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REVIEW

Work-based learning in vocational education over past two decades: A scientometric and future research agenda

El aprendizaje basado en el trabajo en la formación profesional en las dos últimas décadas: una agenda de investigación cienciométrica y futura

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ABSTRACT

Introduction: Work-Based Learning (WBL) is recognised as a successful educational strategy that offers practical experience for vocational students. Despite numerous studies focussing on WBL as a tool for skill transfer, research examining its implementation and impact in vocational education remains few. This study aims to do a bibliometric analysis centred on the deployment of WBL and its effects in vocational education. This study specifically intends to assess the current state of work-based learning (WBL) research in vocational education and to establish a framework for WBL in this domain.
Methods: This research employs a bibliometric analysis of 2,570 Scopus publications from 2003 to 2023. VOSviewer is utilised to delineate the research network pertaining to work-based learning.
Results: The results indicate that the highest number of papers on work-based learning was published in 2023, with 229 articles, and the publication trend has consistently risen each year. Moreover, research on work-based learning frequently employs the phrase workplace learning across many nations. The terms work-based learning and workplace learning are synonymous, both denoting the process of acquiring knowledge and skills within a work context. This encompasses diverse learning modalities, such as formal training, informal learning via job performance, and engagement with colleagues in the workplace. The cluster analysis results on work-based learning and workplace learning yielded six clusters.
Conclusions: The six clusters include recognition of prior learning in work-based learning, acquisition of professional competency, problem-based learning in the workplace, work-based learning curriculum, total quality management for work-based learning, and task performance evaluation.

Keywords: work-based learning ; vocation, skills ; bibliometrics.

RESUMEN

Introducción: El aprendizaje basado en el trabajo (WBL, por sus siglas en inglés) se reconoce como una estrategia educativa exitosa que ofrece experiencia práctica para estudiantes vocacionales. A pesar de los numerosos estudios que se centran en el WBL como herramienta para la transferencia de habilidades, la investigación que examina su implementación e impacto en la educación vocacional sigue siendo escasa. Este estudio tiene como objetivo realizar un análisis bibliométrico centrado en la implementación del WBL y sus efectos en la educación vocacional. Este estudio pretende específicamente evaluar el estado actual de la investigación sobre el aprendizaje basado en el trabajo (WBL, por sus siglas en inglés) en la educación vocacional y establecer un marco para el WBL en este dominio.
Métodos: Esta investigación emplea un análisis bibliométrico de 2.570 publicaciones de Scopus desde 2003 hasta 2023. Se utiliza VOSviewer para delinear la red de investigación relacionada con el aprendizaje en el trabajo.
Resultados: Los resultados indican que el mayor número de artículos sobre aprendizaje en el trabajo se publicó en 2023, con 229 artículos, y la tendencia de publicación ha aumentado constantemente cada año. Además, la investigación sobre aprendizaje en el trabajo emplea con frecuencia la frase aprendizaje en el lugar de trabajo en muchos países. Los términos aprendizaje en el trabajo y aprendizaje en el lugar de trabajo son sinónimos, y ambos denotan el proceso de adquisición de conocimientos y habilidades dentro de un contexto laboral. Esto abarca diversas modalidades de aprendizaje, como la capacitación formal, el aprendizaje informal a través del desempeño laboral y la interacción con los colegas en el lugar de trabajo. Los resultados del análisis de conglomerados sobre aprendizaje en el trabajo y aprendizaje en el lugar de trabajo arrojaron seis conglomerados.
Conclusiones: Los seis grupos incluyen el reconocimiento del aprendizaje previo en el aprendizaje en el trabajo, la adquisición de competencias profesionales, el aprendizaje basado en problemas en el lugar de trabajo, el plan de estudios de aprendizaje en el trabajo, la gestión de la calidad total para el aprendizaje en el trabajo y la evaluación del desempeño de las tareas.

Palabras clave: aprendizaje en el trabajo; vocación, habilidades; bibliometría.

INTRODUCTION

In recent years, the industry has stressed the need of graduates and young workers demonstrating their professional skills.(1) This is owing to rapid technological innovation and dynamic knowledge expansion in the workplace. These challenges have compelled the sector to adapt to the constant change. These developments affect all labour market participants; no industry or employment is immune to the changes and uncertainties brought on by these disruptions. Young workers and recent graduates of educational institutions are particularly exposed to these shifts. As newbies to the labour market, they cannot rely on pre-existing structures or practices to safeguard them from future changes. These newcomers encounter increasingly complex and uncertain labour market challenges.

In fact, the industry has recently developed a portrait of the future workforce qualification requirements and anticipates that graduates of education will possess the necessary skills and be able to effectively perform a variety of roles in the workplace.(2) For example, the industry seeks individuals with the following skills: inquiry and initiative skills.(3) critical thinking, civic responsibility, teamwork and judgement,(4) adaptability and communication,(5,6) social networking, (7) and creativity and problem-solving.(8) Certainly, the demand for these qualifications will persist and be highly dynamic in response to technological advancements. Consequently, the dynamics of the workplace have motivated

educational institutions, particularly vocational education, to adapt to the changes that occur in the workplace.

In this regard, vocational education plays a critical role in training potential skilled individuals to deal with technological and knowledge changes in today's workplace. Vocational education produces graduates who are properly prepared to enter the ever-changing work market by taking a practical approach and focussing on direct industrial skills. Vocational programs include not only theoretical knowledge but also extensive practical experience, helping students to build skills that are in demand in today's employment market. Work-Based Learning (WBL) is one of the learning approaches seen to be successful in giving real-world experience for vocational students.

Work-Based Learning (WBL) can be comprehended from multiple viewpoints. Nisbet et al.(9) describe work-based learning (WBL) as informal learning that transpires within the workplace through interactions among employees. WBL denotes a methodology wherein individuals develop new skills, knowledge, and attitudes via the execution of their responsibilities, yielding advantages for both the individual and the organisation in both the short and long term.(10) WBL necessitates individuals to engage in the work process, communicate with peers, undertake tough assignments, and interact with clients. Consequently, within the framework of WBL, learning transpires as a secondary outcome of work.(11) The primary principle of WBL emphasises experiential learning derived from practical labour.(12) The cultivation of proficient vocational human resources necessitates an environment and duration for interaction and experience exchange.(13)

Numerous experts have emphasised the WBL study, which is deemed capable of promoting productive employee behaviour and enhancing corporate competitiveness.(10,14,15) The WBL idea is crucial for facilitating continuous learning, which enhances the competitiveness and profitability of the organisation, particularly in a dynamic business environment (15). Consequently, personal engagement in WBL seeks to enhance both technical and non-technical competencies required in the professional realm. Moreover, WBL provides a platform to adjust to the frequent changes that arise in the workplace.(16,17) The present research demonstrates the significant impact of WBL in enhancing individual competences in accordance with the requirements of the labour market. The concept of WBL is particularly suitable for vocational education institutes aimed at educating prospective skilled professionals in their respective fields of interest. Despite numerous studies focussing on WBL as a skill transfer method, research investigating its implementation and impact in vocational education remains few. This study seeks to do a bibliometric analysis concentrating on the implementation of WBL and its effects in vocational education. This study specifically intends to explore the research on Work-Based Learning (WBL) in vocational education and to ascertain the framework of work-based learning within this field.

