3	2.68	3	0	0.00
Kenya	3	2.68	1	2	66.67
Spain	3	2.68	2	1	33.33
Belgium	2	1.79	2	0	0.00

Most corresponding authors are from South Africa ($n = 19$), reflecting the country's strong focus on understanding and addressing the specific factors influencing doctoral completion in its national context. This dominance is aligned with national policy efforts aimed at improving doctoral throughput, including the National Development Plan and targeted research funding initiatives such as the University Capacity Development Program (UCDP).

Although South African authors lead the research, there is substantial international interest, particularly from countries like the USA ($n = 9$), Australia ($n = 6$), Finland ($n = 5$), and the United Kingdom ($n = 5$). Notably, African countries like Ghana, Kenya, and India have corresponding authors contributing to this area of research, each with three publications. This demonstrates an emerging regional collaboration and growing interest in doctoral education challenges in the broader context of African and developing countries. Spain ($n = 3$) and Belgium ($n = 2$) also appear in the dataset. The data illustrate that while South African researchers are driving the discourse on factors influencing doctoral completion in South Africa, the significant presence of international corresponding authors suggests that doctoral education is a globally relevant issue.

Figure 7 illustrates the progression of research output by country on South African doctoral completion rates. South Africa experienced a substantial output during the period under review, growing markedly from around 2017, reflecting policy efforts to address educational equity and doctoral success. Notably, the United States has shown exponential growth from 2022 to date. The United Kingdom, Australia, and Spain also contributed significantly, showing sustained international interest in South Africa's doctoral education.

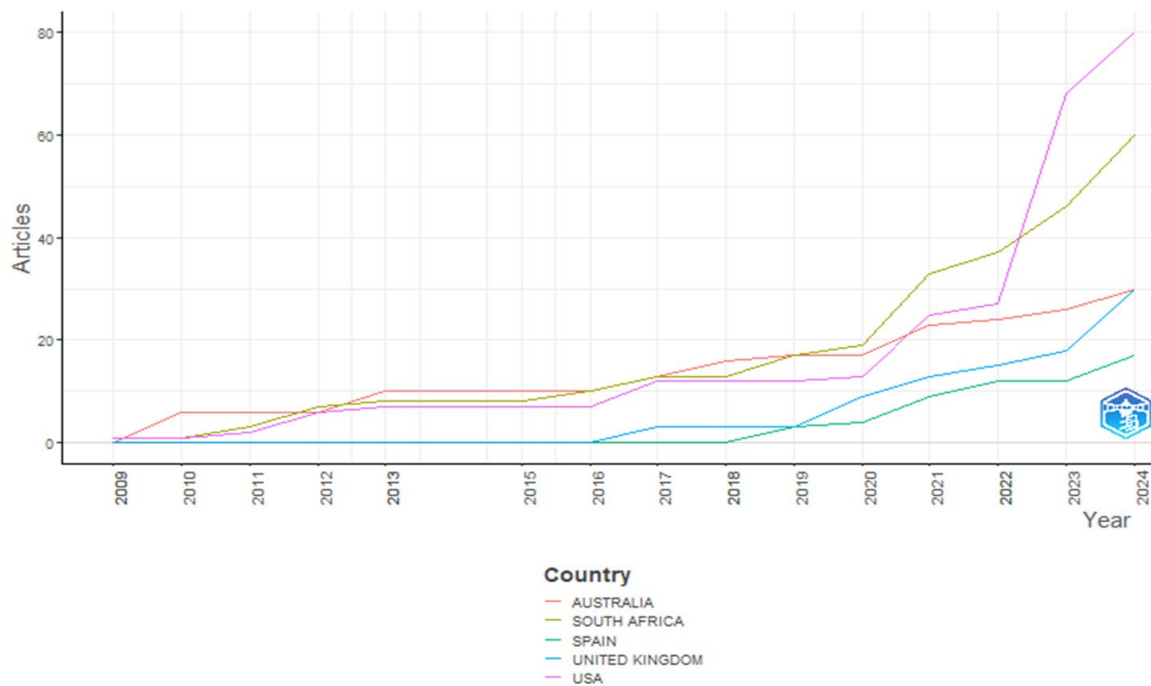


Figure 7. Country production over time

Figure 8 indicates the most cited countries in research on factors influencing doctoral completion in South Africa.

