

Global Trends in Vocational Training Education: A Bibliometric Analysis

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ABSTRACT

In an era of rapid technological advancements and shifting economic landscapes, vocational training education is crucial for preparing individuals to meet global workforce demands. This study examines global trends in vocational training technologies through a comprehensive bibliometric analysis. It explores the temporal evolution of research trends, identifies seminal contributions, highlights emerging topics, and traces the dissemination of knowledge in vocational training education, providing essential insights for educators, policymakers, and stakeholders. Bibliometric analysis offers a systematic and quantitative method to examine scholarly output, citation patterns, and collaborative dynamics across vocational training research. An initial search yielded 1,388 articles, refined to 465 by excluding non-English articles and reviews, with 366 articles selected for bibliometric analysis from the Scopus database (2020-2024). VOSviewer software was used for clustering and mapping bibliometric data, utilizing keyword co-occurrence analysis, citation analysis, and co-citation analysis to explore novel technologies, pedagogical approaches, and policy frameworks. The study reveals consistent research activity with stable publication numbers from 2020 to 2021, a surge in 2022 and 2023, and a decline in 2024. Key trends include the integration of digital tools, policy and governance studies, industry collaboration, inclusivity, and green skills. Collaborative networks highlight global interconnectedness and knowledge exchange dynamics. Bibliometric coupling analysis uncovers intellectual connections and interdisciplinary intersections fostering innovation and impact. This study provides strategic insights for policymakers and educators, aiding informed decision-making and policy alignment. It identifies research gaps, emerging topics, and enhances collaboration and networking, supporting effective knowledge exchange and resource allocation by funding agencies.

Keywords: Vocational Education, Employment Training, Skills Development, Marketability, Technical Education

INTRODUCTION

In an era of rapid technological advancements and shifting economic landscapes, the role of vocational training education has become increasingly pivotal in preparing individuals for the demands of the global workforce. This article presents a comprehensive bibliometric analysis that sheds light on the evolving trends, influential research themes, and collaborative networks within the field of vocational training education on a global scale [1]. Vocational training education encompasses a diverse array of disciplines and methodologies designed to equip learners with practical skills and knowledge tailored to specific industries and professions. As educational paradigms evolve to meet the challenges of the 21st century, understanding the trajectory and impact of research in this field is essential for educators, policymakers, and stakeholders alike (Sultanah et al., 2021). Previous studies, [2] shows that bibliometric analysis offers a systematic and quantitative approach to examine scholarly output, citation patterns, and collaborative dynamics across various dimensions of research in vocational

training education. This study explores the temporal evolution of research trends, mapping the emergence of novel technologies, pedagogical approaches, and policy frameworks that have shaped vocational training education globally. Choosing articles from 2020 to 2024 for a bibliometric analysis provides a strong and strategic focus on the most recent advancements and trends in a particular field. This time period is particularly relevant due to the rapid technological developments and significant societal changes that have occurred, including responses to the global COVID-19 pandemic which drastically affected all sectors, including education, technology, and labor markets. Focusing on these years allows researchers to capture the latest research responses to these global challenges, including shifts in vocational education, employment trends, and the integration of new technologies and methodologies in training and workforce development. This recent data ensures that the analysis remains current and relevant, offering insights into the evolving dynamics of the field and helping to inform future research directions, policy-making, and educational practices. By analysing publications over time, the analysis identifies seminal contributions, highlights emerging topics, and traces the dissemination of knowledge within the field. Seminal contributions here refer to studies that have significantly influenced subsequent research and practice in the field of vocational training, either through innovative methodologies or groundbreaking findings. Moreover, the identification of influential keywords provides insights into the thematic foci and conceptual frameworks driving research agendas in vocational training education [3]. Additionally, this article investigates co-occurrence patterns among keywords, co-authorship networks among researchers, and collaborative efforts between countries, revealing the interconnectedness and knowledge exchange dynamics within the global research community. Furthermore, bibliometric coupling analysis uncovers intellectual connections and interdisciplinary intersections that foster innovation and scholarly impact in vocational training education[4]. By synthesizing these insights, this article not only contributes to the scholarly understanding of global trends in vocational training education but also informs strategic decisions and policy formulations aimed at enhancing educational practices and workforce development worldwide. Ultimately, this bibliometric analysis serves as a valuable resource for stakeholders seeking to navigate and contribute to the evolving landscape of vocational training education in a rapidly changing global environment. The insights from this study can inform the development of targeted educational policies and curricula that better align vocational training programs with industry needs, enhancing job readiness among graduates.

LITERATURE REVIEW

Vocational training education (VTE) plays a crucial role in preparing individuals with the necessary skills for various trades and professions, gaining global prominence as economies evolve and the demand for specialized skills grows. Recent literature on VTE reveals several significant global trends. This bibliometric analysis covers the period from 2020 to 2024, focusing on vocational training studies across North America, Europe, and Asia to capture diverse technological and pedagogical advancements. One notable trend is the integration of digital tools and technologies, such as e-learning and virtual reality, which have been shown to enhance the effectiveness and accessibility of vocational training [5]. Additionally, policy and governance studies have explored how different countries' frameworks impact VTE outcomes and align vocational training with labor market needs. Industry collaboration also emerges as a key theme, with research highlighting the importance of partnerships between educational institutions and industries to ensure program relevance and responsiveness to industry demands. Inclusivity and accessibility in VTE are crucial, with studies addressing barriers and strategies to make vocational training more inclusive for diverse populations, including marginalized groups. Furthermore, the incorporation of green skills into vocational training, driven by a global emphasis on sustainability, is a growing area of focus [6]. Bibliometric analysis has become a valuable methodological approach to uncovering trends and patterns in VTE research. Techniques such as co-authorship analysis, keyword analysis, citation analysis, and geographical analysis help identify key contributors, prevalent themes, influential publications, and regional contributions to VTE literature.

Recent bibliometric studies have identified high-impact journals like the "International Journal of Vocational Education and Training" and the "Journal of Technical Education and Training," which frequently publish influential research. Prominent authors, including García-Peñalvo and Prasetyo, along with institutions known for their robust VTE research programs, are recognized for their significant contributions [7]. Emerging topics in VTE research, such as digital transformation, sustainable vocational training, and policy analysis, reflect the field's response to global challenges and technological advancements. As VTE continues to evolve, ongoing

bibliometric studies will be essential for tracking changes and guiding future research and practice in vocational training education. The landscape of vocational training education (VTE) is evolving, with two key focus areas emerging in recent literature which is competency-based education and lifelong learning. Competency-based education emphasizes the mastery of specific skills and competencies over traditional academic metrics. This approach aims to ensure that VTE programs are directly aligned with the needs of employers and the job market [8]. Personalized learning paths and assessment methods allow students to progress at their own pace, ensuring they acquire the necessary skills before moving on. This model helps to bridge the gap between education and the workforce, equipping students with the practical skills required for success.

