

Systematic Review and Bibliometric Approach in Vocational Education and Training Research

Shyanti Bhattacharyya*, Dr. Ajay Kumar Singh**

*Research Scholar, Department of Education, Assam University, Silchar (First Author)

**Professor, Department of Education, Assam University, Silchar (Second Author)

Abstract

Vocational Education and Training (VET) plays a central role in modern education ecosystems by not only fostering specific technical abilities but also by influencing socioeconomic development and environmental sustainability. Bibliometric analysis provides a systematic mechanism to examine the evolution and structure of academic disciplines. A systematic literature review (SLR) follows a structured and transparent methodology to identify, evaluate, and synthesize scholarly work from major academic databases such as Web of Science, Scopus, and Google Scholar. In the context of Vocational Education and Training (VET), bibliometric research plays an important role in identifying prevailing trends and assessing scholarly productivity. Such analyses evaluate the contributions of stakeholders—including authors, journals, institutions, and countries—and present findings in a structured and comprehensible format (Karantali & Panagiotidis, 2025). The findings of the study suggested that strengthening Vocational Education and Training systems is instrumental in advancing Sustainable Development Goals related to quality education and decent work. A robust VET framework supports the development of a skilled, adaptable, and resilient workforce capable of responding to evolving economic and technological demands.

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I. Introduction

Sustainable Development Goal 4 underscores the necessity of inclusive, equitable, and quality education that supports lifelong learning opportunities. One of the primary pathways for achieving this target is through the systematic development of practical competencies via Technical and Vocational Education and Training (TVET). TVET has increasingly been recognized for its capacity to bridge theoretical knowledge with workplace demands, thus promoting employability and contributing to overall national well-being (Mathur et al., 2022; Fam et al., 2024).

Vocational Education and Training (VET) plays a central role in modern education ecosystems by not only fostering specific technical abilities but also by influencing socioeconomic development and environmental sustainability. Vocational programmes provide experiential, hands-on learning that directly aligns with evolving labour market requirements (Kaushik, 2014). Despite this potential, in contexts like India, many students enter VET after completing formal education, pointing to perceptions of VET as a secondary option and indicating lingering societal bias toward academic tracks (Ahmed, 2016). Socio-demographic patterns further show gender and economic disparities, with higher male and disadvantaged cohort representation in advanced VET enrolments (Vincent & Rajasekhar, 2023).

The persistent divide between school-based learning and employability remains a challenge, and there is broad agreement that vocational programming and structured apprenticeships are key levers for improving employment outcomes among school leavers (Ryan, 2001). In response, India's policy environment has progressively emphasised skill development and vocational integration. The vision for vocational learning traces back to Mahatma Gandhi's "Nai Talim," advocating work-centred education. The National Policy on Education 1986 formally introduced structured vocational programmes, and more recent frameworks have sought to unify and strengthen vocational pathways.

A major milestone in policy integration was the evolution of the National Skills Qualifications Framework (NSQF), which adopts an outcome-based approach articulated through eight competency levels. The NSQF is designed to align Indian qualifications with international standards, enhance educational mobility, and support progression pathways across academic and vocational streams. However, implementation challenges persist, particularly in operationalising National Occupational Standards (NOS) and ensuring consistent quality assurance across training providers.

The National Skill Development Policy emphasises inclusive access to recognised qualifications for domestic and global labour markets and sets targets for women's participation in skill training. Quality

assurance functions under the policy include validation of qualifications, accreditation, learner assessment, and linkages with labour market information systems, while promoting industry partnerships and digital integration (Eggenberger, Rinawi&Backes-Gellner, 2018). Recent state initiatives, such as Karnataka's Skill Development Policy 2025–2032, highlight the adoption of digital technologies, including AI tools, for training and career guidance, reflecting a broader trend toward future-ready skill ecosystems.

Contemporary reforms in India also reflect the National Education Policy 2020 (NEP) commitment to vocational integration. NEP mandates vocational exposure from Grade 6 onwards and proposes a credit-linked NSQF structure where vocational credits can contribute toward academic credentials, thereby fostering permeability between vocational and general education streams. Furthermore, new policy directives in 2025 have introduced the Apprenticeship Embedded Degree Programme (AEDP), requiring on-the-job training as part of higher education degrees to strengthen employability through direct industry engagement.

Globally, countries like Germany and Denmark sustain dual education systems that combine classroom learning with substantial workplace apprenticeships, consistently yielding high youth employment outcomes and smoother transitions to skilled work. Evidence from the Andalusian region of Spain also shows that dual training models enhance labour market integration. Within the European Union, more than 400 policy initiatives have institutionalised work-based learning, demonstrating diverse top-down and bottom-up approaches to VET reform. International comparative efforts also include proposals under the OECD and PISA to assess vocational outcomes systematically and benchmark professional skills across countries.