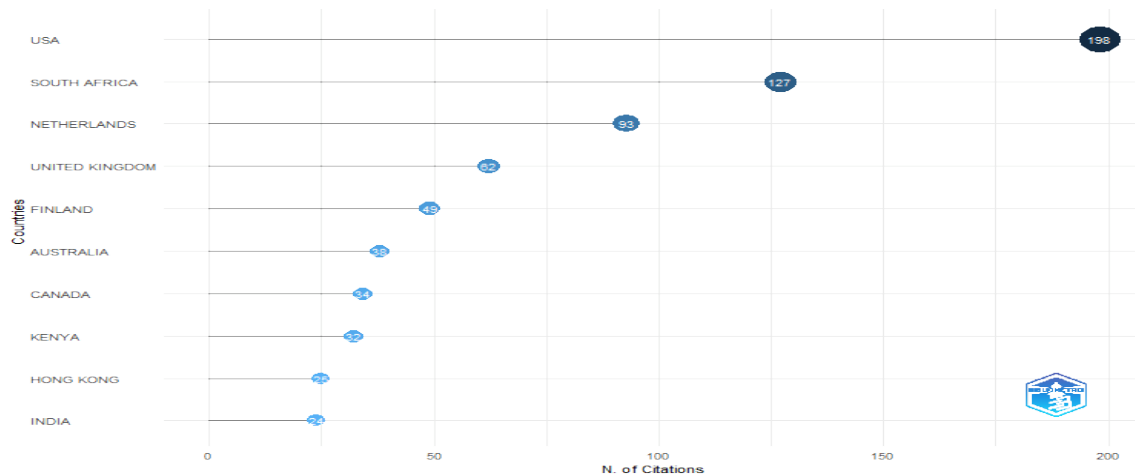


Figure 8. Most cited countries

Citation counts indicate the influence and impact of research from various countries on the academic discourse on doctoral education. The USA emerges as the most cited country in South Africa for research on factors influencing doctoral completion, with 198 citations. This high citation count reflects the global influence of American educational research on doctoral education, particularly in areas such as supervision, student well-being, and academic support. South Africa, with 127 citations, is the second most cited country, reflecting its strong local research output on the topic. South African scholars are deeply engaged in understanding the country's specific challenges related to doctoral completion, such as supervision quality, equity in higher education, and institutional support systems. The dominance of the USA and South Africa in citation counts highlights the balance between global knowledge transfer and local research output. While South African scholars are deeply engaged in addressing context-specific challenges, research from countries like the USA and the UK provides comparative insights and frameworks that can be adapted to local needs.

Figure 9 shows a Three Fields Plot, visually capturing the connections between authors, keywords, and institutional affiliations within doctoral completion research in South Africa. The Three Fields Plot identifies the leading institutions. UNISA and Stellenbosch University are clearly the leading institutions in South Africa when it comes to research on doctoral completion, showing their strong influence and publication output on key themes like 'postgraduate supervision', 'doctoral education', 'doctoral students', 'doctoral education', and 'dropout'. Internationally affiliated universities, particularly from the United States, Australia, Belgium, the Netherlands, Spain, the United Kingdom, Finland, Canada, and Pakistan, also feature in the plot, pointing to collaborative research efforts that blend global insights with South Africa's unique educational landscape. This networked structure of the Three Fields Plot illustrates the collaborative and thematic interconnections shaping South Africa's doctoral research landscape, where local and international research efforts collectively drive understanding and progress in addressing doctoral completion challenges.

Table 5 depicts the authors whose works have garnered substantial attention in this field. Gutiérrez y Muhs et al. (2012) have the highest citation count (TC = 687), with an annual citation rate of 52.85, indicating sustained relevance in discussions on the subject matter. Similarly, Satinsky et al. (2021) and Huerta et al. (2017) have moderately high total citations (95 and 90, respectively), underscoring the prominent theme of the social and psychological factors influencing doctoral completion rates. The high citation counts per year suggest that research addressing diversity, well-being, and institutional support resonates strongly with the academic community, reinforcing the importance of these themes in doctoral completion discourse.