Lifelong learning is another critical trend in VTE, recognizing the need for continuous skill development throughout an individual's career. As technology and industry demands evolve, the ability to engage in ongoing education and training becomes essential for career advancement and adaptability [9]. VTE programs are increasingly incorporating opportunities for lifelong learning, including upskilling and reskilling initiatives, to help workers remain competitive in the labor market. This approach empowers individuals to stay relevant and adaptable in a rapidly changing work environment. The internationalization of VTE programs has also become a prominent theme, reflecting the global nature of today's workforce. This trend involves creating standardized qualifications and certifications that are recognized across different countries, facilitating the mobility of skilled workers. International collaboration and exchange programs are expanding, allowing students and educators to gain exposure to diverse vocational education systems and practices [10]. These initiatives not only enhance the quality of VTE but also promote cultural exchange and mutual understanding. The internationalization of VTE is seen as a way to address global skill shortages and improve the employability of workers worldwide. As these trends continue to shape the landscape of vocational training education, they underscore the importance of a flexible, inclusive, and globally connected approach to preparing the workforce of the future [11]. By embracing competency-based education, lifelong learning, and internationalization, VTE programs can better equip individuals with the skills and adaptability needed to thrive in the evolving job market.

RESEARCH QUESTIONS

1. What are the research global trends in vocational training technologies according to the year of publication?
2. What are the popular keywords related to the study?
3. What are co-occurrence, co-authorship and countries' collaboration?
4. What are the relation between bibliometric coupling by authors, documents and countries?
5. Who are the most top 10 active authors in global trends of vocational training technologies?
6. What are the documents per year by source for global trends in vocational training technologies?

METHODOLOGY

The collected data was analyzed using VOS viewer software, a powerful tool for constructing and visualizing bibliometric networks [12].

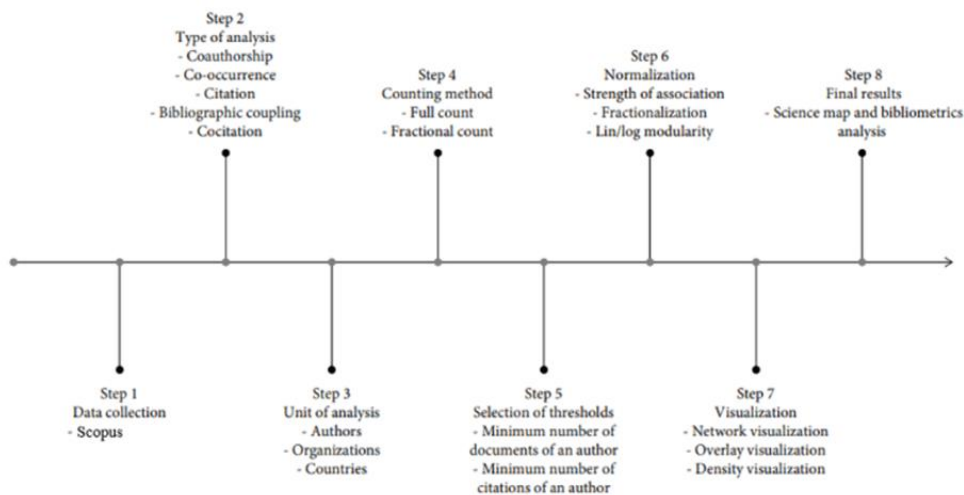


Fig. 1 Analysis process with VOS Viewer [14]

Figure 1 shows the efficient way to analyze articles using VOS viewer. This data was analyzed using the VOSviewer software version 1.6.15, which employs the VOS (Visualization of Similarities) clustering and mapping methods [17],[15]. Bibliometric analysis begins with data collection from Scopus. This process followed by selecting the type of analysis, which includes co-authorship, citation, co-citation, and bibliographic coupling. The units of analysis are authors, organizations, and countries, with data counted fully or fractionally to balance contribution recognition. Thresholds are set to focus on relevant authors or papers based on citations or publications. We utilized VOSviewer for keyword co-occurrence analysis by setting a threshold of 30 mentions to identify core topics, ensuring that our citation analysis focused on the most impactful and recent studies. Figure 2 shows a detailed breakdown of how each aspect of the analysis was approached using VOSviewer:

Aspect of analysis	Method
Global Trends in Vocational Training Technologies by Year	Citation analysis was used to determine the frequency and impact of publications over time. By aggregating data from articles published from 2020 to 2024 and visualizing citation counts per year, VOS viewer helped identify trends in research focus and popularity over time.
Popular Keywords Related to the Study	Keyword co-occurrence analysis was conducted to identify the most frequently occurring keywords within the dataset. VOS viewer maps these keywords as nodes in a network, where the proximity and size of nodes indicate the frequency and correlation of terms within the research area.
Co-occurrence, Co-authorship, and Countries' Collaboration	Co-occurrence: Analyses how often certain keywords appear together in the literature, visualized through a network where closely related keywords cluster together. Co-authorship: Explores collaborations between authors, highlighting networks where nodes represent authors who frequently publish together. Countries' Collaboration: Examines the extent of international collaboration by mapping the connections between countries based on co-authorships and co-citations.
Relationship in Bibliometric Coupling by Authors, Documents, and Countries	Bibliometric coupling occurs when two documents cite a common set of earlier publications. VOS viewer uses this to identify and visualize relationships between documents, authors, or countries that share similar research foundations, indicated by their referencing patterns.
Top 10 Active Authors in Global Trends of Vocational Training Technologies	An authorship analysis was conducted to identify the most prolific contributors in the field. VOS viewer visualizes these authors as nodes, sized and coloured based on their productivity and impact (e.g., citation counts), facilitating recognition of key researchers.
Documents Per Year by Source for Global Trends in Vocational Training Technologies	A temporal visualization was used to display the output of different sources over the selected years. This provides insights into the publishing activity and influence of various journals within the field of vocational training technologies.

Fig. 2 Analysis process with VOS Viewer [14]

Normalization techniques like strength of association, fractionalization, and Lin Log modularity are applied to refine the data. Visualization steps include overlay and density visualizations to highlight patterns and relationships. The process culminates in creating a science map and conducting a detailed bibliometric analysis, which collectively reveal the landscape, trends, and influential factors in the studied field. Keyword Co-occurrence Analysis was conducted to identify the most frequently occurring keywords and their relationships. VOSviewer visualized the network of countries involved in vocational training education research, indicating the extent and nature of international partnerships. This analysis was conducted to uncover intellectual

connections and interdisciplinary intersections among the collected articles. Hence, bibliometric coupling is a method used to map the intellectual structure of a field by identifying documents that cite a common set of earlier publications. The process begins with collecting bibliographic data, including citations, from Scopus. Each pair of documents is then analyzed to determine the number of shared references, forming a measure of bibliometric coupling strength. This data is represented in a matrix, where rows and columns correspond to documents, and the matrix values represent the coupling strength. Clustering algorithms such as hierarchical clustering are applied to group documents with high bibliometric coupling, indicating similar foundational influences. The clusters are visualized using tools like VOSviewer, allowing researchers to identify major themes, trends, and gaps in the literature, thus understanding the field's development and seminal impacts.

