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A Bibliometric Analysis: Quality Standards in Vocational Education (2005-2025)

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ABSTRACT

This study aims to examine the development and trends in research related to quality standards in vocational education from 2005 to 2025. The research data was obtained from the Scopus database, resulting in 239 articles that met the established inclusion criteria. Bibliometric analysis was used with data extraction in CSV and RIS formats, as well as visualization using VOSviewer software. The results of the study provide an overview of the publication and citation trends over two decades regarding the most frequently cited documents, the most productive sources, leading authors, the most productive countries, and the most frequently used author keywords in this field of research. The findings show a significant increase in the number of publications, especially in the period 2015–2025, reflecting growing academic interest in this topic. Articles with the highest citation rates generally discuss the importance of clear, evidence-based quality to improving the quality standards of vocational education. In addition, the analysis shows that several countries, including United States, United Kingdom, and Netherlands play a key role in research productivity and international collaboration. Overall, this bibliometric study can serve as a reference and basis for future studies on quality standards in vocational education.

1. Introduction

Vocational education plays a strategic role in preparing skilled workers who are relevant to the needs of industry amid rapid changes in technology and the job market (Wickramasinghe & Wickramasinghe, 2025; Setiawan, 2025). The studies from Muharam et al. (2025) and Sinarsih et al. (2025) show the implementation of quality standards and comprehensive quality assurance systems is key to ensuring that graduates' competencies match the demands of the business world and industry.

In addition, strengthening the governance of TVET institutions through accreditation, performance-based evaluation, and the involvement of external stakeholders has been proven to increase the accountability and credibility of vocational institutions at the national and international levels (UNESCO-UNEVOC, 2025; Schröder et al., 2023; Tekle et al., 2024). This situation shows that quality standards are not merely administrative instruments, but rather the main foundation for ensuring the relevance and sustainability of vocational education in facing the challenges of the industry 4.0 and society 5.0 era.

Quality standards in vocational education have evolved from a mere set of administrative rules into a comprehensive framework that regulates learning inputs, processes, and outputs, including graduate competencies, curriculum relevance, and graduate user satisfaction (Warsaw, 2013; Meisuri et al., 2024; Ghozali & Retnawati, 2021); Harris & Pranoto, 2025). In line with this, recent studies from Xidirov (2025) and Liando et al. (2025) show that the quality of TVET is largely determined by the integration of work competency standards, curriculum standards, and assessment standards, which are operationalized through accreditation mechanisms and performance-based program evaluations. In many countries, quality standards are also formulated through close partnerships with the business and industrial sectors so that graduate competency profiles truly reflect the actual needs of the job market and technological transformations (UNESCO, 2017; Alinea, 2022; Faraj et al., 2025). This collaborative approach makes quality standards a strategic instrument for ensuring public accountability while increasing public trust in vocational institutions at the national and international levels.

In the context of vocational education transformation, a holistic strategy is needed that focuses not only on hard skills but also on managerial, pedagogical, and psychosocial aspects. Amalia et al. (2025) proved that achieving vocational education quality standards must be aligned with industry needs, such as market-based curriculum planning and partnerships with the world of work. At the school operational level, Nasa & Lestari (2025) found that the leadership style of school principals can boost teacher performance and discipline. This is supported by Trihandayani et al. (2025), who argue that consistent supervision and high work motivation are key to enforcing educator discipline in order to support learning effectiveness. Meanwhile, the success of vocational education must also be supported by learning innovations in the classroom with the implementation of the Genre-Based Approach, which is very effective in improving students' reading literacy (Lailatussyifa et al., 2025). There are also psychological aspects, such as strengthening the mental readiness of vocational education graduates when they are about to enter the world of work through counseling interventions (Putri & Darmayanti, 2025). The synergy between strong school management, innovative learning methods, and psychological support is what makes vocational education of high quality.