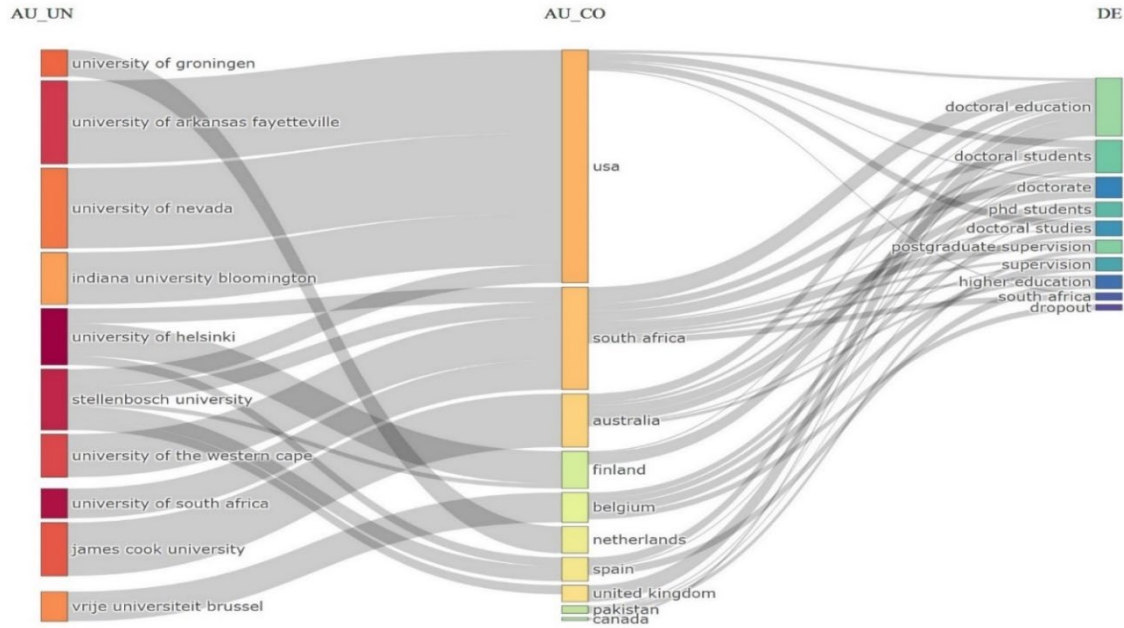


Figure 9. Three fields plot

Table 5. Author scientific production

Author(s), Title, Publisher	DOI	TC	TC per year	Normalised TC
Gutiérrez y Muhs et al. (2012), <i>Presumed Incompetent: The Intersections of Race and Class for Women in Academia</i> , Univ. Press of Colorado	10.2307/j.ctt4cgr3k	687	52.846	4.791
Satinsky et al. (2021), <i>Systematic review and meta-analysis of depression, anxiety, and suicidal ideation among Ph.D. students</i> , Sci Rep	10.1038/s41598-021-93687-7	95	23.750	7.690
Huerta et al. (2017), <i>Graduate students as academic writers: Writing anxiety, self-efficacy and emotional intelligence</i> , High Educ Res Dev	10.1080/07294360.2016.1238881	90	11.250	2.983
van de Schoot et al. (2013), <i>What Took Them So Long? Explaining PhD Delays among Doctoral Candidates</i> , PLOS One	10.1371/journal.pone.0068839	77	6.417	2.718
Raineri (2015), <i>Critical Perspectives on Accounting Business doctoral education as a liminal period of transition: Comparing theory and practice</i> , Crit Perspect Account	10.1016/j.cpa.2013.11.003	47	4.700	1.000
Bekkouche et al. (2021), <i>"Simmering Pressure": How Systemic Stress Impacts Graduate Student</i>	10.1002/piq.21365	34	11.333	4.250

