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A Systematic Review of Factors Shaping Vocational Teacher Professional Education Implementation

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Abstract. This study aimed to analyze the factors influencing developing professional education programs for vocational teachers through a systematic review of literature released between 2010 and 2024. Vocational teacher education aims at equipping instructors with the skills needed to meet industry demands, yet its implementation often encounters systemic challenges. Data was obtained from Scopus and Web of Science due to their comprehensive coverage of high-quality, peer-reviewed literature relevant to education and vocational studies. A qualitative systematic review method was employed using the PRISMA approach, with clearly defined inclusion and exclusion criteria. From an initial total of 559 papers identified, 15 were selected after rigorous screening and eligibility assessment. The data were thematically synthesized and analyzed to derive meaningful insights. The review found that professional competence, teacher perceptions, managerial and social support, working conditions and geographical and cultural contexts are key interrelated factors influencing program success. High professional competence enhances teaching quality, while favorable perceptions of development programs promote active teacher participation. Additionally, support from management and peers fosters a conducive environment for growth and favorable working conditions improve motivation and performance. These findings underscore the importance of strengthening teacher competencies, encouraging stakeholder collaboration and adapting programs to local contexts. This study provides valuable implications for policy development and best practices in vocational education and highlights the need for continued research to expand understanding in this area.

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1. Introduction

Vocational education is essential for cultivating a trained workforce that can adapt to the continuously changing requirements for industry (Scalabrino et al., 2022). The quality of vocational educators is a crucial determinant in achieving this objective, as they are tasked with imparting pertinent academic knowledge and practical skills to pupils. In response to this demand, many countries have established professional education programs for vocational instructors aimed at improving their competencies in teaching in vocational education settings. The execution of these initiatives frequently encounters numerous obstacles that may impede their overall efficacy and influence (Yeap et al., 2021).

The efficacy of executing professional education programs for vocational educators is affected by various interrelated elements (Egloffstein & Ifenthaler, 2017). The elements encompass the significance of program design and curriculum, the accessibility of institutional resources and support, along with external impacts like policies and technology breakthroughs. A comprehensive understanding of these aspects is crucial for enhancing the implementation procedure and ensuring that these programs meet their planned goals (Tran et al., 2023).

In developed nations such as Germany and Switzerland, the adequate execution of professional education programs for vocational educators is facilitated by structured frameworks (Wibowo et al., 2022), strong partnerships between educational institutions and industry and applying advanced technology. Systems like competency-based training in Australia and dual training in Germany are examples of how vocational teacher education programs can match the demands of the labor market (Luczaj, 2022). Several studies have explored specific aspects of vocational teacher development, such as industry collaboration (Ibda et al., 2023; Tran et al., 2023) curriculum relevance (Handayani & Djohar, 2020) and professional training models (Ghavifekr & Yulin, 2021). On the other hand, there are several obstacles to the implementation of these initiatives in developing nations such as India and Indonesia, such as a lack of industry participation, inconsistent legislation and resource constraints (Smaragdina et al., 2021). However, comprehensive studies that integrate these various factors into a holistic understanding are limited. Most of the existing research addresses only fragmented aspects of program implementation, thereby leaving a gap in capturing the full landscape of factors influencing professional education for vocational teachers. As a result, a systematic review offers the opportunity to synthesize findings from multiple studies, identify prevailing patterns and bridge these knowledge gaps by providing a more integrated and contextualized understanding.

This research aim was to perform a thorough review of the factors influencing the execution of professional education programs for vocational educators. This study analyzed scholarly papers from the past decade to identify critical domains

influencing program execution, uncover problems encountered by stakeholders and offer practical recommendations for program enhancement (González-pérez & Ramírez-montoya, 2022). The review used the PRISMA framework to provide a transparent and rigorous methodology, yielding a comprehensive synthesis of evidence. The results of this study are anticipated to assist policymakers, educators and institutions engaged in vocational teacher education. This research enhances the discourse on enhancing vocational education and teacher professional development by identifying key elements and suggesting methods to bridge implementation gaps. Furthermore, it underscores the need for international cooperation in exchanging best practices and tackling shared difficulties, ensuring that vocational teacher education continues to be a crucial component in cultivating a skilled and sustainable workforce.

Before delving into the detailed literature review, it is essential to outline the guiding questions that frame this study. This systematic review was designed to address the following core questions:

- What are the key factors influencing the implementation of professional education programs for vocational teachers?
- How do these factors relate to one another in supporting or hindering the adequacy of such programs?
- What practical insights can be derived from existing studies to enhance the quality and impact of vocational teacher education?

These questions formed the basis for synthesizing findings from various studies and identifying patterns and gaps within the current body of literature.