Recent research highlights new dimensions in VET. Bibliometric studies reveal macro-level trends in VET research and point to evolving global priorities such as digitalisation, innovation, and workforce transformation. Cutting-edge empirical work explores the impact of generative AI on teaching and learning within vocational contexts, identifying both enhanced instructional efficiency and risks of reduced metacognitive engagement. Other studies quantify the influence of VET offerings using data-driven models to map course, job, and skill networks, underscoring the differential impacts of vocational education across economic sectors. Research on micro-credentials further emphasises modular, competency-focused certification as a growing trend in AI-driven educational models that complement traditional vocational pathways.

Significant contemporary challenges also persist. For example, VET completion rates in some countries remain modest despite increased enrolments, pointing to retention and support issues. Additionally, quality regulation continues to be a concern, as evidenced by recent enforcement actions leading to the de-registration of non-compliant training providers. In India, although the demand for vocational training is rising, structural gaps in curriculum relevance, institutional capacity, and sustained industry partnerships continue to limit the system's potential.

In conclusion, VET remains central to sustainable development strategies aimed at enhancing employability, economic resilience, and social inclusion. Continued research, strengthened policy coherence, and responsive implementation mechanisms are essential for ensuring that vocational education delivers meaningful skill development outcomes and aligns with contemporary labour market needs.

1.1 Bibliometric Analysis for review of literature

A systematic literature review (SLR) follows a structured and transparent methodology to identify, evaluate, and synthesize scholarly work from major academic databases such as Web of Science, Scopus, and Google Scholar. The objective is to ensure methodological rigor and replicability so that other researchers can reproduce the process and obtain comparable findings (Linnenluecke, Marrone& Singh, 2020). Unlike conventional literature surveys, a systematic review clearly defines search strategies, inclusion and exclusion criteria, and analytical procedures to minimize bias.

Although review articles and bibliometric studies both examine existing literature, they differ in methodological orientation. A traditional review article integrates dispersed research findings to provide conceptual clarity and thematic synthesis across a domain. In contrast, bibliometric analysis applies quantitative techniques to publication metadata, focusing on citation counts, co-authorship networks, keyword occurrences, and statistical indicators of research performance (Ellegaard & Wallin, 2015). While narrative reviews emphasize interpretative synthesis, bibliometric studies rely on measurable data patterns to map the intellectual structure of a field.

Bibliometric analysis provides a systematic mechanism to examine the evolution and structure of academic disciplines. It enables scholars to identify influential works, research clusters, collaboration networks, emerging themes, and conceptual linkages across publications (Öztürk, Kocaman&Kanbach, 2024). Over the past decade, bibliometric techniques have gained considerable traction in education and management research due to increased access to large-scale digital databases and advanced analytical software (Donthu, Kumar &Pattnaik, 2020; Donthu et al., 2021; Khan et al., 2021).

Through performance metrics and network visualization, bibliometrics assists in recognizing leading authors, productive institutions, high-impact journals, and dominant countries within a research domain

(Hashem E. et al., 2023). For example, a bibliometric investigation by Macha, Urío, and Manase (2023) examined the contribution of VET to entrepreneurial competency development and revealed patterns of collaboration and thematic progression. The growing availability and accessibility of analytical tools such as VOSviewer have significantly enhanced the efficiency and accuracy of bibliometric studies (Passas, 2024). These tools allow for co-citation analysis, bibliographic coupling, keyword co-occurrence mapping, and visualization of scholarly networks.

In the context of Vocational Education and Training (VET), bibliometric research plays an important role in identifying prevailing trends and assessing scholarly productivity. Such analyses evaluate the contributions of stakeholders—including authors, journals, institutions, and countries—and present findings in a structured and comprehensible format (Karantali&Panagiotidis, 2025). Frequently recurring themes in VET bibliometric studies include skill development, industry partnerships, employability, apprenticeship systems, and competency-based education.

Recent scholarship examining employability and vocational training trends indicates significant research output from countries such as Malaysia, the United States, and Spain, with strong emphasis on digital competencies, apprenticeship models, and collaborative industry engagement (Raaz & Verma, 2025). Additionally, bibliometric assessments of VET curricula aligned with Sustainable Development Goals—particularly SDG 4—demonstrate the increasing integration of sustainability objectives, Industry 4.0 requirements, and green economic transitions within vocational education frameworks (Latif, Widiaty& Abdullah, 2024).