Author(s), Title, Publisher	DOI	TC	TC per year	Normalised TC
<i>Mental Health, Perform Improv Q</i>				
McCray and Joseph-Richard (2020), <i>Towards a model of resilience protection: factors influencing doctoral completion</i> , High Educ	10.1007/s10734-020-00507-4	31	6.200	2,756
Mouton (2011), <i>Doctoral production in South Africa: statistics, challenges and responses</i> , Perspecti Edu	10.38140/pie.v29i3.1691	31	2.214	1.525
Manyike (2017), <i>Postgraduate supervision at an open distance e-learning institution in South Africa</i> , SAJE	10.15700/saje.v37n2a1354	27	3.375	0.895
Gube et al. (2017), <i>Towards "Operating Within" the Field: Doctoral Students' Views of Supervisors</i> , Int J Doctoral Studies	10.28945/3641	25	3.125	0.829

Note: TC = total citations

RQ3: What characterizes the intellectual structure of research on doctoral completion in South African universities from 1994 to 2024?

The study also sought to understand the structure of research on doctoral completion in South Africa during the period under review. This was achieved by examining the co-occurrence network for frequently used words. Figure 10 shows the VOSviewer network visualization diagram, comprising a keyword co-occurrence map that identifies the most frequently used terms in research on doctoral completion in South African universities. The keywords ‘supervisor’, ‘doctoral supervision’, ‘doctoral program’, ‘uncertainty’, ‘process’, ‘resilience’, ‘peer’, ‘self-efficacy’, ‘family’, ‘time’, and ‘anxiety’ appear centrally, indicating that these topics are pivotal in the literature. Clusters within the map suggest distinct research themes, such as supervision quality, institutional support, and sociocultural challenges, each connected to the overarching topic of doctoral completion.

This map reveals the interconnectedness of these themes, reflecting the comprehensive nature of research in the field, in which student well-being, academic support, and structural factors are all seen as essential aspects. In the authors’ co-citation network in Figure 10, connections among frequently cited scholars show collaborative ties between South African and international researchers. Key authors in the field would be central in these clusters, indicating their influence and the interconnectedness of their research. This network reveals that South African studies frequently reference global frameworks while contributing uniquely context-specific insights to the global discourse on doctoral completion.