METHODS

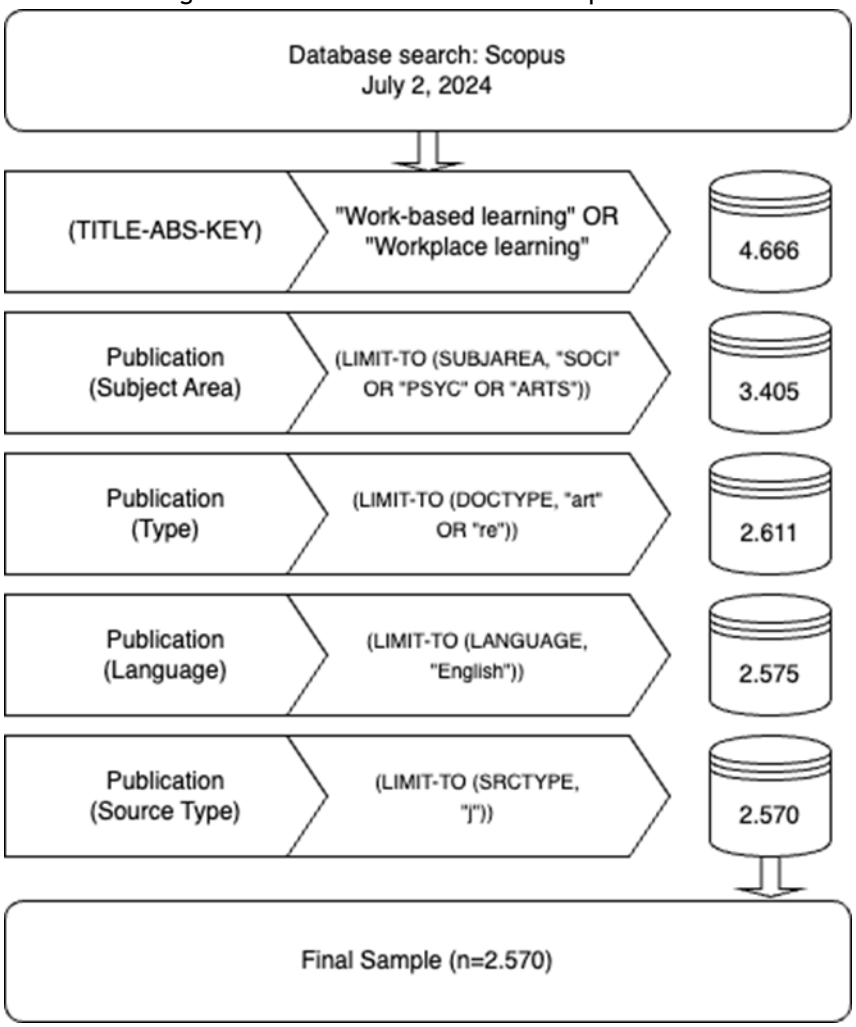
Data collected

This study uses bibliometric analysis to explore research trends regarding work-based learning. The Scopus database (www.scopus.com) was used to search for literature for several reasons. Firstly, Scopus is known for its extensive coverage, surpassing other databases like the Web of Science (WoS).(18) This broad coverage includes various types of sources such as journals, books, and conference papers, which are essential for comprehensive bibliometric studies.(19) Additionally, the trustworthiness and quality of data in Scopus have made it a preferred choice for large-scale analyses in research assessments, science policy evaluations, and university rankings.(20) Moreover, Scopus provides access to a wide variety of scientific journals and sources across multiple disciplines, making it a valuable resource for bibliometric studies in diverse fields.(19) Scopus has the ability to provide a complete record of all the information needed for research information systems (RIS) format, which allows for the import-into and analysis by tools of bibliometric software, as well as basic visualisation and statistical analysis of literature.(21)

To obtain research data, we download data in the form of RIS* (Research information system), which is fed to the Mendeley reference manager. Data consists of citation information, bibliographical information, and abstract & keywords. We used two keywords for the search, namely “work-based learning” OR “workplace learning” in articles published from 2003 to 2023. We were then restricted to English-language articles and reviews only; books and conference abstracts were not eligible. To achieve the research objectives, we used VOS viewer software version 1.6.20 with two considerations. First, VOSviewer helps map co-occurrence networks of authors, countries, keywords, and journals.(22) This feature is particularly useful for identifying patterns and relationships within large sets of bibliographic data. Additionally, VOSviewer is known for its user-friendly interface and flexibility in analyzing various elements of scientific literature.(23)

Figure 1: illustrates the systematic process employed to choose the relevant publications for this research. A total of 2.570 papers that satisfy the requirements for bibliometric analysis were gathered. These papers were published from 2003 to March 2023.

Figure 1. The bibliometric research protocol.



source: own elaboration.