Technical and Vocational Education and Training has also gained strategic importance in preparing learners for green employment sectors and sustainability-oriented skills (Fitriyanto et al., 2024). Studies examining the digital transformation of teaching and learning practices in TVET report a significant rise in research publications addressing technological integration, online platforms, and smart learning environments (Othman, Omar & Rasul, 2026). Emerging research on augmented reality (AR) applications further highlights the potential of immersive technologies to enhance hands-on vocational training experiences (Peter et al., 2025). In Southeast Asia, contemporary investigations suggest that TVET systems increasingly promote lifelong learning frameworks, supporting continuous upskilling and adaptability in dynamic labour markets (Usup et al., 2024).

The present study adopts a bibliometric methodology combined with a structured literature review, utilizing VOS viewer as the primary analytical tool. The investigation is guided by the following research questions:

- R1.** Which articles on Vocational Education and Training have received the highest citations in academic journals over the past two decades?
- R2.** Who are the most influential authors and what are their most cited contributions in the field of Vocational Education and Training during the last twenty years?
- R3.** Which institutions have produced the highest number of publications related to Vocational Education and Training over the past twenty years?
- R4.** Which countries demonstrate the greatest research productivity in Vocational Education and Training during the same period?
- R5.** What patterns can be observed in the annual distribution and publication trends of Vocational Education and Training research over the past two decades?
- R6.** How have citation trends evolved year by year in Vocational Education and Training scholarship during the past twenty years?

By addressing these questions, the study aims to systematically map the intellectual landscape of VET research, identify influential contributors, and highlight emerging thematic directions shaping the field.

II. Methodology

This study employs bibliometric analysis to examine the current research landscape in the field of Vocational and Technical Education across national and international scholarly journals. The dataset was extracted exclusively from the Elsevier Scopus database, which is widely recognized as one of the most comprehensive and reliable indexing platforms for peer-reviewed literature. Scopus provides extensive coverage of high-quality research outputs across disciplines and includes up-to-date publications from global sources (Martins, Gonçalves & Branco, 2022).

Bibliometric analysis is a quantitative research technique that applies statistical and mathematical tools to evaluate academic publications, including journal articles, conference papers, books, book chapters, and other scholarly documents. This approach enables researchers to identify publication patterns, track citation performance, detect collaboration networks, and visualize the intellectual development of a specific research

domain. Through systematic mapping and performance indicators, bibliometric methods reveal research trajectories, highlight emerging themes, and identify potential knowledge gaps.

An effectively conducted bibliometric study provides a structured understanding of existing scholarship and offers insights into future research directions (Genç & Koçak, 2024). Moreover, it facilitates exploration of interdisciplinary linkages and supports the identification of under-examined areas within a field. For example, bibliometric investigations focusing on education research in ASEAN member states using the Scopus database have demonstrated how quantitative mapping can provide comprehensive overviews of regional academic productivity (Hamid et al., 2025).

The present study is confined to a twenty-year period spanning from 2005 to 2025. Only documents indexed in the Elsevier Scopus database were considered for analysis. Publications outside this database were excluded, which may limit the inclusion of certain regional or non-indexed journals. Furthermore, the analysis was conducted using VOSviewer software, which was employed for data visualization, network mapping, and bibliometric clustering.

III. Discussion

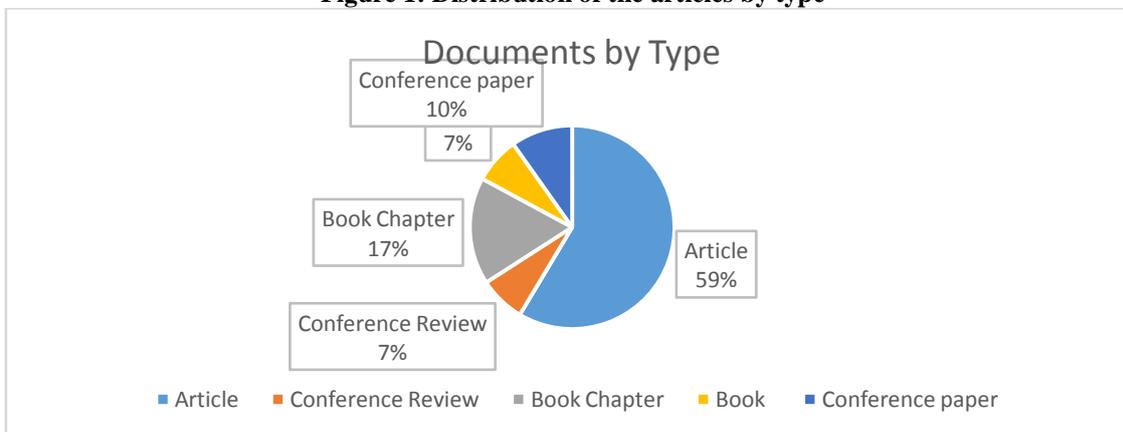
To retrieve relevant literature, the keyword “Vocational Education and Training” was entered into the Scopus search field. The search results were subsequently refined by applying filters for publication years (2005–2025) and English-language documents. After screening based on these criteria, a total of 41 relevant documents were identified.