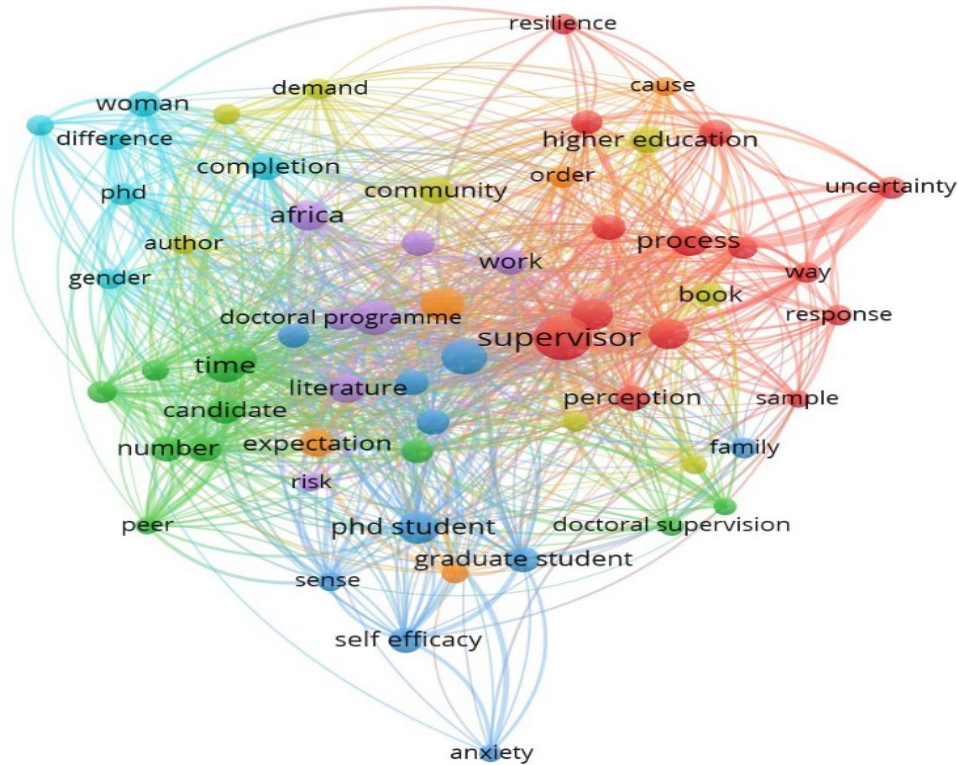


Figure 10. Co-occurrence of keywords

Figure 11 depicts the overlay author citation map, offering key contributors to doctoral completion research and showing how the impact of authors has shifted over time. A review of the documents produced by these authors shows that Gutiérrez y Muhs et al. (2012) are prominent in their work on race and gender in academia and are often cited in discussions of equity in doctoral programs. Satinsky et al. (2021) are influential in research on student well-being, providing valuable insights into the psychological challenges doctoral students face, which has recently gained more attention in the field. Long-standing contributors such as Mouton (2011) remain highly cited, especially on the themes of anxiety, self-efficacy, and emotional intelligence, which form the backbone of understanding doctoral persistence in South Africa. The overlay structure of this map highlights more recent focus areas, such as mental health, suggesting that emerging researchers are building on these foundational works to address contemporary issues in doctoral education.



Figure 11. Authors' co-citation analysis

Figure 12 maps out country co-occurrence, showcasing the geographical spread of doctoral completion in South Africa and hence international interest in the topic. Figure 12 shows that South Africa, the United States, and the United Kingdom form the most prominent nodes, signifying frequent joint contributions and co-authored studies. Other significant nodes are Australia, the Netherlands, Finland, Canada, Spain, New Zealand, and Pakistan. This cross-national network illustrates that South African doctoral education is not only a local priority but a topic of global relevance, drawing input from countries with strong higher education frameworks. The connections between South Africa and other countries suggest that collaborative approaches are instrumental in addressing challenges such as supervision quality, equitable access, and support systems in doctoral education.