2. Literature Review

2.1. Implementation of Vocational Teacher Professional Education Programs

The implementation of professional education programs for vocational teachers is a strategic initiative to improve the quality of educators in the vocational sector, with the objective of generating competent educators who can provide students with practical skills and theoretical knowledge that are pertinent to industry requirements (Hamid et al., 2024; Richter & Richter, 2024). This curriculum aims to solve the problems of a constantly changing employment market so that vocational teachers are not only qualified but also able to adjust to labor market needs and technological changes.

Several important elements such as program and curriculum design, institutional support and government legislation, significantly affect the success of applying this approach. Relevant program design for industrial demands combines theory and practice with mastery of the newest technology (Çoker & van der Linden, 2022). The success of the program also depends much on institutional support, which includes industry engagement, training facilities, and qualified teachers (Lai, 2021; Ramasamy & Zainal, 2023). Furthermore, essential for the execution of this program are supportive government policies that include appropriate funding allocation and the revitalizing of vocational education.

However, implementing the Professional Education Program for Vocational Teachers (PPGV) is not without difficulties such as resource constraints, gaps

between theory and practice (Handayani & Djohar, 2020; Mardhiah et al., 2023) and a lack of industry involvement in the educational procedure. Strategies involving improved capability of educational institutions, integration of technology into the learning procedure, and strengthening of cooperation between educational institutions and industry are required to address these difficulties (Riyadi et al., 2024). The PPGV program has the potential to produce competent vocational teachers who can meet the demands of a continuously changing job market by adopting a holistic approach and receiving support from various stakeholders (As & Diyah, 2023; Sekano et al., 2023; Wang, 2024). The present PPGV program model used in Indonesia uses both concurrent and sustainable methods. While the sustainable model is carried out upon the completion of their academic education, the concurrent model allows potential teachers to continue professional education concurrently with their academic studies. This method seeks to give students freedom in negotiating their paths of professional development.

2.2. Implementation of Professional Education Programs for Teachers in Other Countries

The various countries' implementation of professional education programs for teachers demonstrates a diverse range of approaches and results. The dual training strategy has been successful in producing high-caliber vocational instructors in nations like Germany by fusing classroom theory with real-world industry experience (Bükki & Fehérvári, 2024). This program not only improves the instructional abilities of teachers but also ensures that the curriculum is pertinent to the current industry requirements (Martinez, 2022).

In Australia, the implementation of a competency-based framework in vocational education and training (VET) has been instrumental in aligning learning outcomes with industry demands. This system emphasizes developing of practical skills that meet labor market expectations through close collaboration between training institutions and industry stakeholders. As a result, vocational graduates are better prepared for employment and equipped with relevant competencies. In contrast, developing countries such as Indonesia and India continue to face multifaceted challenges in implementing similar professional education programs. Financial and infrastructural limitations often hinder adequate program delivery (Al-Qallaf & Al-Mutairi, 2016), while inconsistent education policies and limited industry engagement further complicate development of vocational teachers (Luczaj, 2022; Syauqi et al., 2020).

This study investigates how these diverse aspects impact the execution of teacher professional education programs in diverse settings and pinpoint optimal approaches that can be implemented to improve vocational education standards worldwide.

2.3 Factors Influencing the Implementation of Teacher Professional Education Programs

Professional education programs for teachers are impacted by several linked and complicated elements. The relevancy of program and curriculum design is one of the primary elements. Well-crafted initiatives ought to represent contemporary

advancements in vocational education and industry needs (Chinedu et al., 2023; Riyadi et al., 2024). Institutional support is also significant since the adequacy of the program is greatly influenced by the availability of resources, facilities and teacher training programs (Foerste et al., 2017). Moreover, collaboration between educational institutions and the business sector is essential to ensure that the delivered curriculum aligns with the skills demanded in the region. Implementation of programs for teacher professional development is assisted by government legislation and technological developments. Investing in educational technology and supporting policies for vocational education helps to improve already in-use initiatives. Adequate implementation is sometimes hampered, nevertheless, by issues such as resource constraints, poor involvement of stakeholders and policy inconsistencies (Mohd Kamaruzaman et al., 2019; Smaragdina et al., 2021). Thus, developing plans to improve the quality and success of teacher professional education programs depends on a thorough knowledge of these elements.

Implementing vocational teacher professional education programs presents great difficulties in underdeveloped nations like Indonesia and India. Many Indonesian vocational institutions struggle to provide sufficient access to modern equipment and learning materials, so limiting the efficacy of teacher training programs (Cabot et al., 2007). This is a critical issue that includes funding, infrastructure, and trained trainers (N. L. A. Rahman et al., 2022).

Policy contradictions sometimes also make program execution difficult. Frequent policy changes combined with inadequate government funding confuse stakeholders and slow down development of programs aimed at preparing vocational teachers (S. A. Rahman et al., 2022). The lack of strong industry alliances exacerbates the problem since vocational teachers cannot get hands-on experience with the newest industry trends. Notwithstanding these difficulties, several nations have had some successful pilot initiatives stressing the need for scalable methods to overcome resource constraints.

