Professional Development for Novice TVET Teachers: A Systematic Review

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Abstract
This article addresses the escalating demand for skilled Technical and Vocational Education and Training (TVET) teachers by comprehensively investigating the professional development of novice educators in this field. The introduction underscores the pivotal role of novice TVET teachers in shaping the future of vocational education, emphasizing the imperative for their development in an ever-evolving educational landscape. The problem statement accentuates the challenges and gaps faced by these educators, underscoring the need for strategies to enhance their teaching skills in modern TVET settings. The study aims to assess accessible professional development opportunities for novice TVET teachers through a systematic literature review following PRISMA guidelines. Utilizing keywords like "professional development" and "novice TVET teachers," the review encompasses 32 primary sources from databases such as Scopus and Web of Science. The synthesis approach identifies three distinct themes: (1) Enhancing Professional Development, (2) Modern Context, and (3) Continuing Education. The analysis illuminates the intricate landscape of novice TVET teachers, revealing variations in self-efficacy and adaptability. Key components of professional development include skill enhancement, fostering professional identity, community support and mentorship. Professional development emerges as a critical factor in elevating the competencies and self-efficacy of individual including novice TVET teachers.
Keywords: Professional Development, Novice, TVET, Teacher

Introduction
In the dynamic landscape of education, Technical and Vocational Education and Training (TVET) plays a pivotal role in preparing individuals for the demands of the modern workforce (Salleh & Sulaiman, 2020). As the global economy continues to evolve, the significance of TVET programs and, by extension, the educators who facilitate them, cannot be overstated (Nyembe, 2022). Novice TVET teachers, those at the outset of their careers, are entrusted with the responsibility of imparting practical skills, knowledge, and a deep understanding of industry-relevant techniques to their students (Mesuwini et al., 2020). This mandate places

them in a position of immense importance, yet it also presents unique challenges that necessitate ongoing professional development and support.

This article delves into the critical issue of professional development for novice TVET teachers. It aims to illuminate the specific requirements, obstacles, and prospects that educators encounter while striving for excellence and efficacy in the classroom. In this context, "professional development" pertains to teachers' continuous learning and growth, aiming to enhance their pedagogical skills, remain updated with industry trends, and expand their ability to address diverse student learning needs (Pedro et al., 2019). Professional development is a dynamic, ongoing process that goes beyond experiential boundaries (Webster-Wright, 2009). Even highly qualified teachers, when confronted with the unique demands of the TVET environment, face a substantial learning curve. This is especially applicable to novice teachers who have recently completed their own education and may lack the practical experience required in their field. These educators must navigate the dual challenge of mastering their subject matter and acquiring the skills to effectively convey that knowledge to a wide array of learners (Dorgu, 2015; Luna Scott, 2015).

In the early stages of their careers, novice TVET teachers face a multitude of challenges. They are tasked with adapting to a constantly evolving curriculum, integrating technological advancements, and staying responsive to the changing demands of various industries (Msibi, 2021). Simultaneously, they must cater to students with diverse backgrounds, learning preferences, and abilities while cultivating an interactive learning environment that fosters inquiry and innovation (Alejandro & David, 2018; Alsop-Cotton, 2009; Groff, 2013). These intricate responsibilities emphasize the importance of well-structured professional development programs designed to empower novice TVET teachers. In this examination of professional development for novice TVET teachers, we will explore the strategies, approaches, and frameworks that can aid in their development and success. The overarching objective is to provide these educators with the knowledge, competencies, and resources needed to deliver high-quality education and prepare their students for the evolving workforce demands.

This article will draw upon research from various regions and educational institutions to provide a comprehensive overview of the challenges and opportunities in professional development for novice TVET teachers. Our objective is to enrich the ongoing conversation about teacher training and enhance the quality of TVET programs, thus benefiting both instructors and the future workforce they influence. In the pages that follow, we will delve deeper into the multifaceted world of TVET education and the professional development strategies that hold the potential to transform novice teachers into seasoned, highly effective professionals.