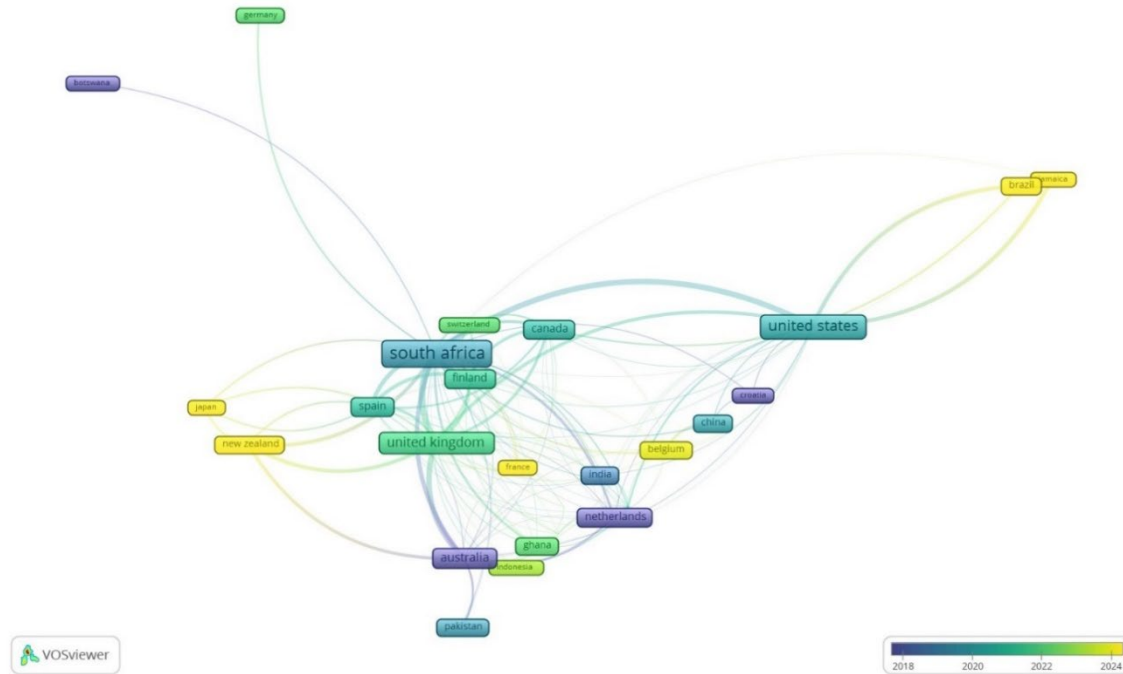


Figure 12. Overly visualization of the country's bibliographic coupling

DISCUSSION AND IMPLICATIONS

The low doctoral completion rates in South African universities reflect multi-dimensional barriers that affect students' academic journeys, particularly in institutions shaped by a post-apartheid legacy. In this regard, the paper gives a qualitative analysis of the research questions.

Question 1 was "What themes and trends emerged in doctoral education in South Africa from 1994 to 2024, and what shifts can be observed in scholarly focus?" To begin with, the discourse on doctoral completion in South Africa reflects a dynamic intersection of policy shifts, evolving methodologies, and socio-political transformation. Since the end of apartheid in 1994, the higher education sector has prioritized redressing historical inequalities, which significantly influence doctoral education (Cloete et al., 2015). Policies such as the National Development Plan 2030 underscore the importance of doctoral outputs for national development, aiming to graduate 5,000 doctoral candidates annually by 2030, as pronounced by van der Berg et al. (2023). However, systemic inequities persist, affecting the educational success of students from under-resourced backgrounds or historically disadvantaged institutions, as alluded to by Xulu et al. (2024). Moreover, the theoretical frameworks underpinning the discourse have evolved over time. Initially, research focused on individual attrition factors (Spaulding & Rockinson-Szapkiw, 2012). But more recently, socio-constructivist and equity-driven models have gained prominence. Thus, recent work increasingly focuses on structural barriers, including supervision capacity and institutional support (Tshuma & Bitzer, 2023). This shift reflects a growing recognition of the interplay between individual agency and institutional responsibility.

Furthermore, the post-apartheid socio-political context remains a critical lens through which this evolution is viewed. For example, the expansion of doctoral enrolments post-1994 has not been matched by proportional increases in completion rates, especially among black South African candidates (Motseke, 2016). This discrepancy highlights the lasting effects of apartheid-era disparities, particularly inadequate academic preparation at the primary and secondary levels. Considering these challenges, integrating a historical lens within the discourse underscores the importance of equity-driven interventions, such as mentorship programs and targeted funding. As a contribution of the

study, the identification of thematic trends and gaps in the literature provides new insights into systemic barriers and equity-driven interventions.

The second research question was “Which authors, institutions, countries, and publishers have significantly contributed to the discourse on factors that influence doctoral completion in South Africa?” Notably, a handful of contributors, such as Pythalto K., Antila H., and Jansen E.P.W.A, have significantly shaped discussions on doctoral completion, as shown in Figure 6. Common themes for these authors are supervision challenges and inequity in higher education. Regarding institutions, Figure 9 shows that UNISA and Stellenbosch University lead in publication output, reflecting their role in driving research agendas. However, the influence of these contributors extends beyond publication metrics. For instance, Stellenbosch University’s research has informed supervision training programs aimed at addressing capacity gaps (Lategan et al., 2023).

International collaborations have also played a pivotal role in advancing the discourse. Partnerships with institutions like the University of Helsinki and Vrije Universiteit Brussel have facilitated knowledge exchange, particularly around addressing local challenges like mental health and socioeconomic barriers (Spaulding & Rockinson-Szapkiw, 2012). These collaborations have introduced global best practices, advocating the adaption of these practices to the South African context. For example, the integration of resilience-based supervision models, inspired by international frameworks, has begun addressing attrition issues. Despite these advances, the influence of these contributions on policymaking and curriculum design warrants deeper exploration. For instance, while thematic areas like supervision quality have received scholarly attention (Nwosu et al., 2024), their incorporation into institutional policies remains uneven. Strengthening these links would ensure that research insights directly inform practices, such as the design of equitable funding models or enhanced doctoral support systems.