2.4 Cross-Cultural Insights

Comparisons across cultures draw attention to universal needs and unique contextual factors in vocational teacher professional education. For example, although the need for matching teacher competencies with labor market needs is clear worldwide, the strategies for reaching this alignment vary depending on cultural, economic and technical settings. Strong institutional frameworks and technological integration propel performance in developed nations; in poor nations, grassroots projects and community-based programs are especially important in helping to close gaps (Cornelius & Stevenson, 2019).

Furthermore, influencing the implementation techniques of vocational teacher training programs is the interaction between legislation, culture and educational institutions. In several nations, funding and priority of vocational education depend on cultural attitudes toward it (Ghavifekr & Yulin, 2021). For instance, societies that give academic education higher priority than vocational training could invest less funds to developing vocational teachers, thus restricting their

possible influence (Yeo & Lee, 2020). These cross-cultural attitudes highlight the need for context-sensitive methods in the design and execution of programs for professional education of vocational teachers. They also underline the possibility for worldwide cooperation to distribute best practices and address shared problems.

3. Methodology

3.1 Research Design and Procedures

This research used a systematic literature review methodology to examine and assess the factors influencing the implementation of vocational teacher professional education programs. The objective was to synthesize existing research to enhance understanding of the challenges and enablers affecting these programs in both developed and developing countries. This systematic approach ensured objectivity and rigor while facilitating the identification of patterns, gaps, and emerging trends that may have been overlooked previously (Othman et al., 2024).

The PRISMA 2020 Statement, which provides a standardized framework for the planning, execution and reporting of systematic reviews, includes several essential steps. The procedure commences with the establishment of precise research objectives, which form the basis for the investigation (Zabidin et al., 2019). This systematic review examined peer-reviewed papers released from 2010 to 2023, sourced from reputable databases to ensure source quality. Focusing on studies related to program design, institutional support, and external factors revealed important insights into the diverse influences on the implementation of vocational teacher professional education. This study aimed to connect theory and practice, thereby contributing to advancing more practical vocational education programs in the future.

3.2 Article Search

The article search stage aimed to systematically explore emerging challenges and issues in the implementation of vocational teacher professional education programs. Although the PRISMA framework does not provide detailed instructions on conducting literature searches, this study adopted a systematic approach based on the recommendations by Wibowo et al. (2022), which emphasized the importance of using high-impact and reputable sources. Scopus and Web of Science were selected as the primary databases because they index a vast range of peer-reviewed journals with high relevance to vocational education and teacher professional development. These two databases are widely recognized for their rigorous indexing standards and international scope, making them particularly suitable for capturing high-quality, globally relevant studies. While other platforms such as ERIC, EBSCOhost or Google Scholar may also offer educational literature, the focus on Scopus and Web of Science was deemed sufficient to ensure the credibility, consistency and academic rigor required for this review. These two databases prioritize high-impact publications in vocational education and teacher professional development (Toimbek, 2021).

In addition, this study used title, abstract, and keywords as search restrictions, and limited the search to publications from 2010 to 2023 to ensure relevance to

recent developments in vocational teacher education. As mentioned by Kravchuk et al. (2023), topics often have multiple keywords associated with them in the field of vocational teacher education. To ensure broad coverage, the article search was conducted using restrictions on titles, abstracts and keywords, without limiting the publication timeframe. The specific keywords used for the databases in this study are as follows: factors AND vocational AND teacher AND professional AND (develop OR implement) AND (education OR training)**, as shown in Table 1.

Table 1: Search String for Papers in Databases

Database	Keywords
Scopus	factors AND vocational AND teacher AND professional AND (develop* OR implement*) AND (education OR training)
Web of Science	factors AND vocational AND teacher AND professional AND (develop* OR implement*) AND (education OR training)

The search results yielded 262 papers from the Scopus database and 297 papers from Web of Science. These papers encompassed various perspectives on the implementation of vocational teacher professional education such as challenges, best practices and innovations in program design.

The use of these two databases allowed the researcher to cover a wide range of high-quality papers that are relevant to the domains of vocational education and teacher professional development. With this approach, the research could identify patterns, challenges and opportunities that arise in the implementation of vocational teacher professional education programs.

The results from the article search formed the basis for identifying critical factors affecting the implementation of vocational teacher professional education programs. These findings also informed developing of strategic recommendations to improve program quality and contextual relevance.

3.3 Inclusion and Exclusion Criteria

Defining explicit inclusion and exclusion criteria was essential for maintaining transparency and achieving high-quality outcomes in this systematic review, which examined the challenges and issues associated with the implementation of vocational teacher professional education programs. This study predominantly used peer-reviewed journal papers as the principal source of information, aligning with suggestions from prior literature.

This review included journal papers that address professional education programs for vocational teachers, were released in English in a peer-reviewed journal between 2013 and 2023, were final publications, were either open access or accessible via institutional libraries, employ suitable qualitative or quantitative methodologies and analyses, and are available in full text. The criteria aim to

guarantee the inclusion of only pertinent, high-quality and accessible papers in the analysis.