Bibliometric analysis is an appropriate method to address these needs because it can identify publication trends and scientific collaboration networks (Maryadi et al., 2025; Shukla et al., 2025). Bibliometrics can identify core research topics, citation patterns, and thematic evolution, which help map scientific developments

quantitatively (Ardiana et al., 2025; Lukose et al., 2024; Mejia et al., 2021). This technique provides an objective picture based on publication data so that the direction of research can be determined more accurately based on scientific and industrial needs (Yeşilbaş et al., 2025; Strazda, 2025; Belaid et al., 2025). This study is expected to provide a clear picture of the direction of thematic developments so that it can be used as a basis for policy and further study. As a result, this study makes an important contribution to strengthening the quality of vocational education at the national and global levels.

This study aims to provides an overview of the latest trends in research on quality standards in vocational education, including annual publication and citation developments, most frequently cited articles, productive sources, most productive countries, most productive authors, and distribution of author keywords. Based on the urgency and research gap, this study aims to conduct a systematic and bibliometric mapping of literature on this topic in the period 2005–2025, with a focus on its implications for the development of vocational training. This study seeks to answer three main research questions (RQ):

RQ1. What are the trends in the development of publications and citations on this topic worldwide from 2005 to 2025?

RQ2. What are the most relevant findings from the mapping of bibliographic documents, sources, authors, and countries?

RQ3. What keywords are frequently used in this topic from 2005 to 2025?

To answer these questions, this study is expected to make a significant contribution to strengthening the theoretical basis for quality standards used in vocational education that are more adaptive, accurate, and future-oriented.

2. Methodology

The Research Method

This study used bibliometric analysis by collecting data from a source using relevant keywords. The articles are then filtered using specific classifications such as year of publication, language of writing, and so on (Prihandini et al., 2023). The results of the analysis visualization were created using VOSviewer software so that later a relationship between keywords, citation networks, and bibliographic coupling could be mapped to identify research trends and dominant themes regarding quality standards in vocational education (Triyono et al., 2023). To ensure that the research can be replicated, all methodological steps are carried out using best practices in bibliometrics (Sultono et al., 2025). With a combination of statistical analysis and graphical mapping, researchers are able to provide a structural quantitative overview of the literature on vocational training in the world. Overall, this research design was developed using a series of stages in (Figure 1), from data collection, document screening and selection, to network analysis and thematic mapping relevant to the research objectives.

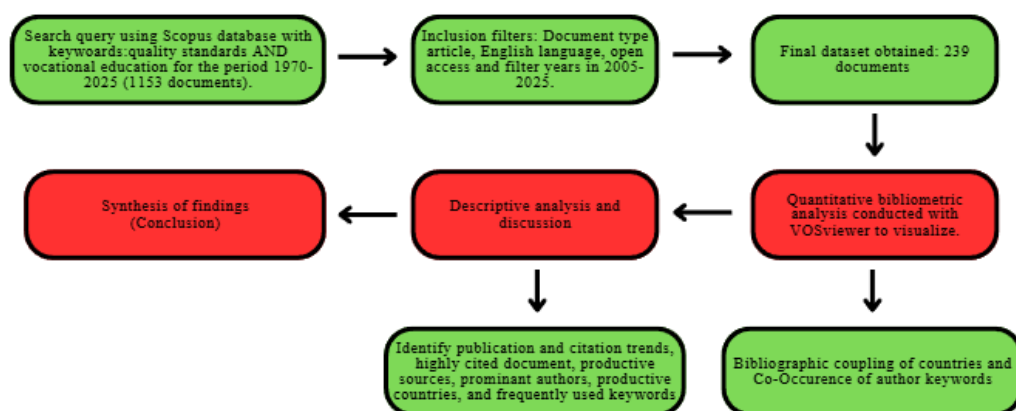


Figure 1. Research Design of PRISMA

The Data Collection

The data collection process was carried out using a systematic approach based on the Scopus database, which was chosen for its extensive literature coverage, standardized metadata quality, and reputation as a reliable global scientific repository. To maintain transparency and ensure that the selection process could be replicated in subsequent studies, the data search stages followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) principles. In the initial stage, researchers used the advance query: (TITLE-ABS-KEY (quality standards) AND TITLE-ABS-KEY (vocational education)) AND PUBYEAR > 2004 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE, “ar”) AND (LIMIT-TO (LANGUAGE , “English”)) AND (LIMIT-TO (OA , “all”)) to obtain documents relevant to the research focus, namely the characteristics of quality standards in the context of vocational education. This search process produced an initial collection of documents reflecting a variety of approaches, application contexts, and research orientations related to the topic. To ensure data suitability, the researchers applied inclusion criteria in the form of English-language publications, article and conference paper document types, open access, and publications within a time frame relevant to the development of research over the past two decades.