Lastly, thematic analysis suggests that underexplored areas such as intersectionality, technology-enhanced supervision, and mental health require further attention. For example, a few studies have examined how intersecting identities, such as gender and socioeconomic status, influence doctoral trajectories. Researching these dimensions could illuminate barriers faced by marginalized groups and inform tailored interventions (Bireda, 2015). Furthermore, leveraging technology in supervision is another promising direction. Tools such as machine learning could predict at-risk students based on academic and behavioral patterns, enabling timely interventions. Furthermore, virtual supervision platforms could address geographic and resource disparities, which would be particularly valuable for candidates in rural areas.

An interdisciplinary approach is critical to addressing complex issues like mental health and financial constraints. Collaborations between education researchers, psychologists, and economists could yield comprehensive strategies, such as integrating mental health support into institutional frameworks or designing scalable funding models. For example, studies linking financial instability with attrition rates suggest that targeted bursary schemes could significantly improve completion rates, according to Rigler et al. (2017). Better still, stakeholder engagement is essential for grounding future research in practical realities. For instance, doctoral candidates could provide insights into their lived experiences, while supervisors and institutions could highlight systemic barriers. Policymakers, in turn, could ensure that research recommendations align with national priorities.

THEORETICAL IMPLICATIONS

This study contributes to the body of literature on doctoral completion by applying a bibliometric lens to explore a long-standing educational issue in a distinct socio-political context. By examining the structural and individual factors affecting doctoral completion, this study highlights the complex interplay between historical inequities and current educational frameworks. The theoretical implications highlight the importance of sociocultural and institutional theories in understanding doctoral attrition, aligning with models that consider both personal and contextual determinants of academic success (Tshuma & Bitzer, 2023).

PRACTICAL IMPLICATIONS

The study suggests strategies for addressing systemic barriers, such as increasing funding for historically disadvantaged institutions, implementing equity-driven policies to support underrepresented groups, and creating national frameworks to standardize supervision practices. Additionally, the study recommends ways to enhance supervision quality, such as providing training for supervisors on equity and inclusion, leveraging technology to facilitate remote supervision, and fostering collaborative supervision models to reduce the burden on individual supervisors. Furthermore, the study also proposes targeted interventions to improve access and support for marginalized students, such as mentorship programs, financial aid packages, and initiatives to address intersectional challenges like gender and race.

CONCLUSION

This study examined the factors influencing doctoral completion in South African universities between 1994 and 2024, exploring how the discourse has evolved, identifying key contributors, and suggesting future research directions. The findings reveal a growing focus on doctoral completion, particularly after 2017, driven by national efforts to improve success rates. Over time, the discourse has shifted from individual-level explanations to the role of systemic challenges. Furthermore, the enduring impact of apartheid-era inequities highlights the need for equity-driven interventions to support underrepresented groups. In this regard, key contributors have significantly shaped the field. Their work, in turn, has informed frameworks for addressing barriers to completion, although more effort is needed to translate these contributions into practical outcomes like improved policies and supervision practices. Additionally, international collaborations have enriched the discourse, bringing innovative perspectives to local challenges.

While this study uses secondary data from the Scopus database, it is important to acknowledge potential biases. These include the exclusion of non-indexed or regionally focused research, which may limit the representation of certain perspectives. Additionally, Scopus's emphasis on English-language publications may overlook valuable contributions in other languages. These biases could influence the comprehensiveness of the findings, and we recognize that they may affect the generalizability of the results.

Future research should address underexplored areas such as intersectionality, cultural and linguistic diversity, and integrating ICT tools in supervision. To be effective, these efforts should adopt interdisciplinary approaches and involve stakeholders like doctoral candidates, supervisors, and policy-makers. By so doing, solutions can be grounded in real-world challenges. Lastly, the bibliometric analysis advances discourse on doctoral completion rates in South Africa by providing a unique, data-driven perspective. This approach not only complements existing qualitative and quantitative research but also explicitly identifies gaps and priority areas for future research and policy intervention.

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