The exclusion criteria encompassed papers that were not in English, were not released in journals (that includes books, conference proceedings, or other reports), did not address professional education programs for vocational teachers, lacked open access or accessibility through institutional libraries, and were not available in full text. The exclusion criteria were implemented to remove papers that are either irrelevant or failed to meet the required quality standards for the systematic review. Several relevant papers were identified, reviewed and compiled for analysis in this review based on the established inclusion and exclusion criteria. This procedure adheres to the PRISMA 2020 standards, ensuring a thorough and systematic approach to preserving the consistency and accuracy of the results (Xu & Ouyang, 2022). This approach enables the research to identify high-quality papers that offer critical insights into the challenges, best practices and opportunities associated with the implementation of vocational teacher professional education programs. The data was then synthesized thematically and analyzed to derive conclusions that can guide future practice. Figure 1 presents the PRISMA-based flowchart of the study selection procedure.

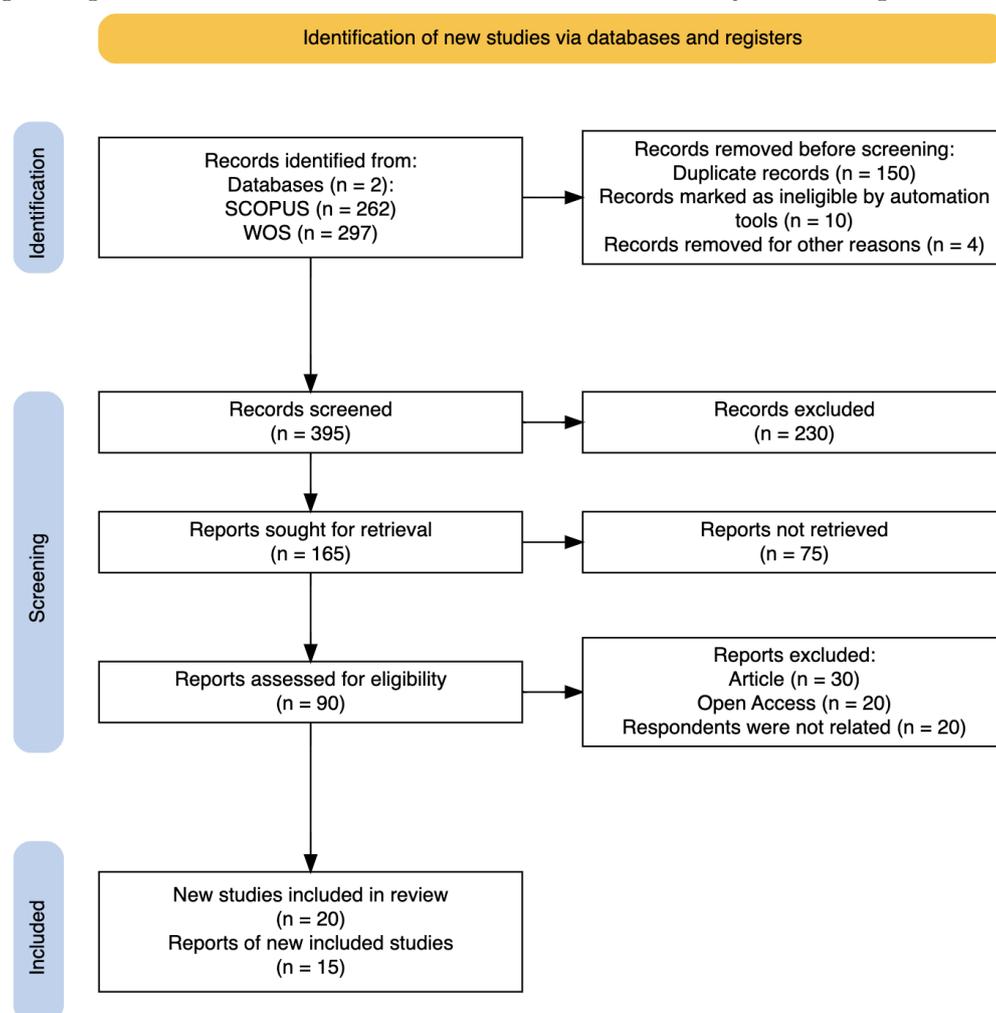


Figure 1. PRISMA-based study selection procedure flowchart

From an initial pool of 559 records identified in Scopus and Web of Science, a total of 20 studies were ultimately included after a multi-stage screening and eligibility assessment. Reasons for exclusion at each stage that includes duplication, inaccessibility or irrelevance to vocational teacher education are clearly outlined to ensure transparency and rigor.

