Continuous Professional Development of TVET Teachers: Identifying Trends and Future Research

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ARTICLE INFO | ABSTRACT

Continuous Professional Development (CPD) for TVET teachers improves the quality of vocational education and ensures relevance to industry advances. This study presents a systematic literature review (SLR) of CPD research trends for TVET teachers over the last ten years (2013-2023), with particular attention to how different CPD models impact classroom effectiveness. Using the PRISMA procedure, article searches were performed in the Scopus database, yielding 48 publications suitable for further study. Despite a large increase in CPD publications, research in developing countries remains scarce, with significant disparities in implementation approaches between developed and developing educational systems. Qualitative approaches dominate methodologically, with apprenticeships, education, and training emerging as primary topics. However, the review reveals limited research on measuring the direct impact of CPD on teacher performance and student outcomes across different educational contexts. These findings point to the need for more integrated, locally based CPD strategies with stronger industry partnerships to enhance the effectiveness and relevance of professional development for TVET teachers. The study provides a foundation for policymakers and researchers seeking to develop context-specific CPD frameworks that balance theoretical knowledge with practical teaching improvements in technical and vocational education.

Introduction

Over the past few decades, education quality has become a primary concern worldwide. The quality and effectiveness of education heavily depend on teacher quality, as they play a key role in determining the success of the learning process (Geldenhuys & Oosthuizen, 2015). One of the main

strategies to improve education quality is through teachers' continuous professional development (CPD).

TVET teachers play a critical role in vocational education systems worldwide, as they are the front line that determines the overall success of the TVET system (Paryono et al., 2017). Because technical and vocational education is closely related to industry needs, TVET teachers must constantly keep up with developments in knowledge and technology in their field (Fejes & Köpsén, 2014; Andersson & Köpsén, 2018).

Continuous Professional Development (CPD) has become an essential component of many countries' strategies for improving the abilities of TVET teachers. Teachers can participate in training and development through CPD, which not only enhances their teaching skills but also allows them to stay up to date on the newest technology breakthroughs in their specialized domains. As a result, CPD has the ability to significantly improve student learning quality, increase teacher efficiency, and ensure that vocational education evolves in response to changing industry needs. However, although CPD is very important, its implementation often does not fully meet the needs of teachers' professional development. One of the main reasons is that existing CPD programs have often followed government policies rather than addressing direct needs in the field. This often limits teachers' professional development because it does not consider the practical challenges and needs faced by teachers in the vocational education environment (Rosidah et al., 2019).

Several studies have been done to investigate continuous professional growth, both globally and within the context of vocational education. Previous research has shown that continuous professional development (CPD) improves teacher abilities in both pedagogical and technical areas. Several studies emphasize the need of continuing professional development in keeping vocational education relevant in today's fast expanding industrial world. However, while there is substantial research on CPD in general, there is a paucity of in-depth knowledge concerning CPD implementation for TVET teachers. Most previous research has focused on general CPD policies or teacher education as a whole, rather than technical and vocational components (Geldenhuys & Oosthuizen, 2015; Paryono et al., 2017).

Meanwhile, research on CPD for TVET/Vocational High School instructors is quite scarce. Much of the research examines CPD implementation in the general education sector or for elementary and secondary school teachers, but relatively few look at the specific issues and needs of CPD in vocational education. Furthermore, given the critical role of TVET teachers in educating trained individuals to fulfill industrial demands, this research deficit becomes even more obvious. This

suggests that there is still potential for greater research into how CPD might be more effectively administered in vocational education settings.

Through this SLR, we discovered that, while much research has been undertaken on CPD, there is no systematic review concentrating on CPD for TVET teachers in a more thorough context. While existing literature investigates various CPD approaches and tactics in general, a research gap appears when we consider how CPD implementation in vocational education or vocational high schools confronts the challenges of extremely dynamic industry needs. Few studies have looked into how CPD can be tailored to meet technical and vocational needs, as well as how it affects the quality of learning in vocational institutions.