These 41 publications collectively accumulated 388 citations during the selected period, reflecting an average citation rate of approximately 19.4 citations per year. The dataset indicates the involvement of 72 distinct authors contributing to research in Vocational Education and Training over the past two decades. This suggests moderate scholarly engagement in the selected timeframe and highlights the collaborative nature of research within this domain.

The findings provide an initial overview of publication productivity, citation performance, and authorship patterns in the field. Further network visualization and cluster analysis using VOS viewer can offer deeper insights into co-authorship relationships, thematic concentrations, and the intellectual structure shaping Vocational Education and Training research.

IV. Findings

Figure 1: Distribution of the articles by type

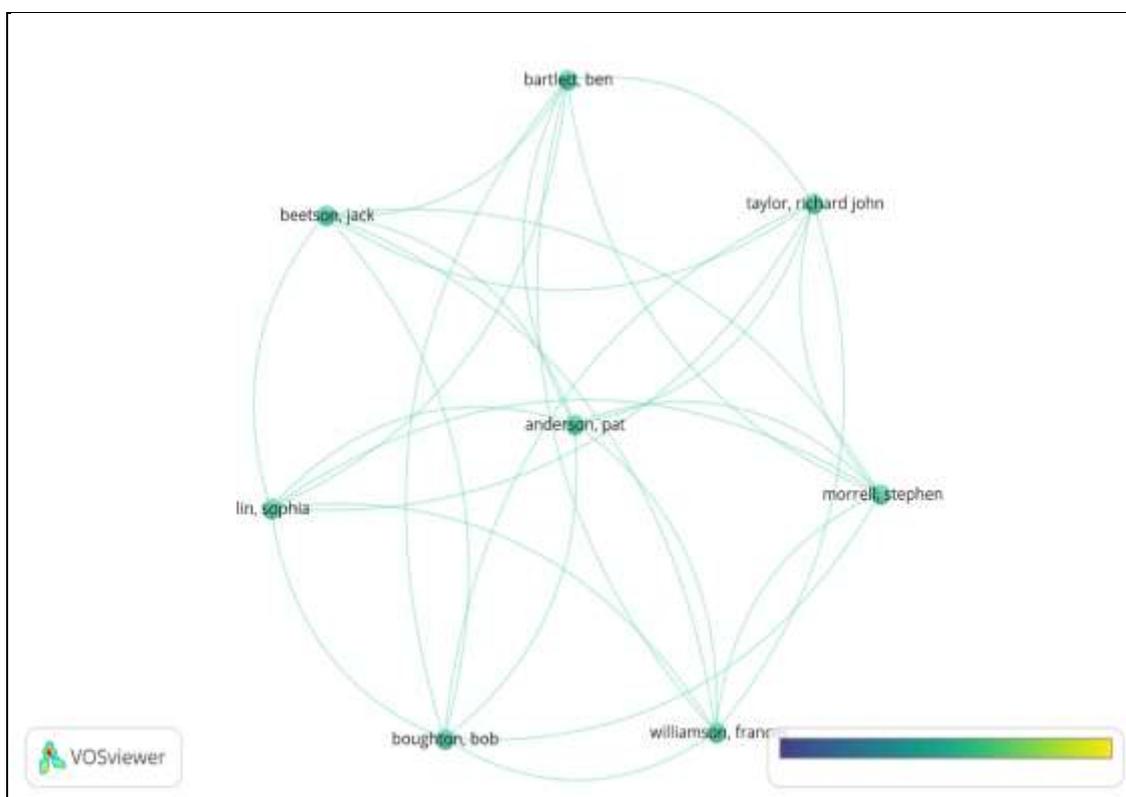


Rank	Title	Affiliations	Year	Authors	Cited by
1	Making the most of the mosaic: Facilitating post-school transitions to higher education of disadvantaged students	Menzies Institute for Medical Research, Hobart, TS, Australia	2011	Abbott-Chapman, J.	82
2	Monitoring progress of change: Implementation of Education for Sustainable Development (ESD) within documents of the German education system	Universität Leipzig, Leipzig, Sachsen, Germany; InstitutFutur, FreieUniversität Berlin, Berlin, Berlin, Germany	2020	Holst, J.; Brock, A.; Singer-Brodowski, M.; de Haan, G.	38
3	One transformation path does not fit all-insights into the diffusion processes of education for sustainable development in different educational areas in	InstitutFutur, FreieUniversität Berlin, Berlin, Berlin, Germany	2019	Singer-Brodowski, M.; Etzkorn, N.; von Seggern, J.	33