The Data Analysis

After initial screening, we cleaned the data by removing duplicates, verifying metadata, and assessing topic relevance based on abstracts and keywords. All data that met the criteria was then exported in comma-separated values (CSV) and research information systems (RIS) formats for further quantitative analysis. This final data set was used to map two decades of publication and citation trends, frequently cited articles, productive sources, most influential countries, productive authors, and author keyword distribution.

The bibliometric analysis stage was conducted using VOSviewer. This tool was chosen because of its powerful capabilities in displaying and interpreting patterns

of relationships between elements in bibliographic data. VOSviewer was used primarily to produce network visualizations that illustrate collaborative relationships between authors, links between institutions, and intellectual structures formed through co-occurrence and bibliographic coupling analysis. The resulting visualizations help researchers understand thematic clusters and the direction of concept development in research on quality standards of vocational education. The results of this network analysis are then interpreted to formulate conclusions about the direction of research, research gaps, and opportunities for future study development.

3. Results and Discussion

Publication Years and Citation Trends

(Figure 2) shows the trend of scientific publications on quality standards in vocational education from 2005 to 2025. The search results are obtained by citation overview in scopus. The search results inform that a total of 239 documents have been published. (Figure 2) shows the annual number of publications and cumulative citations on quality standards in vocational education over the years. Overall, the growth in the number of documents and citations shows that the study of quality standards in vocational education is gaining an important position in the international research discourse.

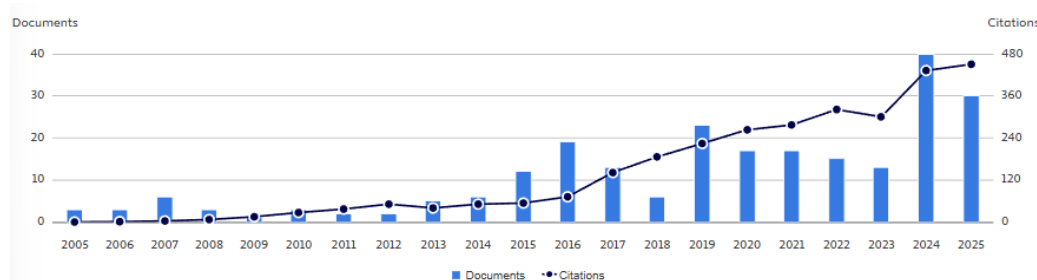


Figure 2. Distribution of publication and citation by years in scopus.

The development of research and citations can be divided into two main phases. In the first phase (2005–2014), this topic began to attract the attention of researchers, but the number of publications was still limited, with a total of around 34 documents published or contributing around 14.30% of the 239 existing documents, so the impact of citations was still relatively low. In the final phase (2015–2025), academic attention to vocational education quality standards increased sharply, with 205 documents published, or about 85.70% of the total publications, and the impact of citations also increased.

Highly Cited Documents

The results of the analysis based on the Scopus database found that the 10 most frequently cited documents throughout the year are presented in (Table 1). This information helps identify which articles from all target articles are the most influential in this field. The total number of citations (column C) from the top 10

articles is 1076. Based on the number of citations, the article by Pryor et al. (2015) entitled “Athletic training services in public secondary schools: A benchmark study” ranks first with 164 citations. In second place is the article by McCrone et al. (2010) titled “Cost-effectiveness of an early intervention service for people with psychosis” with 145 citations. Then in third place is Lown et al. (2015) with the title “Psychosocial Follow-Up in Survivorship as a Standard of Care in Pediatric Oncology” with 129 citations. In general, there are two articles that have more than 110 citations, namely Kirkwood (2016) and Kretser et al. (2019). Four other articles have more than 80 citations, namely from Callegari et al. (2016), Castro-Palaganas et al. (2017), Surmon et al. (2016), and Snowdon et al. (2019). The last one is Sinclair et al. (2016) with 78 citations. This reflects that most publications on quality standards in vocational education have attracted the attention of researchers worldwide.