As a result, this paper presents a systematic literature review (SLR) of CPD research trends for TVET teachers during the last ten years (2013-2023), concentrating on this gap. The PRISMA protocol is used to direct the SLR process. This article presents an in-depth summary of publication advances in CPD research, including the most productive countries and the journals and publishers that most regularly publish CPD-related articles, based on an analysis and synthesis of 48 relevant studies. Furthermore, this article addresses the publication dates of journals that publish CPD research, the methodology utilized in CPD research, current subjects in this study, and recommendations for future research.

"To date, no systematic literature review (SLR) has been found that discusses research on continuing professional development (CPD) of TVET teachers. Although much research has been conducted on TVET teachers and CPD, there is no comprehensive study that collects and synthesizes research related to this topic in a single systematic literature review."

This SLR analysis aims to answer the following questions:

1. How has the publication development progressed in research on Continuing Professional Development (CPD) of TVET teachers?

2. Which countries are the most productive in research on Continuing Professional Development (CPD) of TVET teachers?

3. Which publishers and journals publish research on Continuing Professional Development (CPD) of TVET teachers?

4. When are the most frequent publication times for journals publishing research on Continuing Professional Development (CPD) of TVET teachers?

5. What methodologies are used in research on Continuing Professional Development (CPD) of TVET teachers?

6. What factors are trending in research on Continuing Professional Development (CPD) of TVET teachers?

What are the recommendations for further research on Continuing Professional Development (CPD) of TVET teachers?

Method

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method is used in this study to analyze and synthesize research related to Continuous Professional Development (CPD), with a focus on TVET teachers. SLR is an approach that allows for the systematic, transparent, and standardized collection, evaluation, and synthesis of research evidence, with the goal of providing a comprehensive view of a specific topic (Moynihan, 2007).

The literature search was conducted in Scopus on September 14, 2023, using the Watase UAKE application, and a total of 624 relevant articles were found. This search was conducted using two search blocks, each containing 4 key terms. These terms included combinations such as "continuous professional development", "professional development policies", "vocational teacher competencies", and "vocational teacher training". Table 1 illustrates the key terms used in the search strategy.

Table 1: Key Terms Used in the Search Strategy

Block	*Search Keywords*
Main Variables	"continuous professional development"
	And
Relationship	"professional development policies" OR " vocational teachers competencies" OR "vocational teacher training"

The articles found then underwent a filtering process to ensure that only articles meeting the inclusion criteria were forwarded to the next analysis stage. The search was conducted by relying on the Watase UAKE application, and using MS Excel and Tableau software to manage and analyze the data.

Screening and Eligibility Process

After the identification stage, the articles retrieved were further filtered to remove duplicates and verify that only articles satisfying the relevant requirements were transmitted to the next stage. The initial screening was performed by confirming that the selected articles:

a. Were published between 2013 and 2023.

b. Were indexed in Scopus in categories Q1, Q2, Q3, and Q4.

c. Have a clear abstract.

Articles published in peer-reviewed journals and containing relevant empirical findings were accepted, while articles that did not meet these criteria were excluded. The inclusion and exclusion criteria were based on the research objective to investigate continuing professional development in the context of vocational education.

Table 2. Inclusion and Exclusion Criteria in Article Selection

Criteria	*Inclusion*	*Exclusion*
Topic	Articles discussing Continuing Professional Development (CPD) in the context of TVET teachers.	Articles that do not discuss CPD-related topics or are not relevant to vocational and technical education.
Type of Article	Articles published in peer-reviewed journals.	Articles published in unverified or non-peer-reviewed sources.
Year of Publication	Articles indexed in Scopus Q1, Q2, Q3, Q4.	Articles not indexed in Scopus database or indexed outside Q1, Q2, Q3, Q4. categories
Language	Articles written in English.	Articles written in languages other than English.
Journal Index	Articles indexed in Scopus Q1, Q2, Q3, Q4.	Articles that are not indexed in the Scopus database or are indexed outside the Q1, Q2, Q3, Q4 categories.
Abstract	Articles with clear and informative abstracts.	Articles without abstracts or with abstracts that do not provide sufficient important information about the study.
Methodology	Articles that use clear research methods and relevant empirical data.	Articles that only contain literature reviews without empirical data or relevant analysis
Geographic Focus	Articles that are relevant to global context and can be applied across various countries.	Articles that are limited to very specific geographic contexts or cannot be widely applied.