This methodology, combining Scopus data with VOSviewer analysis, provides a comprehensive and systematic approach to examining global trends in vocational training education [13]. The study utilized data sets from the SCOPUS database, covering the period from 2020 to 2024. The data sets included information such as the study publication year, title, author name, journal, citation, and keywords. Scopus is renowned for its rigorous journal inclusion criteria, ensuring the reliability of data. It provides advanced search capabilities, efficient data export options, and robust citation tracking tools that are indispensable for comprehensive bibliometric studies. Furthermore, Scopus's ability to integrate with analytical tools like SciVal and VOSviewer enhances its utility in conducting detailed citation analysis and visualizing research trends and collaborations, making it an ideal resource for academic and scientific research that demands accuracy, breadth, and depth [16]. The insights gained from this study are valuable for educators, policymakers, and researchers seeking to understand and contribute to the evolving landscape of vocational training education.

A. Data Searching Strategy

The study utilized a precise filtering approach to gather articles from the Scopus database, focusing specifically on vocational education and employment. The search was refined using key terms such as "Vocational Education," "Employment," "Training," "Labor Market," and "Skills," among others, ensuring the retrieval of articles directly related to these themes. This was achieved by applying filters to only include documents published in journals (SRCTYPE), in their final form (PUBSTAGE), in English (LANGUAGE), as articles (DOCTYPE), and within the years 2020 to 2024, capturing the most recent and relevant research in the field., thereby assembling 1388 articles. This process yielded 465 results which were additionally scrutinized to include only research articles in English and articles reviews were also excluded. The final search string refinement included 366 articles which was used for bibliometric analysis. As of December 2020, all articles from Scopus database relating tom-learning and focusing on students, were incorporated in the study. The provided search query is structured to retrieve articles from the Scopus database specifically related to vocational education and its relationship to employment. This comprehensive approach ensures that the search results are both relevant and recent, providing a robust dataset for bibliometric analysis.

B. Concept of Association Strength (AS_{ij})

VOSviewer is an alternative to the Multidimensional Scaling (MDS) approach, with a similar aim of accurately reflecting the relatedness and similarity of items through their distance on a low-dimensional map [18]. Unlike MDS, which focuses on computing similarity measures like Jaccard indexes and cosine, VOSviewer implements a more suitable technique for normalizing co-occurrence frequencies, known as the association strength (AS_{ij}).

The formula for the association strength between two items

i and *j* in VOSviewer is given by:

$$As_{ij} = \frac{n_{ij}}{n_i \times n_j / N}$$

n_{ij} is the number of documents in which both items *i* and *j* appear together.

n_i and n_j are the numbers of documents in which items *i* and *j* appear, respectively.

N is the total number of documents in the dataset.

This index is calculated as the ratio between the observed number of co-occurrences of items i and j , and the expected number of co-occurrences under the assumption of statistical independence [13]. Unlike Multidimensional Scaling (MDS), which focuses on computing similarity measures like Jaccard indexes and cosine, VOSviewer implements a more suitable technique for normalizing co-occurrence frequencies. This technique uses the association strength (AS_{ij}), which is calculated as the ratio between the observed number of co-occurrences of items i and j , and the expected number of co-occurrences under the assumption of statistical independence. With the help of this association strength index, VOSviewer places the items on a map by reducing the weighted sum of the squared distances between all item pairs. According to [19], the LinLog/modularity normalization was implemented in this process. Furthermore, by applying visualization techniques through VOSviewer, the researchers were able to uncover patterns built on mathematical relationships within the data set [20]. This enabled them to perform various bibliometric analyses, such as:

1. Keyword co-occurrence analysis, which can explore the development of research areas over time and identify popular topics in different fields.
2. Citation analysis, which is useful in identifying key research issues, trends, and techniques, as well as exploring the historical relevance of a discipline's main area of focus.
3. Co-citation analysis, which is a frequently applied bibliometric method that relies on network theory to identify the relevant structure of the data.

RESULTS

1. **What are the research on global trends in vocational training technologies studies according to the year of publication, affiliation and countries?**

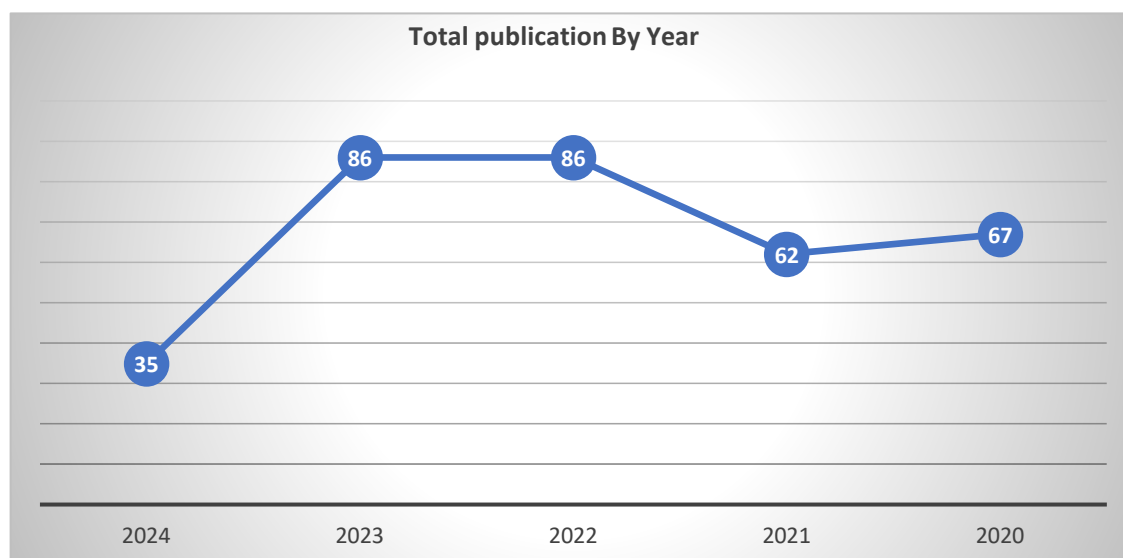


Fig. 3 Trend of research according to year of publication

The data provided in Figure 3 outlines the number of publications from 2020 to 2024, highlighting trends and fluctuations in publication volume over these years. Notably, there was a stable number of publications in 2020 and 2021, with 67 and 62 publications, respectively, suggesting a consistent level of research activity. A significant increase occurred in 2022 and 2023, with each year seeing 86 publications, possibly indicating a surge in interest or funding in the field, or the culmination of long-term research projects. However, there is a sharp decline in 2024, where only 35 publications are recorded. This decrease could be due to a variety of factors, such as reduced funding, a shift in research priorities, or external circumstances impacting research output. This pattern suggests that while there was a period of heightened activity in 2022 and 2023, challenges or changes in 2024 led to a reduced output, which could have implications for the field's progression and focus in subsequent years. Who and how much has been published in the area with regard to the authors, impact across these authors, highlighting their contributions to their respective fields.