Table 1. Top 10 High Cited Documents

Author(s) & Year	Document Title	Publication Source	C
Pryor, et al. (2015)	Athletic Training Services in Public Secondary Schools: A Benchmark Study	Journal of Athletic Training	164
McCrone et al. (2010)	Cost-effectiveness of an early intervention service for people with psychosis	British Journal of Psychiatry	145
Lown et al. (2015)	Psychosocial Follow-Up in Survivorship as a Standard of Care in Pediatric Oncology	Pediatric Blood and Cancer	129
Kirkwood (2016)	The state of cancer care in America, 2016: A report by the American society of clinical oncology	Journal of Oncology Practice	114
Kretser et al. (2019)	Scientific Integrity Principles and Best Practices: Recommendations from a Scientific Integrity Consortium	Science and Engineering Ethics	112
Castro-Palaganas et al. (2017)	An examination of the causes, consequences, and policy responses to the migration of highly trained health personnel from the Philippines: The high cost of living/leaving-a mixed method study	Human Resources for Health	88
Callegari et al. (2016)	Reliability and validity of the Italian version of the 14-item resilience scale	Psychology Research and Behavior Management	88
Surmon et al. (2016)	Perceptions of preparedness for the first medical clerkship: A systematic review and synthesis	BMC Medical Education	83
Snowdon et al. (2019)	Effective clinical supervision of allied health	BMC Health Services Research	80

Sinclair et al. (2016)	professionals: A mixed methods study Compassion training in healthcare: What are patients' perspectives on training healthcare providers?	BMC Medical Education	78
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Most Productive Sources

The ten most productive sources are presented in (Table 2). The table shows the distribution of the number of articles (column A) and the number of citations (column C) from various publication sources related to the research topic. Firstly, Journal of Technical Education and Training have 10 articles with 53 citations. This is followed by BMC Medical Education with 8 articles and 218 citations. Then Applied Mathematics and Nonlinear Sciences with 6 articles and 8 citations. Followed by Sustainability Switzerland with 5 articles and 25 citations. Several other sources such as BMJ Open, Eurasia Journal of Mathematics Science and Technology Education, Indian Journal of Science and Technology, International Journal of Environmental Research and Public Health, and Medical Teacher each have 3 articles with 4 to 80 citations. Finally, there is the American Journal of Pharmaceutical Education with 2 articles and 46 citations. Overall, this table illustrates that even though some journals publish only a few articles, their citation rates remain high. This demonstrates the relevance and influence of the research published in these sources.

Table 2. Top 10 Most Productive Sources

Sources	A	C
Journal of Technical Education and Training	10	53
BMC Medical Education	8	218
Applied Mathematics and Nonlinear Sciences	6	8
Sustainability Switzerland	5	25
BMJ Open	3	21
Eurasia Journal of Mathematics Science and Technology Education	3	16
Indian Journal of Science and Technology	3	4
International Journal of Environmental Research and Public Health	3	63
Medical Teacher	3	80
American Journal of Pharmaceutical Education	2	46

Most Productive Authors

The ten most productive authors in standard quality publications on vocational training from 2005 to 2025 are presented in (Table 3). The table shows the ten most influential authors based on the number of articles (column A) and citations (column C) they produced. First and second place went to Clarke, L. with 2 articles and 53 citations. Second place went to Nurtanto, M. with 2 articles and 52 citations. Third to sixth place went to Ball, J., Davey, A., Magin, P., and Mulquiney, K. with 2 articles and 41 citations each. Seventh and eighth place went to Divayana, D. G. H. from Indonesia with 2 articles and 19 citations, and Omeje, H. O. from Nigeria with 2 articles and 11 citations. In ninth and tenth place are Ismail, A. from Malaysia

with 2 articles and 7 citations, and Anikeeva, O. A. from the Russian Federation with 2 articles and 5 citations. Overall, this table shows that the most dominant contributions and impact of research come from authors in the United Kingdom, Indonesia, and Australia.