Inclusion criteria serve to determine relevant articles that meet high quality standards in accordance with the research objective, which is to explore TVET teacher CPD. Exclusion criteria serve to eliminate articles that do not meet the established standards, such as those without empirical data or those published outside the specified period.

Data Extraction

After the articles were selected, data was extracted using a standard extraction form that recorded various important information, such as article title, authors, publication year, journal name, journal level, number of citations, and the methodology used in the research. Data extraction aims to collect information related to research design, data collection methods, and main topics discussed in the articles. This process was carried out carefully to ensure that the collected data is relevant and useful for synthesizing findings.

Data Synthesis

After data extraction, synthesis was conducted using a narrative synthesis approach, which allows researchers to identify main themes from the findings discovered in the included literature. This synthesis involved grouping research results based on several criteria, such as techniques or methods used in CPD programs, their impact on TVET teacher competencies, and factors that influence the successful implementation of CPD. These findings were then categorized to identify patterns relevant to the development and challenges of CPD in the context of vocational education.

Article Quality Assessment

To assess the quality of articles included in this review, we used a recognized quality assessment tool, the Critical Appraisal Skills Programme (CASP). This quality assessment was conducted by two independent assessors who evaluated the methodology, research validity, and relevance of articles to the research objectives. If there were differences in assessment between the two assessors, agreement was reached through discussion. This process ensures that only articles meeting high methodological standards were included in the synthesis.

Research Limitations

This research has several limitations. Publication bias may occur because articles with positive findings are more frequently published and easier to find. Additionally, most of the included articles come from countries with more established vocational education systems, so the results may not be fully applicable to the context of developing countries that shown on figure 1.

Fig 1: Research Stages

Result and Discussion

The article search through the Scopus database using the Watase UAKE application yielded a total of 624 articles related to Continuing Professional Development (CPD). These articles were then filtered based on several criteria. 31 articles were removed due to duplication, while 189 articles were deleted because they were published before 2013. Another 36 articles were removed because

they were not indexed in Scopus Q1, Q2, Q3, Q4, and 25 other articles were deleted because they did not have abstracts. After initial screening, 343 articles remained for further examination.

After reading the titles and abstracts, a more in-depth selection was conducted and 245 articles were removed because they were considered less relevant to the topic of TVET teacher CPD. Additionally, 32 articles could not be retrieved due to incomplete or inaccessible text. After the screening and eligibility assessment process, 66 articles were found to have complete texts and met the criteria for further analysis. From the articles with complete texts, 18 articles were removed because their focus of discussion was not relevant to the topic of CPD for TVET teachers. Finally, 48 articles were selected to be included in the synthesis and in-depth analysis.

Publication Development

Figure 2 shows the publication development trend in CPD research from 2013 to 2023. Although the articles used in this review were limited to the period from 2013 to 2023, the analysis shows a consistent increase in the number of publications. Despite some insignificant decreases in certain years, publications in 2022 experienced a notable surge, reaching 14.1% of the total available articles.
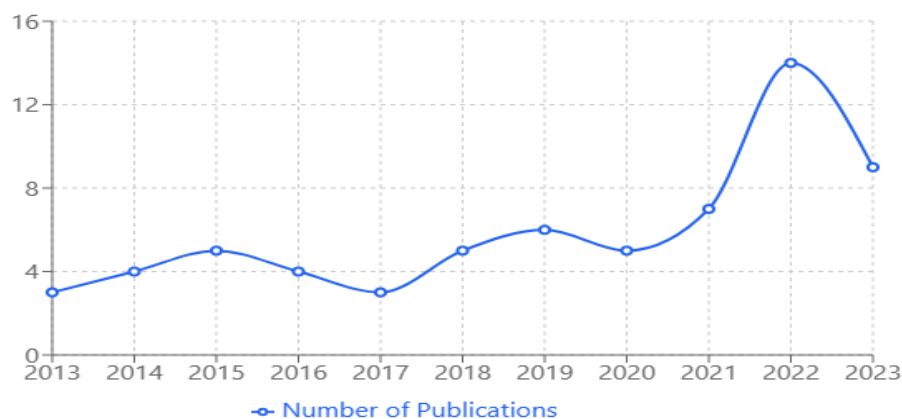

Fig 2: Publication development in CPD research

The year 2023 is still in the process of being updated, with 8.8% of the total available articles, showing a lower number compared to 2022. However, it is estimated that after the end-of-year update, the number of publications in 2023 will increase. Over the past ten years, the number of publications related to TVET teacher CPD topics has shown a positive growth trend. This indicates that this topic continues to attract researchers' interest from year to year.