Data Analysis

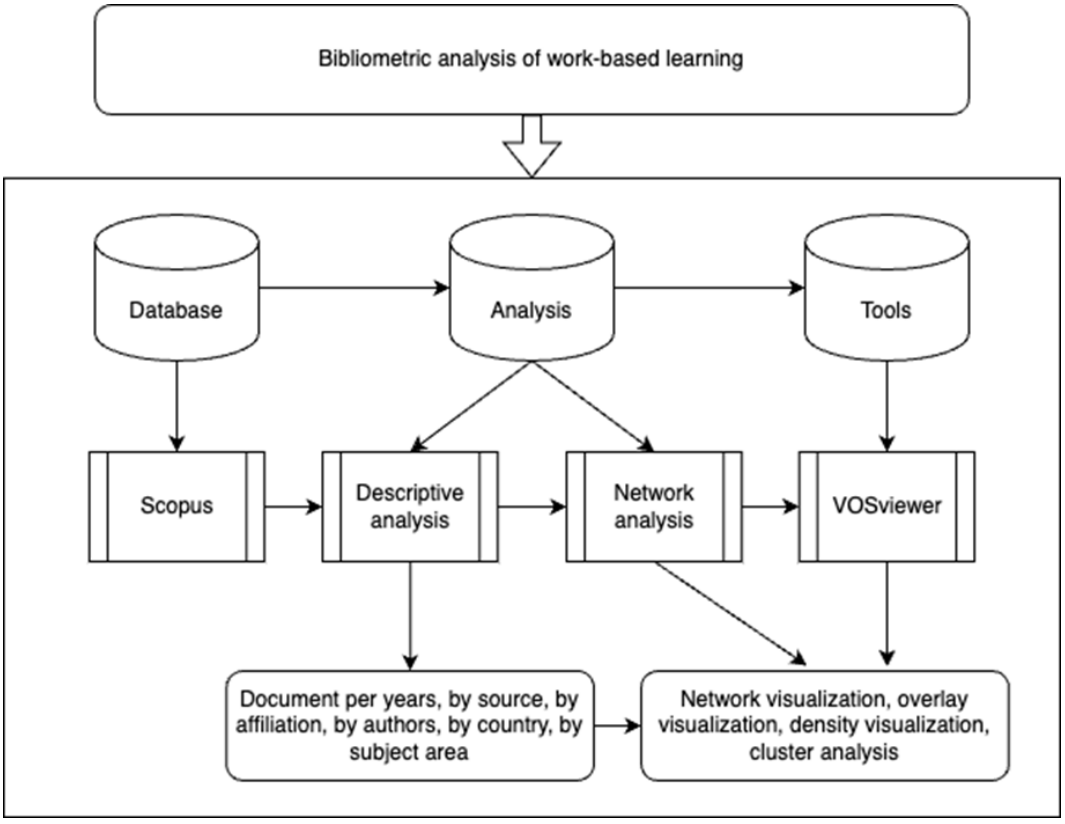
This study uses a bibliometric analysis approach. Bibliometric methods are widely recognized in scientific research evaluation, particularly in scientific and applied fields, as they provide a systematic approach to analyzing scholarly production and its impact.(24,25) These methods involve the use of bibliometric indicators and visualization maps to quantitatively and qualitatively analyze retrieved data, offering insights into patterns and relationships within large sets of bibliographic data.(26) Also, bibliometric analysis has been employed to evaluate the connections between authors, affiliations, journals, or countries and quantify the influence of research and connections, such as citations and keywords utilised.(27)

Furthermore, this study uses VOSviewer to optimize bibliometric analysis. VOSviewer enables the visualization of bibliometric networks to facilitate the interpretation and communication of complex data without requiring advanced technical skills.(28) VOSviewer software, which is known as a bibliometric analysis tool, was developed by Leiden Nees University scientists Jan van Eck and Ludo Waltman.(29) VOSviewer enables bibliometric analysis related to the fields of thematic analysis, mapping analysis, and cluster analysis.(30) In addition, VOSviewer can map academic networks including authors, affiliations, countries, keywords.(22)

Bibliometric Analysis Framework

This study employs the Scopus database to extract and analyse data on trends in work-based learning research. The data are subsequently analysed to ascertain authorship, citations, keywords, and knowledge networks pertaining to work-based learning study subjects. The bibliometric analysis framework presented in this paper is illustrated in Figure 2.

Figure 2: Bibliometric analysis framework



source: own elaboration.

RESULTS

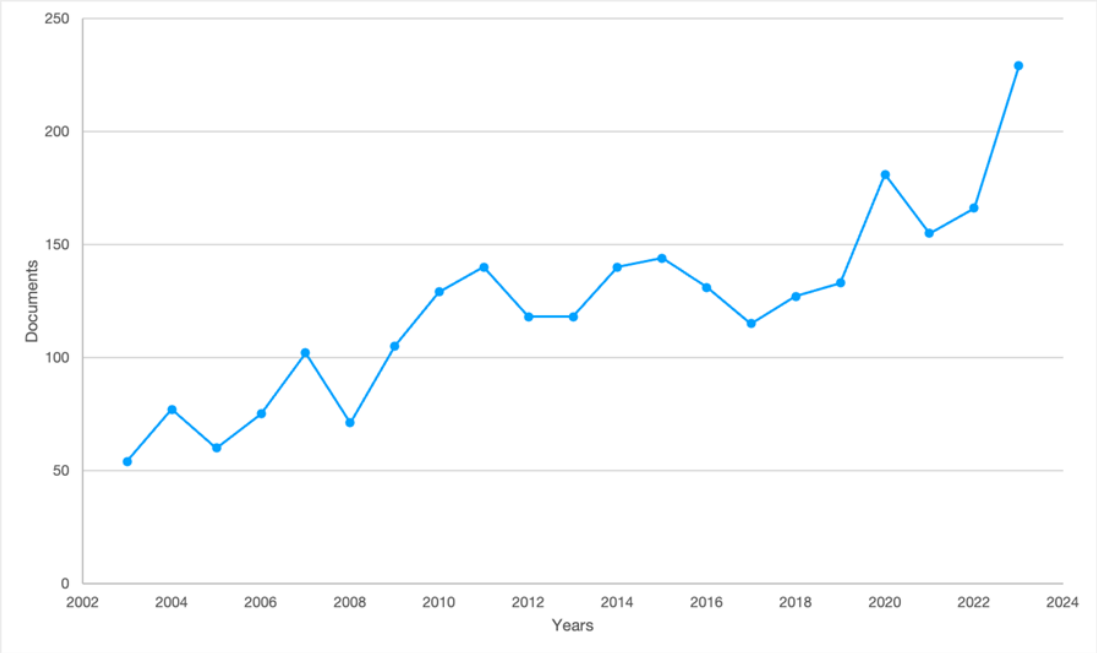
Statistic descriptive

Yearly Trends

A literature search conducted in the Scopus database from 2003 to 2023 yielded 2,570 publications. The keywords employed were ("work-based learning" OR "workplace learning") in the document categories of articles, conference papers, and reviews. All of these sources were derived from publications indexed in Scopus. Figure 3 indicates that the highest number of publications on work-based learning occurred in 2023, with 229 articles, with a consistent year growth in the publication trend. The growth in research indicates a substantial rise in scientific focus on work-based or workplace learning during the last twenty years. The inaugural paper on work-based learning was published between 2003 and 2023, titled "Problems Experienced by Students on Field Placement: Using Research Findings to Inform Curriculum Design and Content".(31) This paper appeared in the Australian Social Work journal and has received 50 citations.