Table 3. Top 10 Most Productive Authors

Author	Country	A	C
Clarke, L.	United Kingdom	2	53
Nurtanto, M.	Indonesia	2	52
Ball, J.	Australia	2	41
Davey, A.	Australia	2	41
Magin, P.	Australia	2	41
Mulquiney, K.	Australia	2	41
Divayana, D. G. H.	Indonesia	2	19
Omeje, H.O.	Nigeria	2	11
Ismail, A.	Malaysia	2	7
Anikeeva, O. A.	Russia Federation	2	5

Most Productive Countries

We also analyzed the collaborative writing relationships between countries. (Figure 3) shows a map of collaborative writing between countries with bibliographic coupling countries. When we set the minimum number of documents for a country to 5 with a minimum of 70 citations for each country, 12 of the 75 countries met the threshold. From 12 contributing countries, they are organized into 3 clusters. The largest cluster consists of 6 countries (red) led by the United States with 30 documents, 108 TLS, and 9 collaborations with other countries. The second cluster (green) has 4 countries and is led by the Netherlands with 12 documents, 155 TLS, and 8 collaborative relationships. The third cluster (blue) consists of 2 countries and is centered on the United Kingdom with 27 documents, 235 TLS, and 8 collaborations with other countries. As can be seen, the United States, United Kingdom, and Netherlands are the largest nodes, indicating the productivity of these countries. Therefore, it can be concluded that these three countries are considered leading countries in terms of publications.

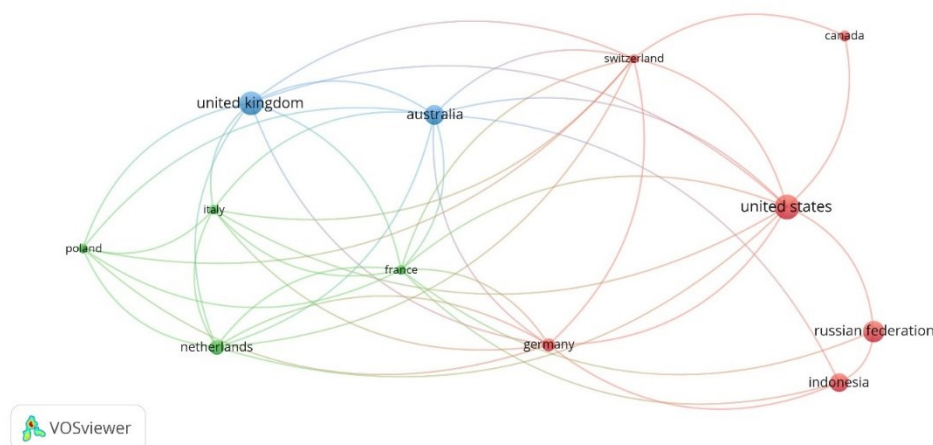


Figure 3. The Bibliographic Coupling of Countries

Most Frequently Used Keyword

We also analyzed the most frequently used keywords. Figure 4 shows a map of the most frequently used keywords. As seen on the map, the size of the nodes represents the number of publications from that country, while the distance between clusters indicates the strength of the relationship between them. To create a map displaying the most frequently used keywords in titles, abstracts, and keywords, the analysis was performed using Co-Occurrence Author Keywords. To generate the analysis network, we used VOSviewer. At least 3 occurrences of keywords with 30 keywords met the threshold of 892 keywords. The author keyword visualization map using VOSviewer is then shown in Figure 4.