Country Network TreeMap

Figure 3 illustrates the distribution of countries where CPD research was conducted, showing that the most productive countries in this research are Australia, China, and Sweden. Australia emerged as the most active country with 8 articles (16.7%) of the total analyzed articles, followed by China with 6 articles (12.5%), and Sweden contributing 5 articles (10.4%).

Fig 3: Treemap network of the most productive countries in CPD research

Other countries contributed smaller amounts, with less than 4 articles each. These findings indicate that although CPD is a relevant topic, research on it remains concentrated in certain countries, particularly developed nations. This also suggests there is potential to expand this research to developing countries that are still lacking in their contributions.

Journals, Publishers and Article Publication Periods

Figure 4 shows the journals that most frequently publish articles about CPD. The Journal of Vocational Education & Training dominates with a contribution of 14.7% of total published articles, followed by Professional Development in Education and Vocations and Learning, each contributing 11.8%. Most articles were published by Taylor & Francis, with a small portion published by other publishers such as MDPI.

Regarding publication periods, the International Journal of Environmental Research and Public Health is recorded as the fastest in publishing articles, with an average time of 19 days, while Sustainability takes 22 days to publish articles. In contrast, the European Journal of Teacher

Education requires a longer time, with an average of 872 days for the article publication process.
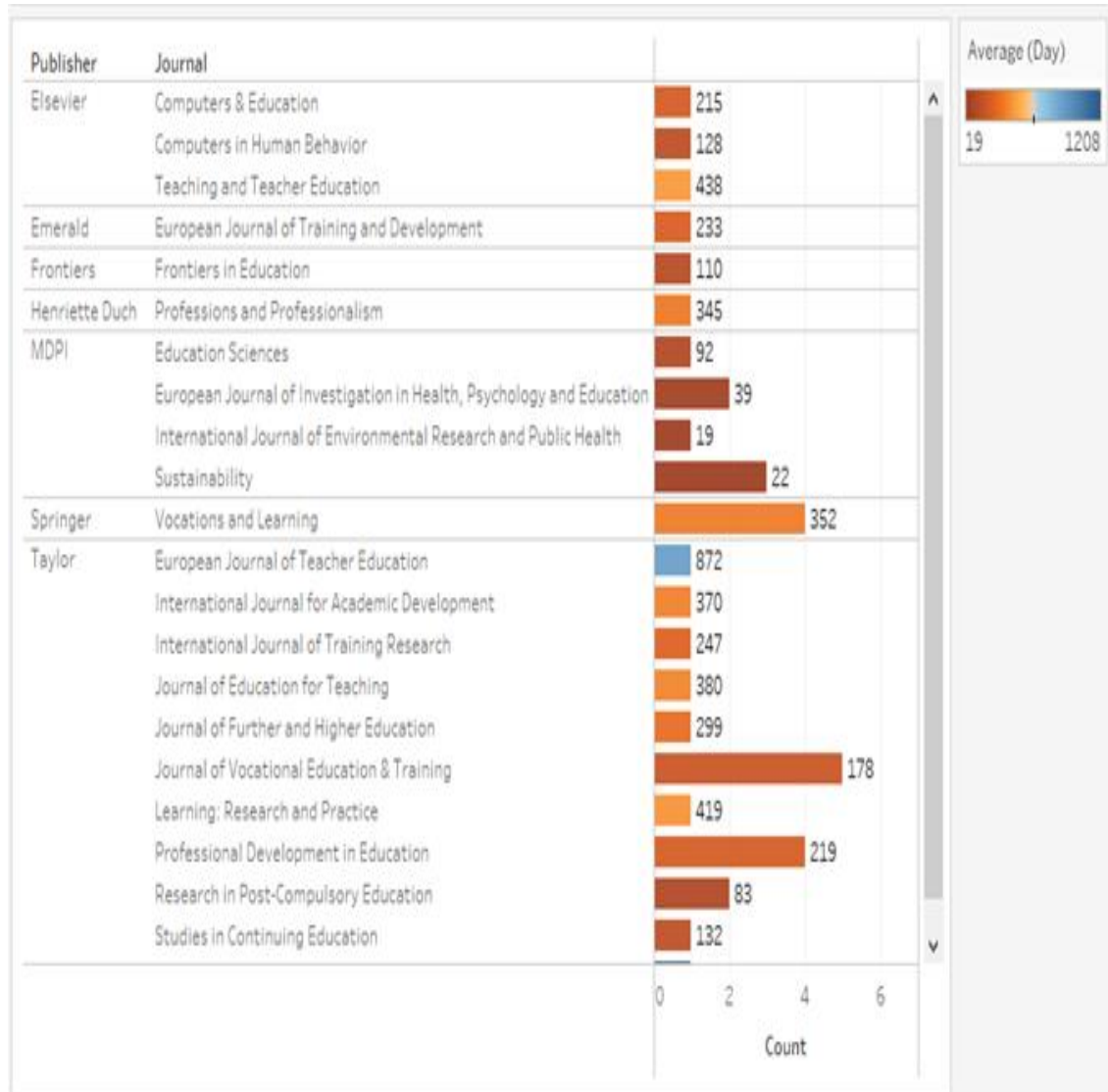