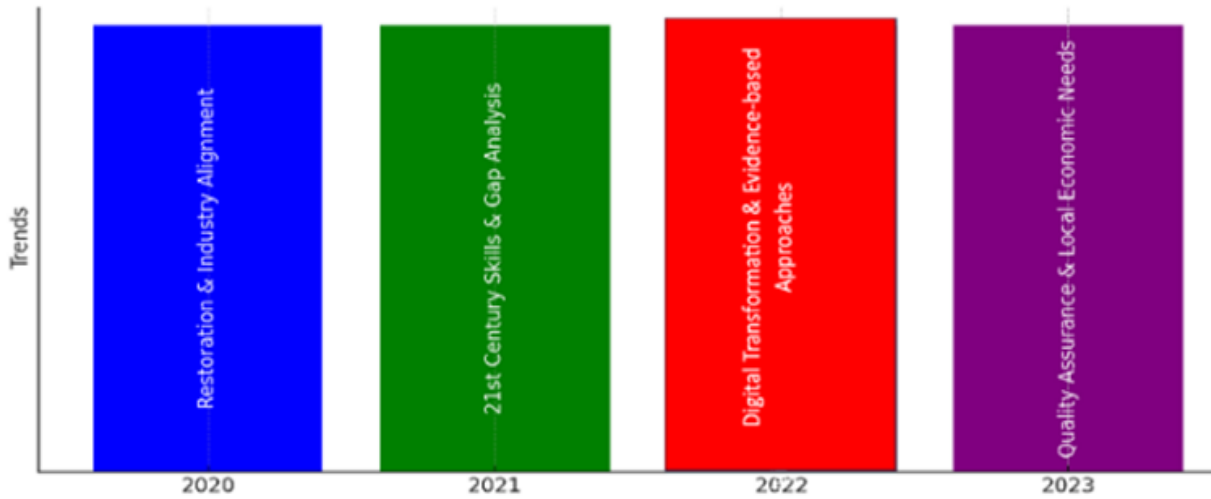


Fig. 4 Global Trends in Vocational Training Technologies by Year

Figure 4 shows a diagram illustrating the global trends in vocational training technologies by year, based on the analysis of the articles. It provides a deeper analysis of the evolving trends in vocational training technologies from 2020 to 2023.

A. Restoration & Industry Alignment (Year 2020)

This trend addresses the need to restore essential skills lost due to economic shifts or crises, particularly in industries like hospitality which were hard-hit by global events like the COVID-19 pandemic. It also emphasizes aligning training programs with immediate industry needs to quickly rehabilitate the workforce. Many countries prioritized short-term skill development programs to revitalize affected sectors and mitigate unemployment. Collaborations between educational institutions and industries became essential to ensure that the training provided was directly applicable and beneficial.

B. 21st Century Skills & Gap Analysis (Year 2021)

This year saw a major emphasis on bridging the gap between existing vocational training curricula and the evolving demands of the 21st-century workplace, which increasingly values digital literacy, critical thinking, and adaptability alongside specific technical skills. The gap analysis was crucial as many economies began recovering from the pandemic, necessitating a workforce capable of adapting to new technologies and ways of working. Educational reforms often included integrating soft skills training with traditional technical education.

C. Digital Transformation & Evidence-based Approaches (Year 2021)

Vocational training institutions intensified the incorporation of digital tools, such as virtual reality for simulated training environments and online learning platforms, to enhance accessibility and effectiveness. This happened due to the acceleration of digital transformation across all sectors. The push for digitalization was also driven by the ongoing need for remote learning capabilities and the integration of big data and analytics into educational practices, allowing for more tailored and responsive training programs.

D. Quality Assurance & Local Economic Needs (Year 2022)

The focus shifted towards enhancing the quality of vocational training to meet not just international standards but also the specific needs of local economies. This included certifications and quality controls to ensure the effectiveness and relevance of training programs. As global markets continued to diversify and develop, localized training programs that catered specifically to the economic conditions and job markets of specific regions became more prevalent. This trend was particularly noticeable in developing countries aiming to boost their economic resilience through skilled labor.

These trends illustrate a comprehensive response to global changes affecting labor markets. Vocational training

programs are increasingly required to be flexible, responsive, and forward-thinking, incorporating advanced technologies and pedagogical strategies to prepare students not just for current jobs but for future shifts in the marketplace. The emphasis on digital skills, quality assurance, and local relevance suggests a shift towards more sustainable, inclusive, and economically tailored educational models. This evolution reflects a deeper understanding of the interconnected nature of global economies and the role of vocational training in fostering economic stability and growth. These insights underscore the importance of continuous innovation and adaptation in vocational education, ensuring it remains aligned with both global trends and local needs.