Moreover, there has been a recent surge of interest among academics and professionals in the integration of work-based learning as a dual learning paradigm with employability skills.(32,33) Future study on employment in vocational education is essential to address the problems posed by the digital era and the fourth industrial revolution. It is advisable to examine work-based learning in conjunction with STEM, experiential learning, and 21st-century skills to enhance employment opportunities. Conversely, Heim et al.(34) emphasised the significance of assessing the outcomes of work-based learning. The study's findings indicated that work-based learning can be assessed using many indicators, including generic learning outcomes—competence development, generic learning outcomes—reflection, job-specific learning outcomes, and organisational learning outcomes. The growing trend of research on work-based learning in vocational education reflects an escalating scholarly interest in comprehending the significance of work-based learning within the framework of vocational education.

Figure 3. Document by years (2003-2023 period)



source: own elaboration.

Source Analysis

The results of the exploration of 2,570 articles from 2003 to 2023 have been published in 160 international journals indexed by Scopus. There are five top journals that have published the most articles on work-based learning in vocational education over the past two decades. The top 5 journals are the Journal of Workplace Learning (340 articles), Higher Education Skills and Work Based Learning (133 articles), Journal of Vocational Education and Training (98 articles), Vocations and Learning (82 articles), and Studies in Continuing Education (53 articles). The Journal of Workplace Learning is the most productive in discussing work-based learning over the past two decades.

Productive Institutions

Over the last two decades, the publication of articles on work-based learning has been dominated by the University of Maastricht with 87 papers. A total of 2,570 papers were published from various different institutions. The University of Maastricht is at the forefront in terms of the number of work-based learning publications (3.4% of the total papers). In second place, the most productive institution publishing work-based learning papers is Middlesex University with 49 papers, contributing 1.9%. The order of other institutions is followed by the University of Technology Sydney (47 papers), Griffith University (44 papers), Linköpings Universitet (40 papers), Open Universiteit (39 papers), UCL Institute of Education (36 papers), University of Jyväskylä (35 papers), Monash University (32 papers), and University of Toronto (29 papers). The top 10 research institutions are exclusively located in industrialised countries. Research on Work-Based Learning (WBL) in industrialised nations demonstrates that this methodology effectively narrows the skills gap between educational institutions and industry requirements. Work-Based Learning (WBL), encompassing internships, work-study programs, and workplace-based training, has emerged as a significant method within educational institutions in nations such the Netherlands, the United Kingdom, Australia, Sweden, Finland, and Canada. Conversely, research on work-based learning in poor nations has garnered limited scholarly interest.

Productive Authors

The majority of authors associate work-based learning with vocational education. The authors analyse work-based learning from multiple angles, including models, implementation, and evaluation. Teunissen has authored the most number of articles on work-based learning (24 papers) from 2003 to 2023. Subsequently, Doman (16 publications), Billet (14 publications), Margaryan (13 publications), and Collin and Gustavsson (12 publications) follow.

Productive Countries

The data indicates that 2,570 publications were published across 87 nations, with the United Kingdom conducting the most research on work-based learning during the past two decades. Research on work-based learning is focused on the ten most productive nations in this field. The UK published 752 papers, followed by Australia with 366, the US with 305, the Netherlands with 237, Sweden with 141, Canada with 124, Germany with 111, Finland with 104, Norway with 66, and South Africa with 61.

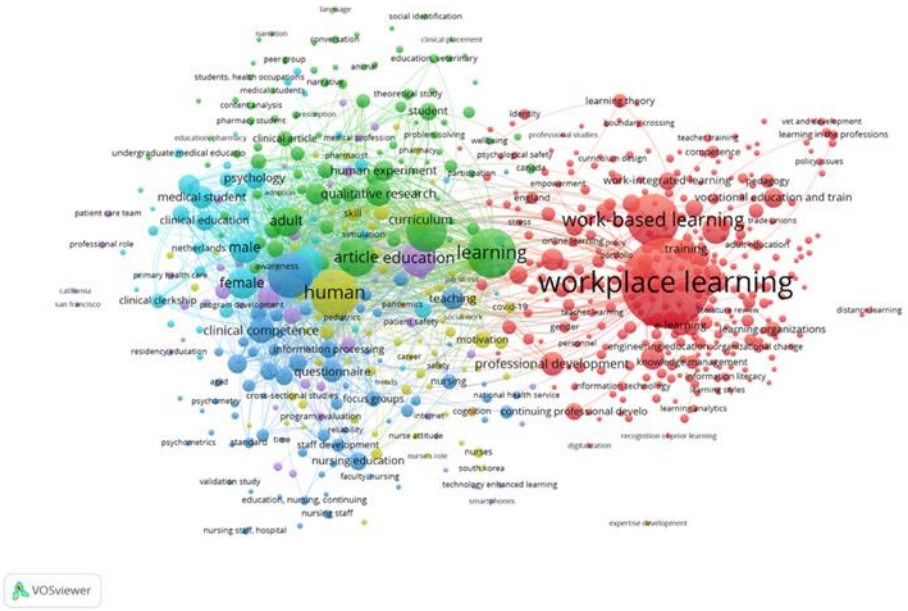
Documents by Subject Area

Studies on work-based learning are published in various journal subject areas. The papers about work-based learning are mostly published in journals with the subject area of Social Sciences, totaling 2,461 papers (57%). Furthermore, work-based learning is mainly studied in journals with the subject area of Business, Management and Accounting, totaling 869 papers (20%), followed by journals with the subject area of Psychology, totaling 481 papers (11%). The rest, work-based learning, is published in journals with the subject areas of Computer Science, Arts and Humanities, Nursing, Medicine, Engineering, Health Professions, Economics, Econometrics and Finance.

Bibliographic Analysis

The final stage of this bibliometric analysis is cluster analysis. According to Atashi et al. (2021), cluster analysis is a sophisticated statistical tool and approach that collects related data points. In cluster analysis, points in the same cluster are more similar than points in different clusters. To facilitate cluster analysis of this work-based learning study, we used VOSviewer 1.6.20 software. This study, 2,570 papers were analyzed by connecting three papers per cluster. The results of the cluster analysis are shown in Figure 4.

Figure 4. Network visualization work-based learning



source: own elaboration.