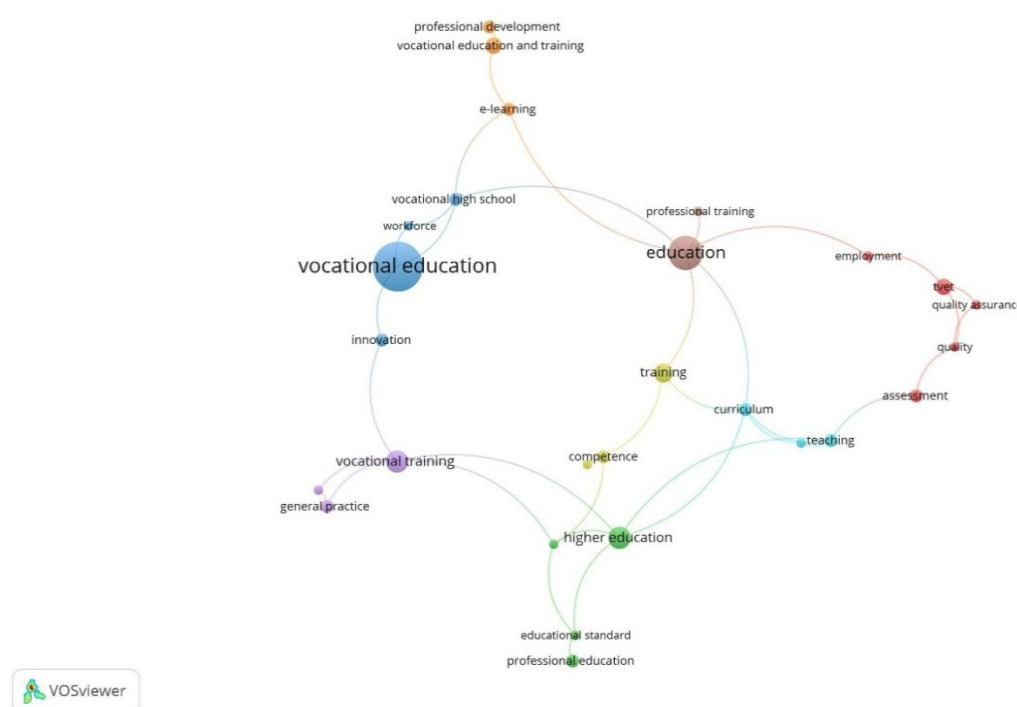


Figure 4. The Co-Occurrence of Author Keywords

The most frequently occurring keywords based on clusters are vocational education (blue), education (brown), vocational education and training (orange), training (yellow), vocational training (purple), higher education (green), curriculum (cyan), and TVET (red).

Table 4. Most Frequently Used Keywords

#	Author Keywords	Occ	TLS	Links
1.	vocational education	16	3	3
2.	education	11	8	6
3.	higher education	7	6	5
4.	vocational training	7	5	5
5.	training	6	4	3
6.	vocational education and training	5	2	2
7.	curriculum	4	6	5
8.	teaching	4	4	4
9.	competence	4	3	3
10.	quality	3	3	3

As listed in Table 4, there are 10 top keywords, indicating that all of these keywords are popular keywords related to quality standards in vocational education. Specifically, the most frequently appearing keywords are vocational education (16 times, 3 TLS, and 3 links), vocational education and training (5 times, 2 TLS, and 2 links), and quality (3 times, 3 TLS, and 3 links). These findings indicate that these keywords have been used by researchers in recent years.

4. Conclusion

Based on the results of a bibliometric analysis of 239 documents indexed in the Scopus database from 2005 to 2025, it can be concluded that studies on quality standards in vocational education have experienced significant growth. This is proven in the first phase (2005–2014) and the final phase (2015–2025), which indicate a double increase in academic interest in this topic. Articles with the highest citation rates generally discuss the importance of clear, evidence-based quality standards in improving the quality of vocational education services. In addition, the documents come from reputable journal articles and conference papers with the involvement of researchers from various countries. Analysis of collaboration between countries shows that United States, United Kingdom, and Netherlands are dominated the number of publications and international cooperation networks, while other countries contribute as regional collaborative partners. Specifically, the keywords of vocational education, vocational education and learning, and quality are themes that indicate the main focus of this topic. The results of this study show that the quality standards have become a relevant topic in vocational education and has great potential to be further developed in future research.

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