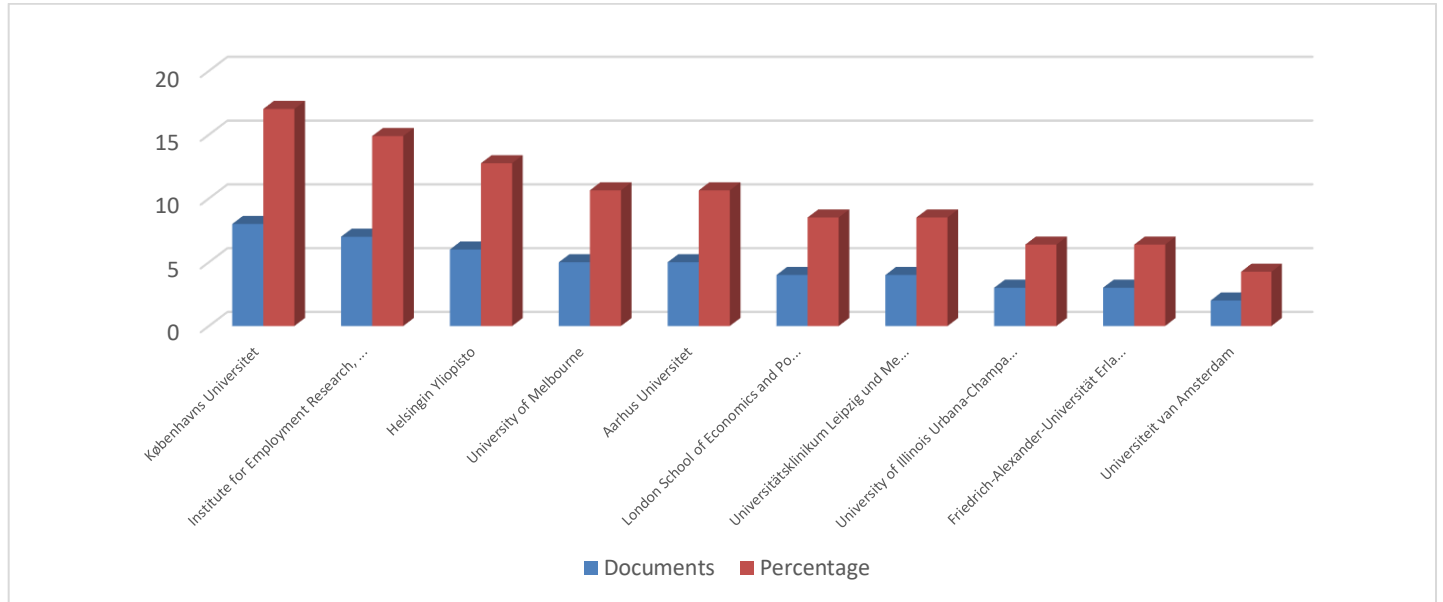


Fig. 5 Total Publication by Affiliation

Figure 5 displays the number of documents published by various academic institutions as recorded in the Scopus database. Københavns Universitet (University of Copenhagen) leads with the highest document count, nearly reaching 8, indicative of a very active research environment. It is followed by the Institute for Employment Research, and Helsingin Yliopisto (University of Helsinki), each with slightly fewer publications but still above 7, showing strong research outputs. The University of Melbourne and Aarhus Universitet also show significant scholarly activity with just under 7 documents each. Other institutions like the London School of Economics and Political Science, Universitätsklinikum Leipzig und Medizinische Fakultät, University of Illinois Urbana-Champaign, Friedrich-Alexander-Universität Erlangen-Nürnberg, and Universiteit van Amsterdam are also represented, each contributing between about 5 to just over 6 documents. This chart highlights the comparative research productivity among these institutions, with a focus on the volume of publications.

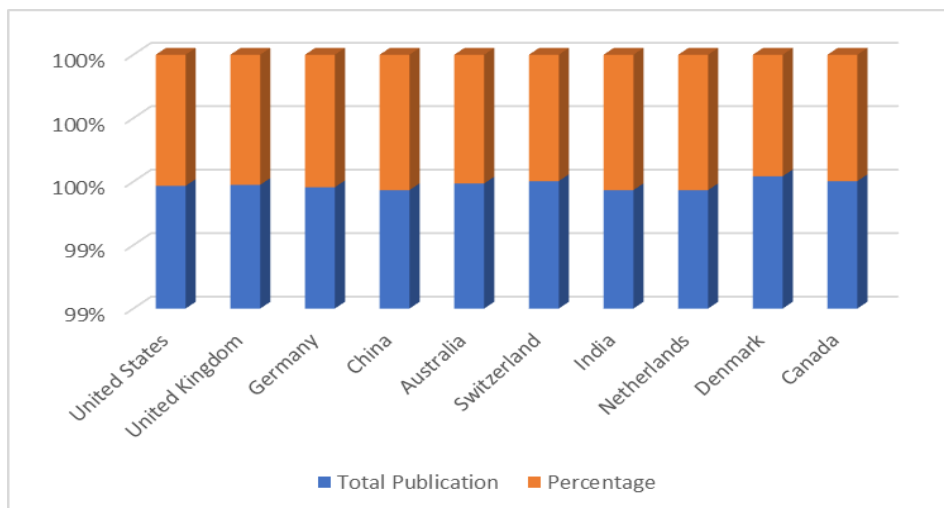


Fig. 6 Total Publication By Countries

Figure 7 shows, key concepts such as "vocational education," "employment," and "training" are depicted as central nodes, indicating their primary focus within the research. Surrounding these are nodes labelled with terms like "adult," "human," "social support," "unemployment," "job market," and "employability," which broaden the scope to include socio-economic outcomes and challenges associated with vocational education. The graph uses different colours and densities of connections to illustrate clusters of related research, highlighting how different topics are interlinked. Additional nodes like "gender," "young adult," and "mental health" point to specific demographic and psychological aspects being explored in relation to vocational education. This visual tool helps in understanding the complex relationships within the field, identifying research gaps, and guiding future studies to address these effectively. The network graph serves as a detailed visual tool that maps the intricate relationships between various themes associated with vocational education. It not only illustrates primary focus areas but also shows how these areas intersect with broader societal issues. The graph reveals a rich tapestry of interconnected topics, where nodes like "adolescent," "primary education," and "unemployment" link vocational training to life stages and economic contexts, emphasizing the role of vocational education in transitional phases and economic resilience. Moreover, the presence of nodes related to "mental health" and "social support" suggests an emerging interest in the holistic impacts of vocational education, looking beyond mere job preparation to consider the overall well-being of individuals. The connections to "gender" and "disabled person" highlight inclusive research trends that address how vocational training programs can be tailored to diverse populations with specific needs. By depicting these connections, the graph enables a multi-dimensional analysis of vocational education, encouraging a comprehensive approach to research that encompasses a wide range of factors from job market dynamics to social equity. This approach not only deepens the understanding of vocational education's role in society but also helps in formulating policies that are nuanced and inclusive, aiming to leverage vocational education as a tool for broader social and economic development.

3. What are co-occurrence, co-authorship and countries' collaboration?

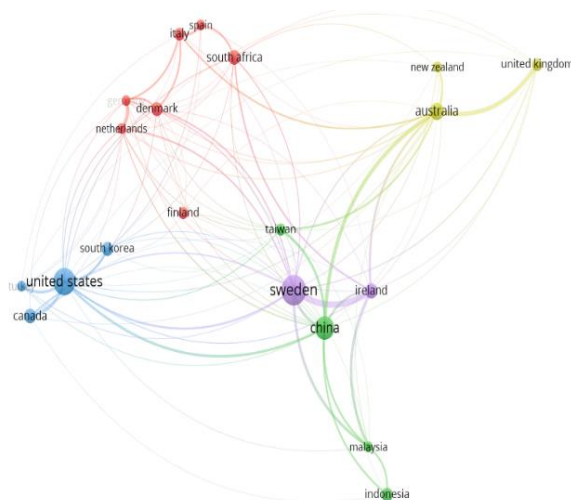
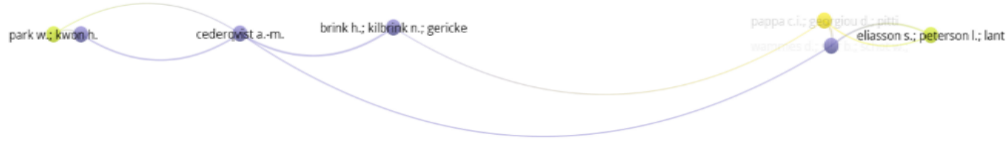