In addition, studies on work-based learning often use the term workplace learning in different countries. This is shown in the results of density visualization (see Figure 5), which often uses the term workplace learning. Both terms (work-based learning and workplace learning) have the same meaning, referring to the process of acquiring knowledge and skills in the work context. This includes various forms of learning, including formal training, informal learning through work performance, and interaction with others in the work environment.

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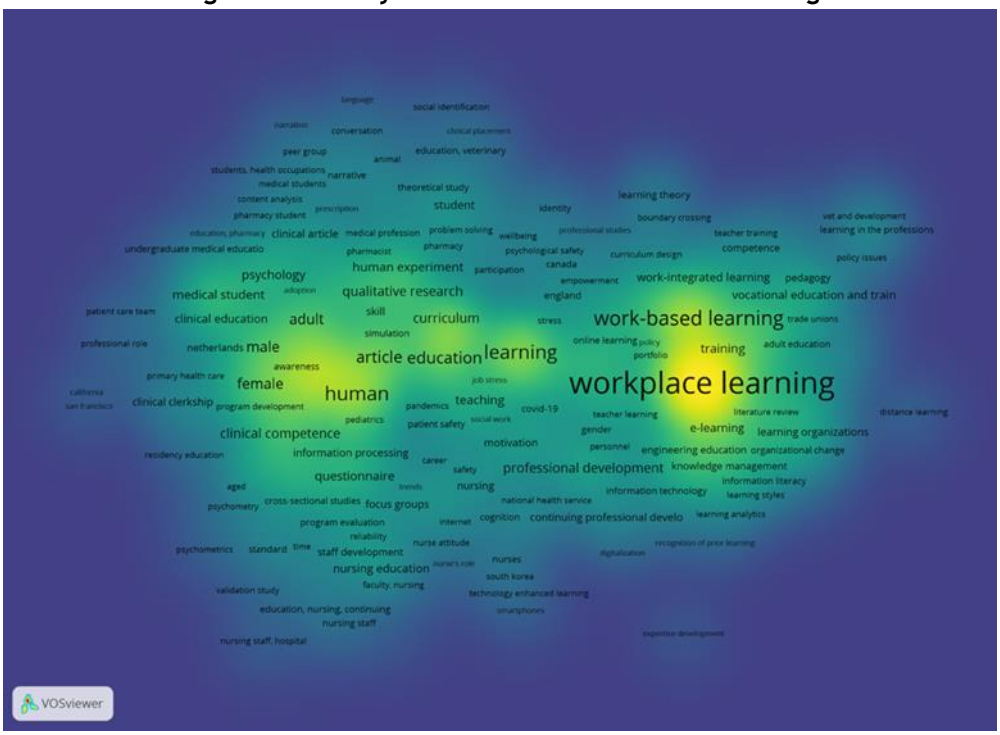
Figure 5. Density visualization work-based learning



source: own elaboration.

The cluster analysis results regarding work-based learning and workplace learning obtained seven clusters. The seven clusters include recognition of prior learning in work-based learning, acquisition of professional competency, problem-based learning in the workplace, work-based learning curriculum, total quality management for work-based learning, and task performance evaluation.

Cluster 1: Recognition Prior Learning (RPL) in work-based learning

Recognition of Prior Learning (RPL) is an increasingly significant mechanism within work-based learning frameworks, facilitating the acknowledgment of competencies acquired through various forms of experience, including informal and non-formal learning. RPL serves as a bridge for individuals who may not have traditional academic qualifications but possess valuable skills and knowledge gained through work or life experiences. This process not only enhances individuals' employability but also promotes lifelong learning by integrating diverse learning pathways into formal education systems.(37) RPL can effectively engage individuals who have been marginalized from traditional educational routes, allowing them to gain recognition for their competencies and access further educational opportunities.(38–40) Furthermore, the implementation of RPL aligns with the objectives of National Qualifications Frameworks (NQFs), which aim to standardize and validate skills across different contexts, thereby supporting a more inclusive approach to education and workforce development.(37,41) In the United States, RPL has been identified as an important technique for assisting the nation's workforce in earning college credit and completing degrees. Therefore, there is a need for a shift in the way workplace learning is assessed in RPL--from determining equivalency with existing curriculum knowledge and toward assessing the extent to which workplace learning can be used to solve problems, create relationships, and bring.(42)

The integration of RPL into work-based learning programs has been shown to yield significant benefits for both learners and educational institutions. For instance, work-based learning models that incorporate RPL can enhance the relevance and applicability of educational content by directly linking it to real-

world experiences.(40,43) This connection not only enriches the learning experience but also fosters a culture of continuous professional development among participants. Research conducted by Liossi(40) show that recognising alternate learning and training pathways provides important personal, economic, and societal benefits, as the person has the chance to pursue academic and/or professional development. The application of RPL in education shows how institutions can leverage this recognition to create more flexible and responsive learning environments.(44) Additionally, RPL can act as a catalyst for lifelong learning, enabling individuals to pursue further education and professional growth based on their prior experiences.(45)

However, the implementation of RPL is not without challenges. Issues such as institutional resistance, lack of awareness, and the complexities of assessing experiential learning can hinder its effectiveness.(38,46) A common challenge is the slow expansion of RPL policies in various countries, indicating that despite increasing recognition of the importance of these policies, systemic barriers often hinder progress.(47) Moreover, the tension between the inclusive intentions of RPL and the constraints of its implementation can create disparities in access and recognition.(46) To address these challenges, it is crucial for educational institutions and policymakers to develop clear frameworks and support systems that facilitate the recognition of prior learning, ensuring that it serves as a genuine pathway for individuals seeking to enhance their skills and qualifications in a rapidly evolving job market.(48,49)

Cluster 2: Acquisition of Professional Competency

The implementation of work-based learning (WBL) significantly enhances the acquisition of professional competencies by providing learners with practical experiences that bridge theoretical knowledge and real-world applications. WBL allows students to engage directly with industry practices, fostering the development of critical skills that are essential for their future careers. The practical knowledge and competency assessment should be central to vocational education, as these elements are crucial for preparing students to meet industry standards and expectations.(50) This hands-on approach not only solidifies theoretical concepts but also equips students with the necessary skills to navigate complex professional environments effectively. WBL encourages continuous learning processes that are much needed in the development of new technologies. In addition, the integration of a competency-based learning management system shows how a structured WBL experience can systematically improve students' practical skills, ensuring they meet the standards required for professional practice. This alignment of education with industry needs not only benefits students, but also improves overall workforce effectiveness.