	Germany				
4	Teacher induction, identity, and pedagogy: hearing the voices of mature early career teachers from an industry background	School of Education, Charles Sturt University, Wagga Wagga, Wagga Wagga, NSW, Australia	2015	Green, A.	28
5	Monitoring SDG 4.7: Assessing Education for Sustainable Development in policies, curricula, training of educators and student assessment (input-indicator)	Department of Education and Psychology, Freie Universität Berlin, Berlin, Berlin, Germany	2024	Holst, J.; Singer-Brodowski, M.; Brock, A.; de Haan, G.	22
6	Regional skill ecosystems to assist young people making education employment linkages in transition from school to work	Lincoln University, Lincoln, CAN, New Zealand	2015	Dalziel, P.	22
7	Vocational education and training and the therapeutic turn	University of Greater Manchester, Bolton, Greater Manchester, United Kingdom;	2006	Hyland, T.	19
8	Mobilising for change in vocational education and training in Sweden—a case study of the ‘Technical College’ scheme	Department of Management and Engineering, LinköpingsUniversitet, Sweden	2018	Persson, B.; Hermelin, B.	18
9	International education policy: Its influence on the conception of VET and the VET system in Germany	Universität Konstanz, Konstanz, Baden-Wurttemberg, Germany	2015	Deissinger, T.	16
10	Retention and attrition among National Certificate (Vocational) Civil and Construction students in South African TVET	Cape Peninsula University of Technology, Bellville, South Africa	2019	Van Der Bijl, A.; Lawrence, M.	15

Table1: Top 10 Articles

Figure 2: The following diagrams shows the results of VoSviewer output related to network and density visualization of authors.



In the analysis conducted by Vos viewer 72 authors were selected with atleast one document to be published. Some of the 72 items in the network are not connected to each other. The largest set of connected

items consist of 8 items. The authors in the cluster are Pat Anderson, Ben Bartlett, Jack Beetson, Bob Boughton, Sopia Lin, Stephen Morrell, Richard John Taylor and Frances Williamson.

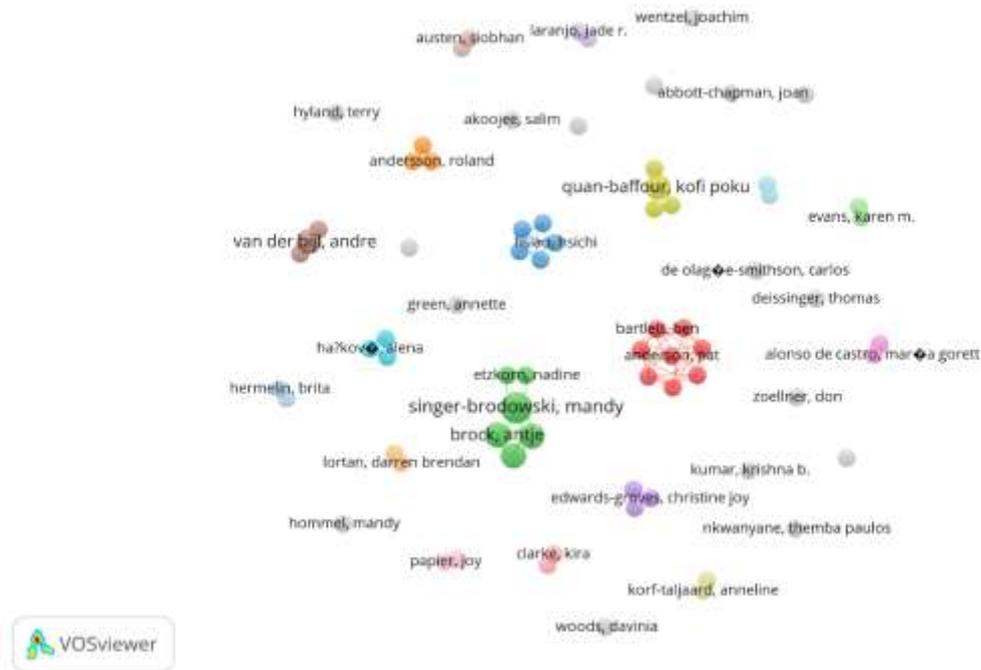


Figure3: The above figure shows the analysis of inter connected units of 72 items into 35 clusters. The largest cluster consisting of 8 items.