Fig 4: Maximum number of Journals, Publishers publishing CPD research and article publication periods

Methods Used CPD

Table 2 shows a summary of research methods used in the analyzed articles. Most research used qualitative methods (N=19), which generally involved data collection through interviews, observations, and focus group discussions. Quantitative methods (N=15) were used in research that relied on surveys and experiments for data collection. Additionally, there were studies using mixed methods approaches (N=6), conceptual papers (N=5), comparative analysis (N=2), and development research (N=1).

It's important to note that although there is variation in the methods used, research with a development approach (development research) is still relatively rarely applied in the topic of CPD, indicating opportunities for further research in this area.

Table 2. Methods Used in CPD Research

	Research methods	*Number of publications*	*Percentage*
1.	Qualitative (Interviews, Focus Groups Observations and Interviews)	19	39,6
2.	Quantitative (Surveys and Experiment)	15	31,3
3.	Mixed methods	6	12,5
4.	Conceptual papers	5	10.4
5.	Comparative analysis	2	4,2
6.	Development research	1	2,1

Research Topics

Figure 5 illustrates the distribution of research topics within CPD. Based on the analysis of 48 selected articles, five main topics can be identified:

Professional Development (58.3%), which is the main focus in most research. This research emphasizes the importance of competency development for vocational teachers, evaluation of professional development policies, and the challenges and opportunities faced in improving teacher competencies. Training (18.7%), focusing on developing pedagogical competencies of vocational teachers, the impact of training on teacher motivation and performance, and the use of technology in training programs.

Apprenticeship (10.4%), with special attention to soft skills development and the role of apprenticeships in vocational teachers' professional development. Courses (6.2%), which discusses the relationship between course materials and workplace practices and the importance of integrating academic learning with work experience. Education (6.2%), focusing on vocational teacher preparation, the need to produce quality teachers, and the implementation of competency-based education for vocational teachers.

Fig 5: CPD Research Topics

Discussion

Continuous Professional Development (CPD) plays a crucial role in improving the competencies of vocational teachers, which in turn contributes directly to improving the quality of vocational education itself. CPD not only enhances teachers' technical and pedagogical skills but also ensures that teachers' competencies align with the ever-changing industrial world. Thus, CPD becomes an inseparable aspect of efforts to improve the quality of vocational education and prepare students for workplace challenges.