Moreover, work-based learning promotes continuous professional development, which is vital for maintaining and enhancing competencies over time. For example, work-based learning has a significant impact on strengthening students' employability skills by providing relevant practical experience in the workplace.(33,51) Through internship programs, industry collaborations, or community-based projects, students can develop communication, collaboration, and problem-solving skills that are highly sought after in the job market. In addition, this hands-on experience allows students to understand the dynamics of the work environment, hone technical skills, and build professional networks, thereby increasing their confidence and readiness to enter the workforce after graduation. Work-based learning not only enriches academic knowledge, but also prepares students to face future career challenges.

A WBL role designed to instill skills in the workplace can be effectively linked to the principles of vocational education, emphasizing the importance of practical experience in developing competencies. This role involves creating structured opportunities for students to engage in real-world tasks within a professional environment, allowing them to apply theoretical knowledge in practical settings. Miao and Hoppe(52) highlight that a learning design approach tailored to WBL can facilitate the integration of task-relevant knowledge, thereby enhancing students' skill acquisition and readiness for the workforce. By immersing students in authentic work scenarios, they gain hands-on experience that is critical for

mastering the skills required in their chosen fields, which is a fundamental aspect of vocational education.(53)

Furthermore, the implementation of WBL roles fosters a collaborative relationship between educational institutions and industry partners, which is essential for aligning educational outcomes with labor market needs. This partnership enables the co-creation of learning experiences that are directly relevant to the skills employers seek, thereby enhancing the employability of graduates. Raelin emphasizes that students learn effectively by engaging in real work that complements their classroom learning, promoting the acquisition of broad, transferable skills.(54) Additionally, the integration of vocational education with work-based learning not only improves the quality of training but also elevates the status of vocational pathways in society, as noted by recent research on enhancing social recognition of vocational education. By establishing a robust framework for WBL, educational institutions can better prepare students for successful transitions into the workforce, ultimately contributing to a more skilled and competent labor market.

Cluster 3: Problem-based Learning in the workplace

Learning to solve problems through work-based learning (WBL) is increasingly recognized as an effective pedagogical approach that aligns closely with Problem-Based Learning (PBL) methodologies. WBL emphasizes the application of theoretical knowledge in practical settings, allowing learners to engage with real-world challenges. This experiential learning model fosters critical thinking and problem-solving skills, as students are often required to navigate complex situations that do not have straightforward solutions.(55,56) Research indicates that PBL in the workplace, which involves students working collaboratively to solve non-routine problems, enhances their ability to analyze and address issues systematically.(56,57) By implementating WBL, students not only gain practical experience but also develop essential skills such as self-regulation and mastery of content, which are crucial for effective problem-solving in professional environments (58).

The effectiveness of WBL in enhancing problem-solving capabilities is well-documented across various educational contexts. Studies have shown that students engaged in PBL in the workplace demonstrate improved problem-solving skills compared to those who experience traditional learning methods.(57) In this context, WBL fosters an environment where students can learn collaboratively, which is essential for developing critical thinking and problem-solving abilities.(59,60) Furthermore, PBL in the workpplace encourages collaborative learning, where students can share diverse perspectives and strategies, thereby enriching their understanding and enhancing their ability to tackle complex problems.(55,56,60) Such collaborative environments mimic workplace dynamics, preparing students for future professional challenges where teamwork and effective communication are vital.

Moreover, the integration of PBL into WBL not only cultivates problem-solving skills but also promotes a deeper understanding of subject matter through contextual learning. By confronting real-world problems, students are compelled to apply theoretical concepts in practical scenarios, which reinforces their learning.(61) This synergy between WBL and PBL not only enhances students' ability to address immediate challenges but also cultivates a mindset geared towards lifelong learning and adaptability in their future careers.(62,63) Furthermore, the integration of work-based experiences into educational curricula allows students to bridge the gap between theory and practice, fostering a deeper understanding of their field and enhancing their employability.(64) Thus, the combination of work-based learning provides a comprehensive framework for developing proficient problem solvers ready to meet the demands of the modern workforce.

Cluster 4: Work-based learning curriculum

The alignment of a work-based learning (WBL) curriculum with industry needs and standards is crucial for ensuring that students acquire relevant skills that are in demand in the job market. A well-structured

WBL curriculum integrates theoretical knowledge with practical application, allowing students to engage directly with industry practices. Connecting professional development with the curriculum and industry enhances student completion rates and fosters the development of critical employability skills among craftsmen in the construction industry.(65) This connection not only prepares students for immediate employment but also equips them with the adaptability needed for future career advancements.(66)

Moreover, the incorporation of work-integrated learning (WIL) strategies within the WBL framework further enhances students' readiness for the workforce. Cooper(67) defines WIL as a method that combines professional work experience with classroom studies, thereby facilitating competency development and the transfer of learning to the workplace. This approach allows students to develop personal competencies that are highly valued by employers, such as teamwork, communication, and problem-solving skills. By embedding WIL into the curriculum, educational institutions can ensure that students are not only familiar with theoretical concepts but also adept at applying them in real-world contexts, thus meeting the evolving demands of various industries.(67)

Additionally, the effectiveness of a WBL curriculum is reflected in its ability to foster collaboration between educational institutions and industry partners. Hamdani et al.(68) highlight that self-designed project-based learning models provide students with direct experience in an industrial atmosphere, significantly improving the skills required by employers. This collaborative approach not only enhances the learning experience but also ensures that the curriculum remains relevant and responsive to industry changes. As a result, students emerge from such programs with a robust set of skills that align with current job market requirements, ultimately increasing their employability and career success.(33,68,69)

The integration of theory and practice within a curriculum is essential for fostering a comprehensive learning experience that prepares students for the complexities of the workplace. A well-designed curriculum should not only impart theoretical knowledge but also emphasize the application of that knowledge in real-world contexts. This balance enables learners to make meaningful connections between academic concepts and practical applications, thereby enhancing their understanding and retention of the material. Research indicates that students who engage in experiential learning—where they apply theoretical concepts in practical settings—demonstrate improved problem-solving skills and greater overall competency in their respective fields.(67)