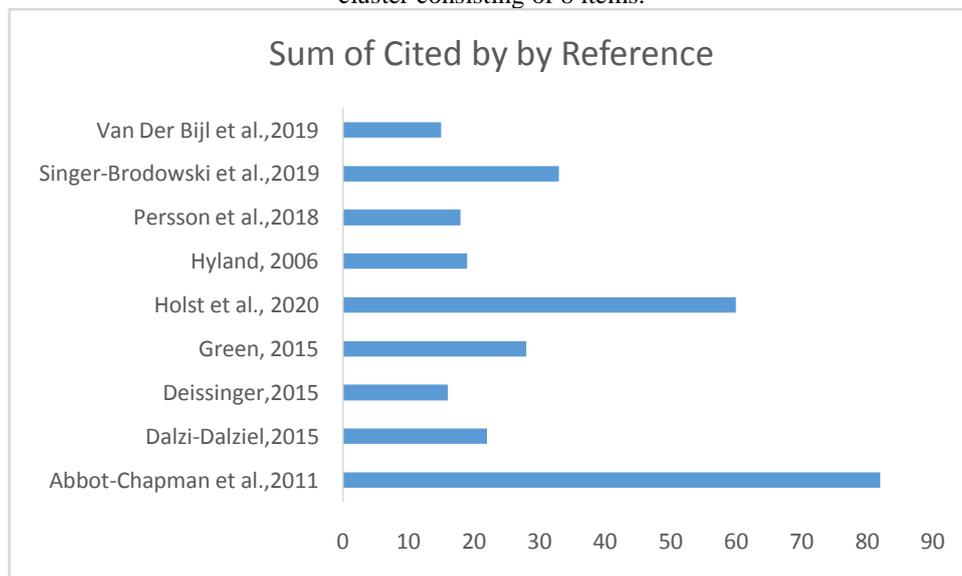


Figure 4: Table for 10 most cited authors.

Distribution of number of studies year wise (2005-2025)

Figure shows the distribution of the number of publications done in between the years 2005-2025. The data indicates that the publication rates of every year are not continuous or rather quite fluctuating over the twenty years. It can be seen that 2023 had the highest number of studies whereas the years 2012, 2009, and 2007 had none.

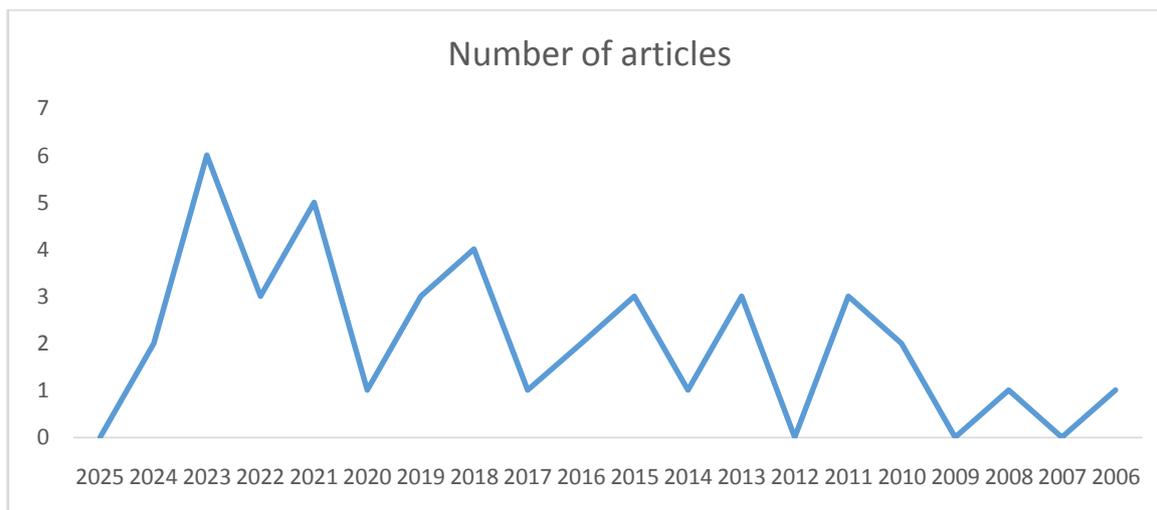


Figure 5: total number of articles published yearwise

Distribution of publications by country

The top countries with the highest number of published documents are Australia, South Africa, Germany and United Kingdom. The countries with the highest number of citations are Australia, Germany, South Africa, United Kingdom, Sweden and New Zealand.

Rank	Country	Documents	Citations
1	Australia	9	140
2	South Africa	9	37
3	Germany	6	112
4	United Kingdom	3	26
5	Spain	2	6
6	Sweden	2	23
7	Canada	1	0
8	India	1	0
9	Italy	1	2
10	New Zealand	1	22
11	Philippines	1	12
12	Slovakia	1	1
13	Taiwan	1	1

Table 2: Top countries with the most publications and citations

Keyword analysis and trending topic

The top keywords found after bibliometric analysis are education for sustainable development, higher education, governance, vocational education and training, skills, Germany etc.