3.4 Searched Data and Screening Outcomes

The initial search yielded a total of 559 papers from the Scopus and Web of Science databases. After removing 150 duplicates, 395 papers remained, which were then screened based on titles and abstracts. A total of 305 papers were excluded as they fell outside the scope of this review, resulting in 90 papers for full-text assessment. After reviewing the full texts, 70 papers were excluded for not meeting the inclusion criteria. A total of 20 papers were selected, but five of them were removed due to methodological limitations that did not align with the expected research standards. Additionally, some of these papers did not significantly contribute to the understanding of the topic being researched or contained data that was not relevant to this study's context. Ultimately, the remaining 15 papers were deemed to have met the inclusion criteria and relevance and were used as the basis for further analysis in this review.

3.5 Count of Publications in a Year

Most of the selected papers were released between 2023 and 2024, with some released in the preceding year. There was a significant increase in academic interest regarding the challenges of developing professional education programs for vocational teachers, as evidenced by the rising number of scholarly publications on this topic. Additionally, there was an excellent focus on teachers' digital competencies, which are crucial for adequate teaching and learning in today's educational era, as indicated by the increasing number of related publications.

The 15 papers analyzed in this study demonstrated a clear growth trend in publications related to vocational teacher professional education. This indicated that researchers are increasingly interested in exploring various aspects that influence development of teachers' professional competencies including factors related to motivation, managerial support and working conditions.

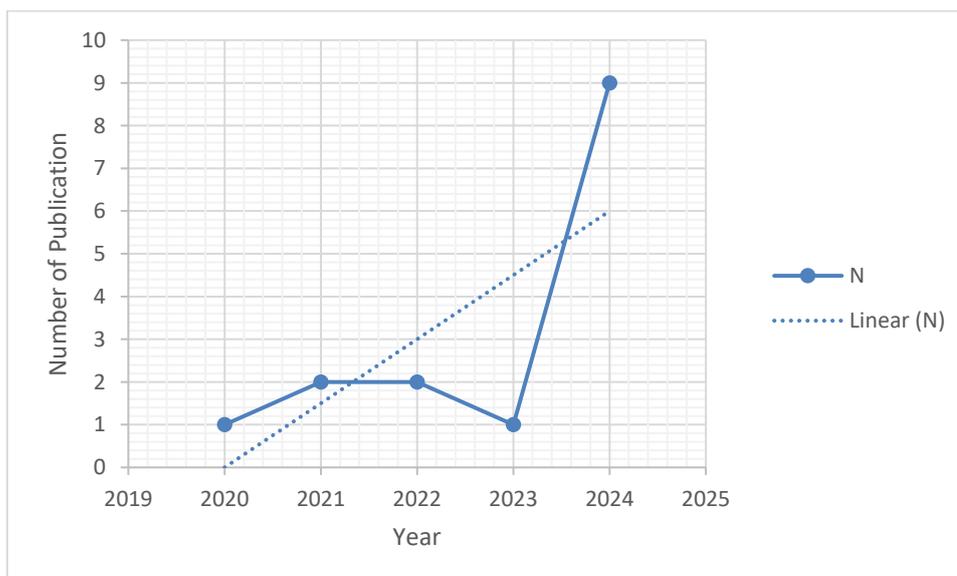


Figure 2. Number of papers released each year

The studies included in this research were conducted in various countries, such as Indonesia, Belgium, Germany, Ukraine, Thailand, China, Brunei Darussalam, Finland and South Africa. This diversity of contexts allowed for a more comprehensive understanding of the factors faced within vocational education systems across different regions and nations. As illustrated in Figure 2, the number of papers on this topic increased over time, indicating a growing academic focus on the factors in implementing professional education programs for vocational teachers.

3.6 Name of Journal Publishing the Research Papers

The analysis of publication trends included the distribution of journals, which was a standard method used by researchers in systematic literature reviews. As shown in Table 3, the qualifying papers were released in fifteen different journals.

Table 3: Name of Journals Publishing the Research Papers

Name of Journal	Year	N	Percentage
Cogent Education	2024	2	20%
Taylor & Francis	2021	2	20%
MDPI	2022	1	10%
Journal of Technical Education and Training	2020	1	10%
International Journal of Training and Development	2024	1	10%
International Journal of Mentoring and Coaching in Education	2024	1	10%
ELSEVIER	2024	1	10%
Journal of Higher Education Theory and Practice	2022	1	10%
FRONTIERS	2023	1	10%
WILEY	2024	1	10%

Applied Mathematics and Nonlinear Sciences	2024	1	10%
F1000Research	2024	1	10%

Cogent Education and Taylor & Francis each released two papers, making them the journals with the highest number of publications, contributing 20% of the total publications. Other journals, such as MDPI, the Journal of Technical Education and Training, the International Journal of Training and Development, the International Journal of Mentoring and Coaching in Education, Elsevier, the Journal of Higher Education Theory and Practice, FRONTIERS, Wiley, Applied Mathematics and Nonlinear Sciences, and F1000Research, each released one article, contributing 10% to the total publications.