Cluster 5: Total Quality Management for work-based learning

Total Quality Management (TQM) is vital in enhancing work-based learning by fostering a culture of continuous improvement and stakeholder engagement. In vocational education, TQM emphasizes the importance of quality assurance mechanisms for developing skilled workers who meet industry demands. TQM principles emphasize the importance of aligning educational practices with industry standards, ensuring students acquire the necessary skills and competencies that meet employer expectations. According to Tortorella et al.(70), integrating TQM practices in organizations leads to improved operational performance, which is critical in a work-based learning environment where practical skills are essential. Furthermore, TQM serves as a holistic approach that enhances the quality of organizational performance, which is essential for adapting to the needs of a dynamic workforce.(71) This alignment between TQM and work-based learning ensures that educational institutions can effectively prepare students for real-world challenges, enhancing their employability and performance in the job market. A well-structured quality management system is fundamental to achieving curriculum objectives in higher vocational education.(72)

In addition, implementing TQM in a work-based learning environment encourages collaboration between educational institutions and industry partners, fostering an environment that supports knowledge transfer and innovation. Loke et al.(73) asserted that TQM initiatives can significantly enhance organizational learning and knowledge management, essential components in a work-based learning context. This collaborative approach benefits students by providing them with hands-on experience and allows

organizations to benefit from the new perspectives and innovative ideas learners bring. In addition, TQM practices positively influence work-related outcomes, such as job satisfaction and performance, which are important to both students and employers in a work-based learning framework.(74,75) Embedding TQM principles into work-based learning will encourage educational institutions to create a robust framework that enhances the quality of education and ensures that graduates are well-equipped to meet the demands of the modern workforce.

Cluster 6: Task Performance Evaluation

Task Performance Evaluation in work-based learning is very important in the context of vocational education, because it is to see the effectiveness of training and students' readiness to enter the workforce. Integrating practical experiences into vocational training, often called work-integrated learning (WIL), emphasizes the importance of learning through the actual work process. This approach improves task performance and encourages the development of essential skills critical for employability.(76) Research shows that effective vocational education contributes significantly to acquiring vocational knowledge and skills, which are critical for a successful transition to the labor market.(77) Furthermore, task performance evaluation during work-based learning can provide valuable insights into the effectiveness of vocational training programs, allowing for continuous improvement and adaptation to industry needs.(78)

In assessing task performance, various evaluation frameworks can be used to measure the competencies acquired by students during their vocational training. For example, using performance assessments that combine cognitive and non-cognitive skills can comprehensively understand students' abilities.(79) In addition, collaboration between vocational schools and employers is essential in creating relevant assessment criteria that reflect real-world expectations.(80) This partnership can help bridge the gap between theoretical knowledge and practical application, ensuring that students are well-prepared for the demands of their future careers. Furthermore, incorporating feedback mechanisms from supervisors and industry professionals can enhance the evaluation process, providing students with constructive insights that can guide their professional development

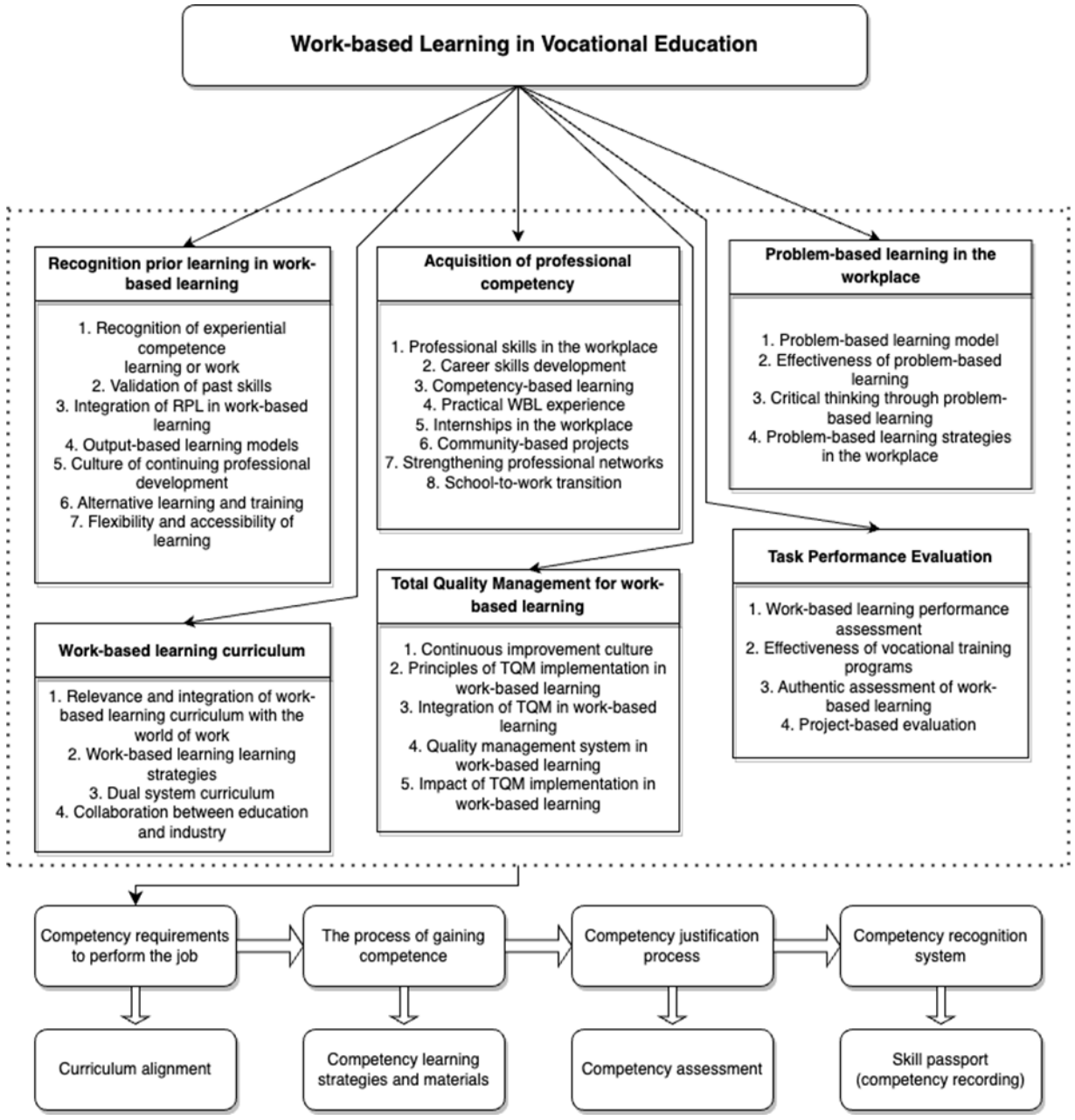
DISCUSSION

Based on cluster analysis of the bibliography of 2,570 papers, six clusters were obtained regarding the implementation of work-based learning in vocational education. The proposed framework regarding work-based learning in vocational education is shown in Figure 6. In general, the application of work-based learning (WBL) in vocational education has proven to be a highly effective approach for bridging the gap between theoretical knowledge and practical skills. By embedding learning within real-world work environments, WBL enables students to gain hands-on experience, fostering a deeper understanding of their chosen field and enhancing their employability. The direct interaction with industry practices allows learners to develop not only technical skills but also important soft skills, such as communication, problem-solving, and teamwork, which are crucial in the workplace. Furthermore, WBL offers opportunities for personalized learning, as students can progress at their own pace, apply concepts to practical tasks, and receive real-time feedback from mentors or supervisors.