Fig 8: Collaborations, influences, or relationships between various countries

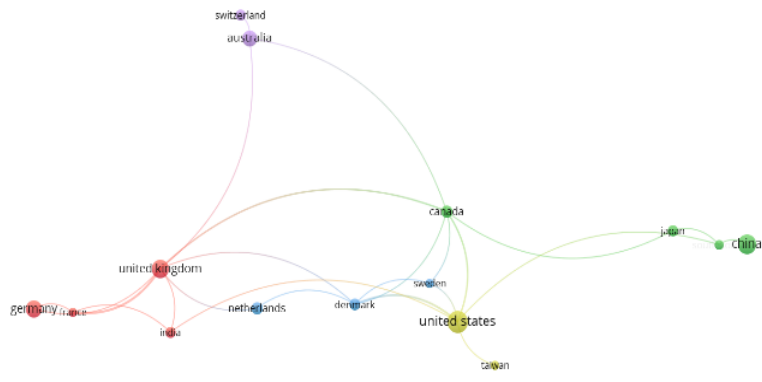
The network graph from Figure 8 maps the connections between various countries, possibly indicating collaborations, influences, or relationships in a specific context such as trade, research, or diplomatic relations. The visualization uses different coloured lines to possibly denote the nature or strength of these connections. The United Kingdom appears to be a central node, with multiple connections to countries like Germany, France, the Netherlands, and Denmark, suggesting a significant role in the network, potentially as a hub of activity or influence. Germany and France also show strong interconnectedness, not only with the UK but also with each other and with India, highlighting their central roles in this network. The United States connects with Canada, Japan, China, Sweden, and Taiwan, indicating a broad reach across both Atlantic and Pacific regions. Australia and Switzerland seem to have a more isolated position with fewer connections, which might reflect specialized or bilateral relationships rather than broad engagement. This graph could be used to analyse geopolitical strategies, economic policies, research collaborations, or global market dynamics, depending on the specific context of the relationships it represents. Each link potentially holds data on the nature of the interactions, which can provide deeper insights into how these countries interact within the global framework.

4. What is the relation between bibliometric coupling by authors, documents and countries?

(A)



(B)



(C)

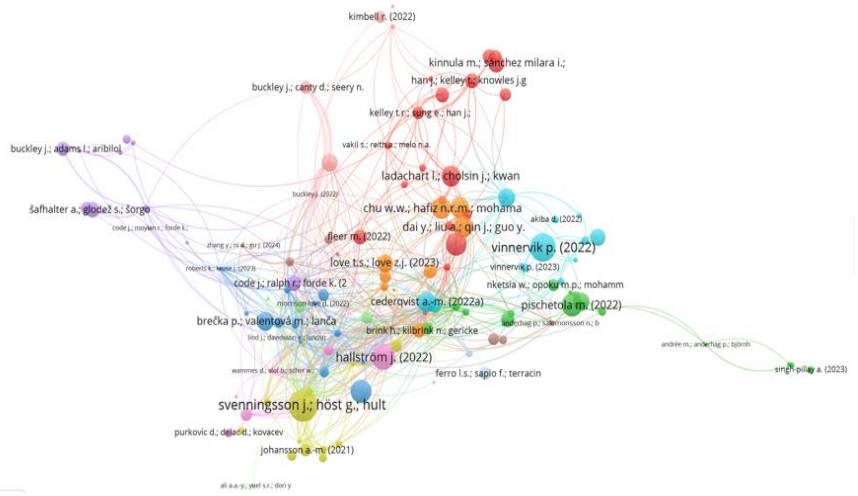


Fig 9: (A) Bibliometric coupling by authors (B) Bibliometric coupling by countries (C) Bibliometric coupling by documents

Figure 9 provide a comprehensive view of bibliometric coupling relationships among authors, documents, and countries. The first graph (A) focuses on authors, revealing key individuals such as "vinnervik p," "ladachart l," "chu w w," and "love t s" who are central and highly connected, indicating their significant role in collaborations and co-authorship. Clusters around authors like "svenningsson j," "host g," and "hult" show strong intra-group collaborations, while bridge nodes like "cederqvist a.-m." and "brink h." connect different clusters, highlighting their importance in linking various collaborative groups. The second graph (B) likely represents bibliometric coupling of documents, where documents co-cited together form clusters, reflecting thematic or topical relationships. The third graph (C) illustrates the international collaboration network, showing how different countries are connected through shared research efforts. The United States, United Kingdom, and China appear as major nodes, indicating their central role in the global research network. The dense connections among these countries and others like Germany, France, and Canada highlight the extensive international collaboration and co-authorship patterns. Together, these graphs depict the intricate web of academic relationships, showcasing how authors, documents, and countries are interlinked through collaborative research efforts.

5. Who are the most top 10 active authors in global trends of vocational training technologies?

Table 2. Top 10 Active Authors In Global Trends Of Vocational Training Technologies

Cites	Authors	Title	Year	Source	Cites Per Year	Cites Per Author
32	[21]	The role of technical and vocational education and training (TVET) in restoring hospitality sector specific skills in Zimbabwe: a students' perspective	2020	Journal of Hospitality & Tourism Education	8	32
28	[22]	Upskilling and reskilling the workforce via industry driven technical and vocational education and training: Strategies to initiate Industry/Institution partnership.	2020	Journal of Economic Info	7	9
24	[23]	Life and career skills among technical and vocational education and training (TVET) students in vocational colleges	2020	Online Journal for TVET Practitioners	6	8
19	[24]	Backward and forward reviews on technical and vocational education and training (TVET) in Malaysia: The evolution and ICT-driven future prospect	2020	Universal Journal of educational research	4.75	5
13	[25]	Establishing Quality in Technical and Vocational Education in Burundi	2023	Open Journal of Social Sciences	13	7
13	[8]	21st Century competencies in Technical and Vocational Education and Training: Rhetoric and reality in the wake of a pandemic.	2021	Journal of Education (University of KwaZulu-Natal)	4.33	13
12	[26]	Employers' identification of skills needed by technical and vocational education graduates for industrial work effectiveness	2020	Journal of Education, Society and Behavioural Science	3	6
10	[27]	Digital learning in technical and vocational education and training (TVET) in public university, Malaysia	2022	Journal of Technical Education and Training	5	3
8	[4]	Students' tendencies in choosing technical and vocational education and training (TVET): Analysis of the influential factors using analytic hierarchy process	2021	Journal of Computer and Mathematics Education	2.67	8
6	[28]	Effectiveness of technical and vocational education: A meta-analysis	2022	Pakistan Journal of Educational Research and Evaluation	3	2

Table 2 provides a snapshot of recent academic publications in the field of Technical and Vocational Education and Training (TVET). These publications, dating from 2020 to 2023, reflect ongoing research and discussions surrounding the efficacy, evolution, and strategic development of TVET across different regions and sectors.