In this research, it can be seen that CPD is a key factor in developing vocational teacher competencies. Based on findings from the analysis of 48 selected articles, 58.3% of research highlights the importance of CPD programs in improving teacher competencies, especially in teaching skills and technical skills relevant to their respective vocational fields. Well-structured CPD programs can encourage teachers to continuously develop their abilities in line with technological developments and industry trends, thus providing more relevant learning for students.

Additionally, this research also shows that the quality of vocational education will increase significantly when teachers have adequate competencies. Teachers who participate in CPD programs tend to be better prepared in facing classroom challenges and more creative in designing learning methods that suit student needs. This not only improves teaching quality but also affects student learning outcomes. Teachers involved in CPD programs are better able to create engaging learning environments that support student competency development, especially in fields requiring practical and technical skills. CPD also plays a role in ensuring that vocational education remains

relevant to the industrial world. As education oriented toward practical skills, vocational education must constantly adjust its curriculum to the evolving needs of the workplace. Through CPD programs, vocational teachers can continuously update their knowledge about the latest technology and industry trends, and prepare students to face them. This will help students be more prepared and competitive in the job market. These findings align with research results showing that CPD programs involving industrial practices and introduction to new technologies have a positive impact on the quality of vocational education provided by teachers.

Although many acknowledge the importance of CPD, there are several arguments doubting this program's effectiveness. One main argument that often arises is that CPD programs don't always result in significant improvement in teacher performance. Some argue that although teachers participate in various training programs, the results aren't always immediately visible in their teaching. However, this research shows that well-designed CPD programs relevant to vocational teachers' specific needs prove effective in improving their competencies. CPD programs focused on developing specific pedagogical and technical skills provide tangible positive impacts on teacher performance. Therefore, it's important to distinguish between quality CPD programs and those irrelevant to teacher needs.

Furthermore, there are also concerns about the cost and accessibility of CPD programs, especially in developing countries. Many argue that the cost of organizing CPD programs can be very high and burden educational institutions. Indeed, CPD programs require initial investment, but evidence shows that the long-term benefits of these programs are far greater. Effective CPD programs can improve education quality, which in turn will positively impact student performance in the job market. This will provide long-term benefits for the education system and society. Additionally, with technological advances, CPD programs are now more affordable and easily accessible through online platforms, which can reduce implementation costs. Therefore, although cost is a challenge, investment in CPD should be viewed as a long-term investment that provides great benefits.

It's important to remember that although CPD has many benefits, this program is not without challenges. Not all CPD programs can run smoothly, especially without full support from relevant parties such as government, educational institutions, and industry. Additionally, the time required for teachers to participate in CPD programs can also be a constraint, especially for those with busy schedules. Therefore, it's important to design CPD programs that are not only effective but also flexible and can be adapted to teachers' needs and conditions.

However, despite these challenges, the results of this research show that CPD is a crucial element in improving vocational education quality. CPD programs tailored to vocational teachers' real needs will have a significant impact on teaching quality and, ultimately, on the quality of education received by students. Considering existing challenges, designing more flexible CPD programs based on teacher and industry needs can improve the effectiveness of these programs.

Conclusion

This research has successfully presented an in-depth systematic literature review (SLR) on the Continuous Professional Development (CPD) of TVET teachers, identifying trends and developments that have occurred in the last ten years. The main findings show a significant increase in CPD-related publications, with dominant research focus on apprenticeships, education, and training for vocational teachers. Nevertheless, research in developing countries remains limited, providing room for further research to expand insights into how CPD is applied in various vocational education contexts. Leading journals such as the Journal of Vocational Education & Training and Professional Development in Education have become major publishers, with the majority of research using qualitative approaches. The main topics that frequently emerge are the importance of education and training, highlighting the need for CPD for TVET teachers to ensure continuously improving education quality.

This research also identifies research gaps, particularly related to the implementation of more integrated CPD models relevant to educational policies in the field. These gaps open opportunities for further research that can explore comparisons of various CPD models, their effectiveness in improving vocational teachers' teaching skills, and their impact on vocational education quality. This research is important as it contributes to a deeper understanding of CPD in the technical and vocational education sector, and shows that although this topic has received attention, there is still much potential to enrich CPD-related literature and practice. These findings indicate that the effectiveness of CPD for TVET teachers is highly relevant and worthy of follow-up in further research.

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