The work-based learning (WBL) development strategy must consider several important aspects in order to provide an optimal impact on the development of student competencies. First, competency needs must be clearly identified based on industry demands and technological developments to ensure that the curriculum applied is relevant to job market conditions. Second, the process of acquiring competencies through education and training must be systematically structured by utilizing learning opportunities in the workplace that can develop practical skills directly. Competency justification needs to be carried out to ensure that skills acquired through WBL meet industry-recognized standards, either through performance evaluation or certification. Finally, a competency recognition system must be built so that

competencies acquired through WBL can be officially recognized, either in the form of certificates, licenses, or other formal recognition, which facilitates the recognition of competency achievements throughout the world of work. By considering these things, the WBL development strategy can ensure lifelong learning, which allows individuals to continue to develop their skills over time and changes in the world of work.

Figure 6: Framework for Work-based Learning in Vocational Education



source: own elaboration.

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CONSIDERATIONS AND RESEARCH'S FUTURE LINE

Work-based learning (WBL) is crucial in preparing skilled human resources for the future, especially amidst rapid technological developments and ever-changing industry needs. By integrating direct experience in the workplace, WBL allows students to apply the knowledge gained in class to real situations, deepen practical skills, and develop professional attitudes needed in the job market. This approach not only helps students prepare themselves for the challenges of the workplace but also allows them to build professional networks that are beneficial for their future careers.

Studies on work-based learning are essential to understanding how effective this approach is in preparing skilled human resources to face the world of work challenges. Future research on WBL can provide insight into how WBL can be better implemented, identify challenges faced by students, teachers, and industry, and evaluate its impact on graduates' practical skills, employability, and professional readiness. In addition, this research provides an overview of elements that need to be strengthened in WBL programs, such as collaboration between educational institutions and the industrial sector and the development of more relevant curricula. Implementing WBL research is also useful in designing vocational education policies that are more responsive to the needs of the ever-evolving labor market and ensuring that graduates have theoretical knowledge and the practical skills needed in a competitive world of work. Based on the results of the bibliographic analysis related to WBL, several suggestions for future research are obtained, as shown in Table 1.

Table 1: Suggestions for future research.

No	Cluster	Suggestions for Future Research
1	Recognition Prior Learning (RPL) in work-based learning	Future research on Recognition of Prior Learning (RPL) in work-based learning should focus on several key areas to enhance its effectiveness and applicability. One promising avenue is the exploration of e-RPL practices, which emphasizes the need for a robust analytical framework that aligns e-portfolios with the diverse purposes of RPL. This could involve developing guidelines for integrating technology into RPL processes, thereby facilitating a more streamlined and accessible assessment of prior learning. Additionally, research should investigate the impact of RPL on social equity and inclusion, particularly in how it can provide access to educational opportunities for individuals from non-traditional backgrounds.
2	Acquisition of Professional Competency	Exploration of the impact of competency improvement through work-based learning. In addition, the effectiveness and relevance of competency-based training (CBT) need to be further explored.
3	Problem-based Learning in the workplace	One promising direction is investigating how PBL can be tailored to different industries and organizational cultures, as the needs and challenges vary widely across sectors. Research could also examine the role of technology in facilitating PBL, particularly how digital tools and platforms can enhance collaboration, problem-solving, and knowledge sharing in remote or hybrid work environments. Additionally, longitudinal studies assessing the long-term outcomes of PBL, such as employee skill development, career progression, and organizational performance, would provide valuable insights.
4	Work-based learning curriculum	Examining the alignment between WBL curricula and the evolving demands of the labour market, particularly in sectors undergoing rapid technological change. Studies could explore how WBL programs can incorporate emerging skills, such as digital literacy or soft skills, like adaptability and emotional intelligence, to ensure that learners are equipped for future challenges. Additionally, research could investigate the role of mentorship and coaching within WBL frameworks, exploring how these relationships impact learning outcomes and career trajectories.
5	Total Quality Management for work-based learning	One area for investigation is how TQM principles, such as continuous improvement, customer focus, and employee involvement, can be adapted to optimize learning outcomes in workplace settings. Research could explore how organizations can implement systematic feedback loops and performance metrics to assess and improve WBL processes, ensuring that both learners and employers benefit. Another important focus would be understanding the barriers and enablers to the adoption of TQM in diverse industries, as different sectors may face unique challenges in aligning their WBL practices with TQM standards. Longitudinal studies on the long-term impact of TQM on the development of skills, productivity, and organizational culture in work-based learning settings could also yield valuable findings.

source: own elaboration.

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CONCLUSIONS

The evolution of work-based learning (WBL) from 2003 to 2023 has significantly impacted TVET across multiple dimensions, including recognition of prior learning in work-based learning, acquisition of professional competency, problem-based learning in the workplace, work-based learning curriculum, total quality management for work-based learning, task performance evaluation, and expertise development. This study shows that RPL plays a critical role in recognizing the skills and knowledge that individuals acquire outside the formal educational context, thereby enhancing their employability and professional growth. Furthermore, the incorporation of problem-based learning in workplace learning environments has been shown to foster critical thinking and problem-solving skills among learners, as they engage with real-world challenges. This approach not only facilitates the development of relevant curricula tailored to industry needs but also promotes practices that ensure continuous improvement of educational outcomes. Furthermore, effective task performance evaluation mechanisms are essential to assess learners' competencies in an authentic environment, thereby contributing to skill development and lifelong learning. The synthesis of these elements underscores the transformative impact of WBL on vocational education, highlighting the need for adaptive pedagogical strategies that align with the dynamic nature of the workplace.

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77. .

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Methodology: Tuatul Mahfud.
Software: Tuatul Mahfud.
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Formal Analysis: Tuatul Mahfud.
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