NC Shereni's article on restoring specific skills in Zimbabwe's hospitality sector via TVET is the most cited, reflecting its significant impact and relevance in addressing sector-specific educational needs. G Vinayan, D Harikirishanan, and SM Ling's work on upskilling and reskilling through industry-driven TVET highlights the importance of industry-institution partnerships, which is also highly cited, indicating the value placed on collaboration between educational institutions and industry. Citations per year provide an indicator of the relevance and ongoing influence of these works in the field. For example, the 2023 paper by S Nduwimana and I Sindayigaya already shows a high annual citation rate (13), suggesting it has been well-received and addresses current issues in TVET. Citations per author can indicate the individual impact of researchers in the field. The sole-authored paper by NC Shereni has 32 citations, showing a significant individual contribution to TVET literature. The papers cover diverse aspects of TVET, from sector-specific skills and digital learning to employer needs and policy reviews.

This diversity underscores the multifaceted nature of TVET challenges and innovations, addressing both localized and global perspectives. There's a notable focus on the role of TVET in adapting to and preparing for the future, particularly through ICT integration and alignment with industry needs, as seen in papers by MFM Yaakob et al. and ANA Razak et al. The research spans a variety of geographical contexts, from Malaysia to Zimbabwe, highlighting the global importance of effective vocational education frameworks. The focus extends across several sectors including hospitality, industrial work, and broader vocational education systems, illustrating the versatile application of TVET in bolstering employability and economic development. The table captures a vibrant and dynamic field where TVET is seen as a critical component of education systems worldwide, responsive to the changing needs of industries and economies. The ongoing citation of these works suggests their foundational role in shaping contemporary TVET strategies and policies.

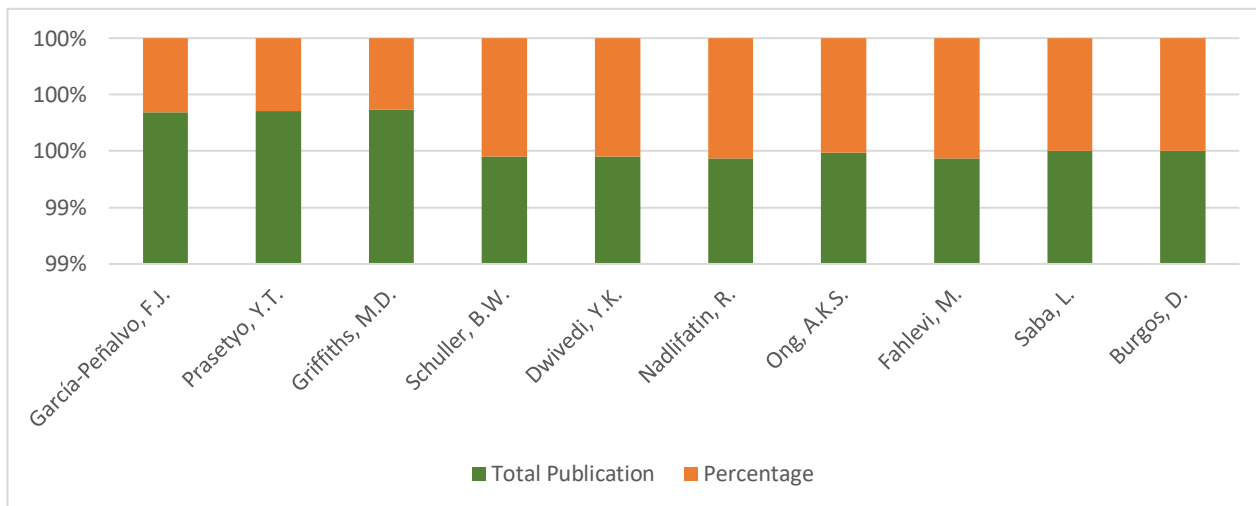


Fig. 10: Total publication by top 10 most active authors on global trends in vocational training education

Table 3 Total Publication By 10 Most Active Authors

Year	Journal Of Vocational Rehabilitation	International Journal for Research in Vocational Education and Training	Journal Of Technical Education and Training	International Journal of Environmental Research and Public Health	Social Policy and Administration
2020	2	1	1	3	0
2021	2	3	2	8	3
2022	3	4	2	4	3
2023	3	2	1	1	4
2024	3	2	1	0	2

Figure 10 and Table 3 presents a list of ten authors along with their total number of publications and the corresponding percentage of their contributions. García-Peñalvo, F.J. leads with 57 publications, representing 15% of the total contributions among the listed authors, highlighting his significant research activity. Prasetyo, Y.T. follows closely with 54 publications, contributing 14%, indicating a substantial involvement in academic research. Griffiths, M.D., with 47 publications, accounts for 12% of the total, showing a strong research presence. Schuller, B.W., having 45 publications, makes up 19% of the contributions, which is notably high in percentage terms, reflecting a concentrated research effort. Dwivedi, Y.K. has 38 publications, contributing 16%, demonstrating consistent academic productivity. Nadlifatin, R. and Ong, A.K.S. have 35 and 32 publications respectively, with contributions of 15% and 13%, indicating their active participation in research. Fahlevi, M., with 28 publications (12%), and Saba, L., with 25 publications (10%), both contribute significantly to the research field. Finally, Burgos, D. has 20 publications, making up 8% of the total, indicating a meaningful yet smaller contribution compared to the others.