The existing body of research on the implementation of professional education programs for vocational teachers showed variation in the methodological approaches used, reflecting the complexity of this research topic. The literature review revealed several factors encountered in the implementation of vocational teacher professional education programs including differences in geographical and cultural contexts that can influence the outcomes and adequacy of these programs.

With the increasing number of publications across various journals, it is hoped that further research can provide deeper insights and more practical solutions to enhance the quality of vocational education worldwide. This indicates that research in this area is gaining more attention from the academic community, potentially driving the development of best practices in vocational education.

The diverse methodological approaches reflected the multifaceted nature of this research topic. The literature review also highlighted various factors that have been faced in the implementation of professional education programs for vocational teachers.

3.7 Data Extraction and Synthesis

As part of the data extraction and synthesis procedure, a careful review of the qualifying papers was necessary to identify and classify the main challenges and impediments with the use of occupational teacher professional education programs. The collected data addressed all the study objectives, methodological techniques, significant conclusions and recommendations.

To analyze the data, this study applied a narrative synthesis strategy as defined by Popay et al. (2006), which is widely used to integrate diverse research methods and outcomes. This approach enabled the identification of trends, recurring themes and key variations across studies. A practical example of this method's application can be seen in Ghavifekr and Yulin (2021). Through this synthesis, the study gained a deeper understanding of the challenges and contextual factors affecting vocational teacher professional education programs.

The data extraction and synthesis procedure was a crucial stage in understanding the challenges and barriers faced in implementing vocational teacher professional

education programs. This procedure involved a careful review of eligible studies to identify key themes and insights relevant to the research objectives.

First, a comprehensive analysis of the selected papers was conducted, focusing on their methodologies, findings and recommendations. The collected data included specific challenges encountered in the implementation of vocational education programs, such as resource limitations, institutional support and stakeholder engagement. The goal was to create a clear picture of the factors influencing program adequacy. A narrative synthesis strategy was applied to analyze various research techniques and quantitative results presented in the literature. This approach allowed for the identification of trends and recurring themes among the studies, facilitating a deeper understanding of the complexities involved in vocational teacher education. By synthesizing the data, this study highlighted not only standard challenges but also contextual factors that may influence the implementation of these educational programs.

The narrative synthesis also provided insights into how different educational contexts and institutional frameworks can shape the experiences of vocational teachers. For instance, variations in policy support and technology integration were noted as significant factors affecting program success. This comprehensive analysis enabled the identification of strategies that can be adopted to address the challenges faced by vocational teacher education programs.

4. Results

After a thorough search in the Scopus and Web of Science databases using the PRISMA approach, fifteen relevant papers were identified. This research aimed to synthesize and analyze key details from these papers including their objectives, publication years, journal sources and findings. Table 4 presents a summary of the data searched and the screening results.

Table 4. Summary of the searched data and screening outcomes.

No	Source	Geographical setting	Sample	Factor	Study Focus
1.	(Kholifah et al., 2024)	Indonesia	381 vocational teachers (public and private schools)	Family Sociology, Managerial Support, Work Conditions	Examines the roles of family sociology, managerial support, and work conditions in shaping teacher motivation and professional development, and their impact on teacher performance.
2.	(Widayati et al., 2021)	Indonesia	40 teachers from	Teachers Perceptions	Investigates teachers' perceptions of

No	Source	Geographical setting	Sample	Factor	Study Focus
			various schools		continuing professional development, that includes the challenges they face and their expectations for better development programs
3.	(Wang, 2024)	China	Data from 1,500 vocational education teachers	Professional Competence	Investigates the factors that influence the professional competence of vocational education and training teachers in China over a decade, utilizing a comprehensive diagnostic approach.
4.	(Alharbi et al., 2021)	Brunei Darussalam	200 TVET teachers	Professional Competence, Impact of training	Explores how professional development workshops influence TVET teachers' beliefs regarding technology-enhanced instruction using the Technology Acceptance Model.
5.	(Kolho et al., 2023)	Finland	8 VET subject teachers	Teacher Skills	Investigating the relationship between teacher autonomy, agency, and guiding behavior in fostering students' entrepreneurial skills.
6.	(Zhou et al., 2022)	China	18 secondary	Work Placement	Exploring the impact of work

No	Source	Geographical setting	Sample	Factor	Study Focus
			vocational teachers		placement on vocational teachers' practices and identifying factors that facilitate or hinder this impact.
7.	(Prummer et al., 2024)	South Africa	45 (24 focus groups + 21 individual interviews)	Mentoring and Social Support	Investigating VET leaders' perceptions of individual, peer groups and expert-based mentoring in a professional development program.
8.	(Gryson et al., 2024)	Belgium	14 teachers in 4 TDTs	Conditions Supporting Program	Investigating the conditions that facilitate the sustainability of Teacher Design Teams (TDTs) in interdisciplinary vocational education.
9.	(Chen, 2020)	China	345 secondary vocational teachers	Teacher Skill	Exploring factors that predict vocational teachers' transfer of learning from work placement to their school practices.
10.	(Richter & Richter, 2024)	Germany	2314 in-service teachers	Professional Competencies	Validating an 18-item instrument (TPD Monitor) to assess the quality of teacher professional development programs.
11.	(Abiltarova et al., 2022)	Ukraine	Online questionnaire survey	Social Support	Analyzing the status, trends and