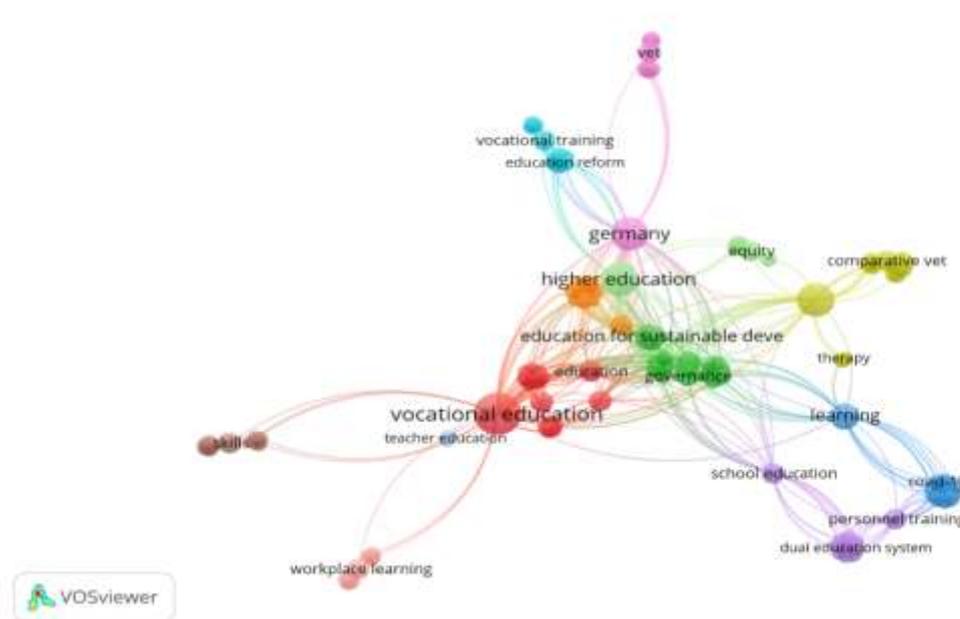


Figure 6: It is seen from the key word analysis that there are 132 total items with 12 clusters. A total of 761 links with the total link strength is calculated to be 793.

Rank	Keyword	Occurrences	Total link strength
1	Vocational Education	8	72
2	Germany	5	57
3	Higher Education	5	55
4	Vocational Education And Training	5	30
5	Education For Sustainable Development (Esd)	3	43
6	Learning	3	30
7	Comparative Vet	2	9
8	Document Analysis	2	30
9	Education	2	27
10	Equity	2	7

Table 3: Table for most frequently occurring keywords

Table 4: Most influential organizations in terms of publications of documents

Rank	organization	documents	citations	Average citations
1	InstitutFutur, Freie University of Berlin, Berlin, Berlin, Germany	2	71	35.5
2	Cape Peninsula University Of Technology, Bellville, South Africa	2	15	7.5
3	National Centre For Vocational Education Research, Adelaide, Sa, Australia	2	6	3
4	Menzies Institute For Medical Research, Hobart, Ts, Australia	1	82	82
5	University of Leipzig, Leipzig, Sachsen, Germany	1	38	38
6	School Of Education, Charles Sturt University, WaggaWagga, WaggaWagga, Nsw, Australia	1	28	28
7	Department Of Education And Psychology, Freie University of Berlin, Berlin, Berlin, Germany	1	22	22
8	Lincoln University, Lincoln, Can, New Zealand	1	22	22
9	Department Of Education, University Of Greater Manchester, Bolton, Greater Manchester, United Kingdom	1	19	19
10	University Of Greater Manchester, Bolton, Greater Manchester, United Kingdom	1	19	19