6. What are the documents per year by source for global trends in vocational training technologies?

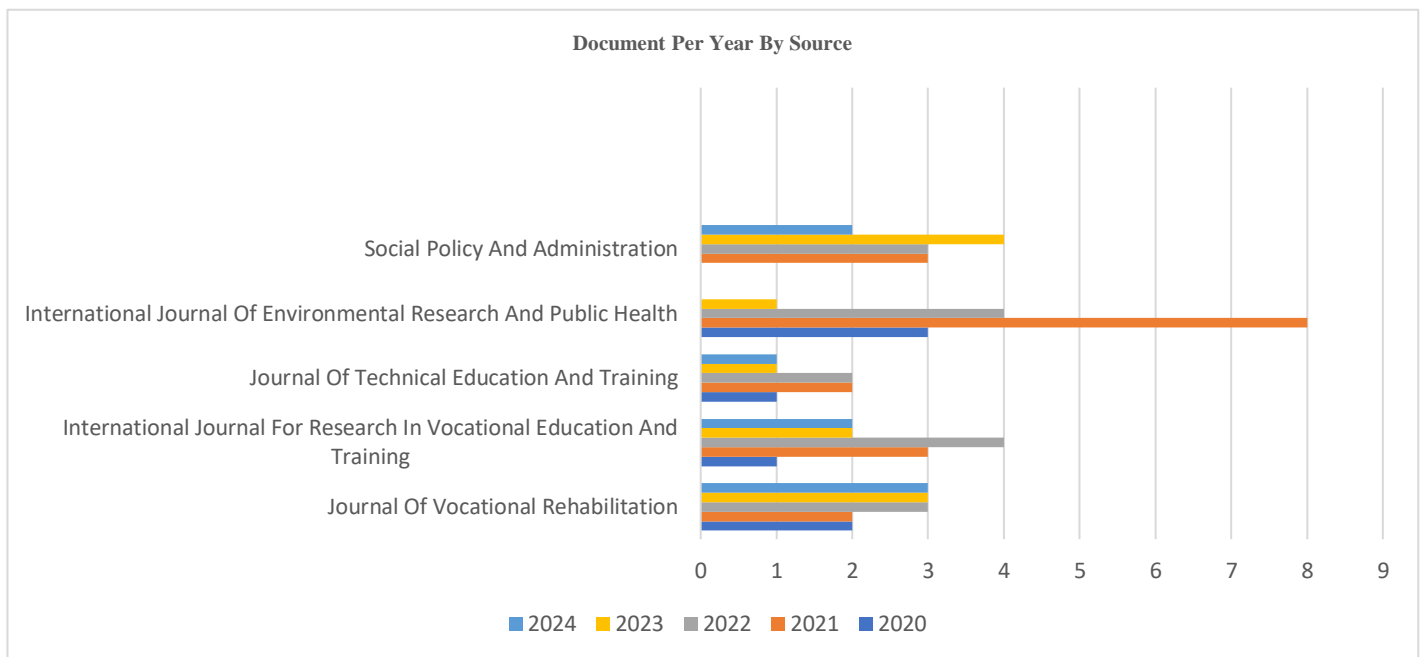


Fig. 11: Document per year by source

Table 4: Document Per Year By Source

Author	Total Publication	Percentage
García-Peñalvo, F.J.	57	15%
Prasetyo, Y.T.	54	14%
Griffiths, M.D.	47	12%
Schuller, B.W.	45	19%
Dwivedi, Y.K.	38	16%
Nadlifatin, R.	35	15%
Ong, A.K.S.	32	13%
Fahlevi, M.	28	12%
Saba, L.	25	10%
Burgos, D.	20	8%

The data presented in Figure 11 and Table 4 lists various academic journals along with the total number of documents each has published, possibly focusing on themes related to vocational education and its interdisciplinary applications. Leading the chart is the International Journal of Environmental Research and Public Health with 16 documents, suggesting a robust integration of environmental and public health topics which may overlap with vocational education in areas like environmental health training. The International Journal for Research in Vocational Education and Training ranks second with 13 publications, underscoring its pivotal role in disseminating research specifically targeted at vocational education and training systems. The Journal of Vocational Rehabilitation and the Journal of Technical Education and Training follow, with 8 and 7 documents respectively, highlighting their focus on rehabilitation and technical skill development within vocational contexts. Other journals such as the Social Policy and Administration and Sustainability Switzerland each contribute 6 articles, pointing to a broader discussion on the socio-economic impacts and sustainability issues related to vocational training. Additionally, journals like Applied Mathematics and Nonlinear Sciences and the Indian Journal of Labour Economics, with 5 publications each, along with the Economics of Education Review and the Journal of Autism and Developmental Disorders each with 4, indicate a rich diversity of research ranging from quantitative analyses to specialized educational needs within vocational education. This assortment of journals reflects the wide-reaching implications and diverse applications of vocational education in addressing a range of societal challenges.

CONCLUSIONS

The distribution of publications across these varied journals highlights the multidimensional impact of vocational education. It not only addresses specific technical skills and rehabilitation needs but also integrates with larger social, economic, and environmental themes. The emphasis on public health and environmental issues within vocational training contexts suggests a response to global challenges such as climate change, public health crises, and sustainability. Meanwhile, the focus on economics and labour market outcomes points to a significant concern with the efficacy of vocational education in improving economic efficiencies and addressing unemployment. The involvement of specialized journals in discussions about vocational education reflects a recognition of the need to adapt educational strategies to meet the needs of diverse populations, including those with specific disabilities. This is indicative of a broader societal shift towards inclusivity and tailored education solutions, which are crucial for fostering equitable access to opportunities and resources. Moreover, the presence of such research in high-impact journals signals robust academic interest and investment in understanding and optimizing vocational education. It also highlights the potential of vocational training to act as a bridge between traditional education systems and the evolving demands of the global job market, including the green economy, technology sectors, and more. In conclusion, vocational education stands as a pivotal element in the contemporary educational and economic landscape, evidenced by its widespread academic investigation across various domains. Its adaptability and relevance across different sectors position it as a crucial tool in addressing some of the most pressing challenges of our time, including workforce development, social inclusion, and sustainable development. The breadth and depth of research into vocational education not only enhance our understanding but also facilitate the development of policies and programs that are responsive to both individual needs and global imperatives. The widespread research into vocational education also underscores the critical need for ongoing adaptation and refinement of educational models to align with shifting economic patterns and technological advancements. As industries evolve, vocational training programs must continually update and modify their curricula to prepare workers for emerging roles, particularly in sectors like renewable energy, digital technology, and advanced manufacturing. This necessitates a dynamic approach to vocational education, where training is not only about imparting specific skills but also about fostering adaptability and lifelong learning capabilities among workers. Such flexibility is essential for maintaining workforce relevance in a rapidly changing global economy. This focus on adaptability and relevance also prompts a reconsideration of how vocational education is perceived and valued in society. There remains a significant need to elevate the status of vocational training, recognizing it as equally prestigious and vital as academic education. This shift in perception is crucial for attracting more individuals to vocational programs, thereby broadening the talent pool and enhancing societal recognition of skilled trades and technical professions. In conclusion, vocational education is not just a component of the global education system but a crucial engine of economic stability and social mobility. By addressing both immediate job skills and long-term career adaptability, vocational education plays a pivotal role in equipping individuals for a variety of career

paths, while also meeting the needs of industries and economies at large. The ongoing research and discussion within diverse academic journals highlight the complex interplay between vocational training and broader societal goals, emphasizing the essential role of vocational education in fostering a resilient, inclusive, and sustainable future.

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