No	Source	Geographical setting	Sample	Factor	Study Focus
12.	(Weiss et al., 2023)	Germany	79 trainee teachers	Professional Competence	development factors in vocational training methodology in the context of globalization. Examining the relationship between VET trainee teachers' professional identification, autonomy needs and intention to stay in the profession.
13.	(Koskimäki et al., 2021)	Finland	422 educators	Sustainable Development Models	Developing and testing a model for continuing professional development among social and healthcare educators.
14.	(Jiang et al., 2022)	China	422 educators	Professional Competence	Evaluating teachers' professional competence and identifying influencing factors for professional development in higher vocational education.
15.	(Sakdapat, 2024)	Thailand	36 participants	Skill Teacher	Exploring sustainable approaches for developing professional skills in vocational education students.

4.4 Factors Identified in the Systematic Review

Several important elements were found in this systematic review that affect the evolution of professional education initiatives for occupational instructors. The study revealed five main elements that are important in determining the adequacy of professional education initiatives for vocational teachers. Among these elements were professional competency, teacher impressions, managerial and social support, working conditions, geographical and cultural setting. As Figure 3 shows, each of these components interacts dynamically and affects the general efficacy and the execution of the programs.



Figure 3: Factors shaping vocational teacher professional development

Professional competence, which was a significant topic of many studies, that includes evaluations of the factors impacting teacher competence and the influence of professional training, was the factor that appears most frequently in these papers. Six papers emphasized the significance of professional competence at the vocational teacher level and within the broader educational framework, suggesting that the enhancement of this competence is crucial for the improvement of teaching quality.

Moreover, various studies identified teachers' perceptions regarding professional development. Research on teachers' perceptions highlighted the challenges and expectations associated with professional development programs, which can affect both participation and the adequate of these initiatives. Additionally, managerial and social support were identified as significant factors in various studies, with peer support and mentoring programs demonstrating value in assisting teachers to navigate challenges encountered during their professional development.

Working conditions represented another significant factor, as evidenced by studies examining their impact on teacher motivation and performance. The analysis indicated that favorable working conditions enhance teachers' professional development. Finally, geographical and cultural contexts were

identified as factors influencing the implementation of professional education programs, with variations in educational policies and local cultures impacting the design and execution of these programs. The examination of these factors offered a deeper understanding of the challenges and opportunities in developing professional education for vocational teachers.

The identified factors were significantly associated with the adequacy of vocational teacher professional education programs. High professional competence allowed teachers to implement more practical teaching methods, whereas favorable views of professional development promote active engagement in these programs. Adequate managerial and social support fostered an environment conducive to teacher success, while favorable working conditions improved motivation and performance. A comprehensive understanding of geographical and cultural contexts facilitated the design of programs that are pertinent and responsive to local needs. The adequacy of vocational teacher professional education programs was significantly dependent on the interplay among these factors, which together enhance the quality of vocational education.

5. Discussion

The purpose of this discussion was to examine the results of the systematic review with the factors that influence developing of professional education programs for vocational instructors. The results of the analysis suggested that the success of these educational programs is influenced by various important factors including professional competence, teachers' perceptions, managerial and social support, working conditions and geographical and cultural contexts. These findings are consistent with the framework proposed by Milić et al. (2022), which emphasizes that teacher professional development must be intensive, sustained and contextually relevant.

Initially, vocational educators must possess a high level of professional competence in order to improve the quality of their instruction. This is in line with (Riyadi et al., 2024), who argued that competency-based training significantly enhances the adequacy of vocational teachers' instructional programs, especially when aligned with industry needs.

Additionally, the perceptions of professional development programs by teachers were also significant. The adequacy of these programs was further enhanced by the increased participation of teachers who have a favorable attitude toward them. Similar findings were reported by Ghavifekr and Yulin (2021), who found that favorable teacher perceptions are strongly correlated with active engagement in training activities, which ultimately affects the implementation of acquired skills.

Consequently, it is imperative for program organizers to comprehend the expectations and obstacles encountered by educators and to develop programs that are tailored to their requirements. This reflects Knowles' theory of andragogy, which highlights the importance of adult learners' experiences and self-direction in designing professional learning programs.

Managerial and social support were also demonstrated to be influencing factors. A supportive environment, which is fostered by both management and peers, can assist in developing instructors. Adequate mentoring programs, as described in the study by Scalabrino et al. (2022), can offer the requisite support to assist educators in surmounting the obstacles they encounter during their professional development.