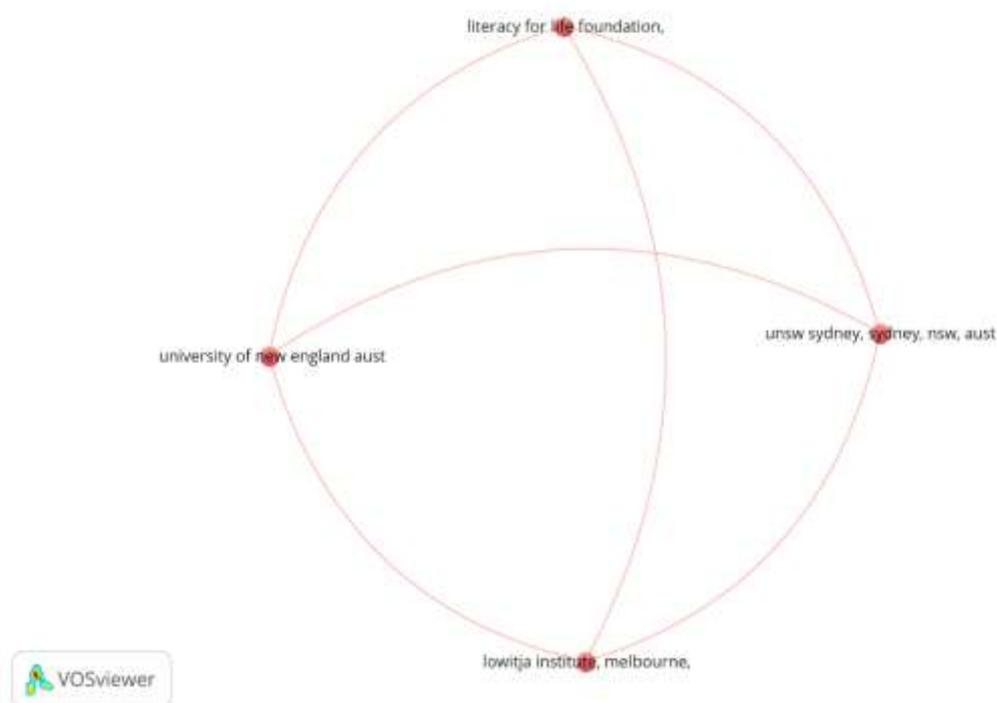


Figure 7: Top Organizations involved in the research for Vocational Education and training

On analyzing the top Organisations involved in the research of Vocational Education and training in the last 20 years it is seen that a total of 48 organisations were identified in 34 clusters. The largest cluster consisted of 4 items.

V. Conclusion And Implications

This study examined 41 scholarly publications indexed in the Scopus database between 2005 and 2025 to explore research developments in the field of Vocational Education and Training (VET). The findings indicate a growing academic interest in this domain over the past two decades. The upward trend in publications, particularly the peak observed in 2023 (followed by 2018), reflects increasing scholarly engagement with vocational and technical education as a strategic area of educational reform and workforce development.

The thematic analysis of the selected literature reveals that a significant portion of research focuses on vocational education at the higher education level. Special attention has been given to dual vocational systems, particularly the German model, which integrates institutional learning with structured workplace training. The dominant research methodologies employed across the reviewed studies include document analysis and survey-based approaches. Many of these studies conclude that structured vocational pathways contribute to sustainable knowledge acquisition and improved labour market readiness.

The dataset includes contributions from 72 authors and records a cumulative total of 388 citations across the 41 publications, demonstrating moderate but meaningful scholarly impact within the selected timeframe. Several prominent institutions have contributed substantially to the literature. Notable among them are InstitutFutur at Freie Universität Berlin (Germany), Cape Peninsula University of Technology (Bellville, South Africa), and the National Centre for Vocational Education Research (Adelaide, Australia). In terms of geographic distribution, Australia, South Africa, Germany, and the United Kingdom emerge as leading contributors to VET-related scholarship.

The analyzed publications consist of diverse document types, including journal articles, books, book chapters, and conference proceedings, suggesting interdisciplinary and multi-format engagement in the field.

Vocational Education and Training plays a pivotal role in preparing individuals for employment and facilitating the transition from education to the world of work. By strengthening practical competencies, technical expertise, and employability skills, VET enhances individuals' capacity for meaningful employment and sustainable livelihoods. The findings of this bibliometric review reaffirm that VET serves as a critical bridge between academic instruction and labour market demands. Alignment of curricula with industry needs contributes to improved employability outcomes, wage growth, and workforce productivity. Additionally, VET

systems can contribute to reducing unemployment, fostering entrepreneurship, and improving labour market predictability.

The study further underscores the importance of supportive policy frameworks, effective implementation strategies, and strong collaboration between educational institutions and industry partners. Apprenticeship models, work-integrated learning, and continuous curriculum revision—particularly through the integration of information and communication technologies—are central to enhancing the relevance and quality of vocational programmes. Teacher training and professional development also emerge as essential components for sustaining innovation and instructional quality in VET systems. Furthermore, adequate infrastructure and technical resources remain critical for effective programme delivery.

Equitable access to vocational education is another key consideration. Expanding opportunities for women, rural populations, and economically disadvantaged groups can promote social inclusion, economic self-reliance, and community development. By creating pathways for marginalized populations to acquire market-relevant skills, VET can contribute significantly to social cohesion and inclusive growth.

In conclusion, strengthening Vocational Education and Training systems is instrumental in advancing Sustainable Development Goals related to quality education and decent work. A robust VET framework supports the development of a skilled, adaptable, and resilient workforce capable of responding to evolving economic and technological demands. Future research may focus on evaluating the long-term impact of VET programmes on employment outcomes, income mobility, and skill sustainability. Further investigations could also explore strategies for deeper integration between vocational and academic streams, as well as innovative models of industry–education partnerships.

Ultimately, Vocational Education and Training remains a transformative force in empowering individuals, enhancing practical learning, and embedding education within real-world economic and social contexts.

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