Teachers' motivation and productivity were enhanced by favorable working conditions. Research by Nagel et al. (2023) shows that teachers in institutions with better infrastructure, access to learning tools and recognition systems exhibit excellent motivation and instructional innovation. Consequently, it is imperative to consider this aspect when developing effective professional education programs.

Lastly, it is imperative to consider the cultural and geographical contexts. The design and implementation of professional education programs can be influenced by differences in educational policies and local cultures. This is supported by Smaragdina et al. (2021), who emphasize that contextual challenges such as rural location, cultural diversity and decentralised governance require flexible and locally responsive program models.

In general, the adequacy of vocational teacher professional education programs is closely tied to the interplay of these factors. This aligns with Bronfenbrenner's ecological systems theory, which highlights that individual development—such as that of teachers—is shaped by interactions within and between multiple environmental systems. It is anticipated that the quality of vocational education can be enhanced, resulting in excellent benefits for both students and society as a whole, through the adequate comprehension and management of these factors. Further research is required to investigate the relationships between these factors and to identify the most appropriate methods for developing professional education programs for vocational instructors.

6. Implication and Limitation of the Study

This systematic review presented significant implications for developing professional education programs aimed at vocational teachers. The research findings suggested that prioritizing the enhancement of teachers' professional competence is essential in designing development programs. These programs enhance teachers' skills and knowledge, thereby increasing their competence and adaptability to changes in the educational landscape.

The significance of managerial and social support highlighted the necessity for collaboration among teachers, school administration and colleagues. Adequate mentoring programs offer essential support to assist teachers in addressing challenges, thereby enhancing the efficacy of professional education initiatives. These findings underscored the need to context-specific approach in program development, considering geographical and cultural factors. Program organizers must consider local factors that could affect the implementation and success of the

programs, facilitating the creation of more pertinent and adequate interventions. This research established a basis for formulating policies and best practices in vocational education, while also offering insights for researchers and practitioners in the discipline.

This review also highlighted the importance of improving the status and reputation of vocational education. Collaboration among policymakers, industry partners, and educational leaders is essential for the implementation of strategic initiatives aimed at enhancing the social recognition of vocational education. This may encompass public awareness initiatives highlighting the value and advantages of vocational education, alongside enhancing career development and income prospects for vocational educators.

In terms of practical implications, this study offers recommendations for educational system administrators and teacher training departments. Education policymakers should incorporate contextually relevant training modules that emphasize industry-aligned competencies and sustainable mentoring systems. Meanwhile, teacher training institutions should develop continuous professional development models that integrate local needs, improve institutional support and address motivational factors for vocational teachers.

From a research perspective, the findings suggest the need for longitudinal future studies to explore the effects of professional education programs across various regions and educational settings. It is also recommended that further research adopt mixed-methods designs to capture both the measurable outcomes and the contextual nuances influencing program success.

While this research offers valuable insights, several limitations must be acknowledged. The analysis was confined to 15 papers that satisfied the inclusion criteria, potentially limiting the representation of the broader literature in vocational teacher professional education. This limitation may hinder the generalization of the findings to a broader context. Additionally, most of the analyzed papers were sourced from countries across the globe potentially which may not be applicable to local contexts. Differences in educational policies, cultures and teaching practices among countries may influence the applicability of these findings in other contexts.

Concerning the validity and reliability of the findings, it is important to note that the reviewed studies employed various research designs with differing levels of methodological rigor. While the PRISMA framework and narrative synthesis were used to ensure transparency and coherence, the absence of a formal quality appraisal (e.g., using CASP or AMSTAR) may affect the consistency of the conclusions. Future reviews should integrate more stringent quality assessment tools to enhance the robustness and credibility of the findings.

7. Conclusion

This systematic review has offered a comprehensive synthesis of the factors influencing the implementation of vocational teacher professional education programs. In response to the first research question, five key elements were identified: professional competence, teacher perceptions, managerial and social support, working conditions and the geographical-cultural context. These factors are not isolated but interdependent. Professional competence, for example, is reinforced through institutional structures, while favorable teacher perceptions are shaped by favorable working environments and peer collaboration. This reflects the interplay between opinion (teacher beliefs), implementation (program structure), and action (instructional transformation). The findings are supported by theoretical frameworks such as Bronfenbrenner's ecological systems theory and Knowles' principles of andragogy, which emphasize the contextual and experiential dimensions of adult learning.

In addressing the second and third research questions, the review recommends that vocational teacher education prioritizes continuous pedagogical and industry-based training, and adaptive curricula. Collaborative efforts involving policymakers, educational institutions and industry partners are crucial in elevating the status of vocational education. Despite its insights, the review is limited by the scope and geographic concentration of the studies, which may not fully represent global diversity. Additionally, while AI tools were not directly applied in the primary studies reviewed, their growing use in literature screening and data analysis represents an important consideration for future research. Expanding research into underrepresented regions, integrating technology such as AI, and exploring cross-cultural policy impacts will be essential to building more equitable and adequate vocational teacher education systems.

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