Literature Review

TVET programs have gained global recognition for their vital contribution in equipping individuals with practical skills that align with the dynamic requirements of today's workforce (Brewer & Comyn, 2015; Varma & Malik, 2023). Novice TVET educators, those new to the field, play a pivotal role in imparting these essential skills to students (Shandu, 2016). This literature review delves into the specific challenges and requirements of novice TVET teachers while evaluating the existing landscape of professional development initiatives intended to

enhance their classroom efficacy. Mentorship programs, which pair novice TVET teachers with experienced peers, prove to be an invaluable source of guidance, encouragement, and a platform for addressing challenges and discovering solutions (Coppe et al., 2023; Mashiloane, 2019; Shandu, 2016). Additionally, peer support networks, encompassing both in-school and online communities, provide avenues for the exchange of best practices and shared experiences. Figure 1 shows the conceptual framework that connects the elements of effective professional development with teacher competence.
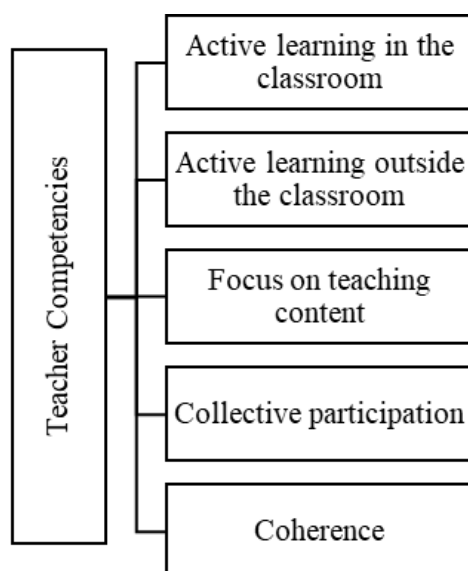

Fig. 1 Conceptual framework that connects the elements of effective professional development with teacher competence (Ithnain & Saidin, 2021)

Novice TVET teachers encounter a unique set of challenges that differentiate them from their peers in general education (K. Ismail et al., 2018; Shandu, 2016). Their role involves instructing technical subjects, demanding current industry expertise and hands-on proficiency. These educators must bridge the gap between theory and practice, which can be especially daunting without prior industry exposure (Hartman et al., 2023; Popple, 2015). Furthermore, they must accommodate diverse learning styles and abilities among the students, emphasizing the significance of effective classroom management and student engagement (Khan et al., 2017). In TVET teaching, a prominent feature is the focus on practical, industry-relevant skills. Novice TVET teachers may possess strong theoretical knowledge, but the translation of this knowledge into practical instruction often necessitates mentorship and continuous professional development (Melki & Bouzid, 2021; Njenga, 2023; Omar et al., 2020; Van der Bijl, 2015). Practical experience, gained through internships or co-op programs, constitutes a valuable asset for novice TVET teachers, significantly informing their teaching methods (Barabasch & Watt-Malcolm, 2013; Thakalekoala, 2021; Zone, 2014)

Although industry knowledge is indispensable, novice TVET teachers also necessitate pedagogical training (Shandu, 2016; Wan Abdullah et al., 2022). Proficiency in teaching techniques, curriculum design, and evaluation strategies is imperative for successful instruction. It is imperative that professional development programs incorporate components designed to enhance the pedagogical skills of novice TVET teachers, be it through courses,

workshops, or guidance from experienced educators (A. Ismail et al., 2018; Ithnain & Saidin, 2021; Wan Abdullah et al., 2022). TVET programs frequently face the need to swiftly adapt to shifts in industry technology and requisites. Novice TVET teachers require assistance in maintaining the relevance of their curriculum and teaching approaches (Okolie et al., 2023; Omar et al., 2020). Professional development endeavors should exhibit adaptability and responsiveness to the evolving requirements of these educators and the industries they serve.

In the digital era, technology plays a pivotal role in education (Cloete, 2017; Kandel, 2022). Novice TVET teachers must receive instruction on the incorporation of technology into their teaching practices. This entails gaining proficiency in e-learning platforms, utilizing simulation tools, and harnessing digital resources to enrich the teaching and learning processes (Makonye et al., 2022; Ndibalema, 2020; Ogundolire, 2020). The effectiveness of professional development endeavors for novice TVET teachers should be continuously evaluated. Researchers and policymakers should engage in studies to ascertain optimal approaches, assess the outcomes of various strategies, and enhance programs based on empirical evidence. This iterative method is imperative for aligning professional development initiatives with the precise requirements of novice TVET teachers.

Finally, institutional and governmental regulations wield significant influence over the professional development of novice TVET teachers (Kistan, 2019; Muthuri, 2023; Vinden, 2020). Sufficient financial resources, acknowledgment of the significance of TVET education and the formulation of supportive policies can significantly enhance the effectiveness of professional development initiatives (Creemers et al., 2012). To sum up, novice TVET teachers hold a pivotal position in the realm of technical and vocational education. Their professional growth is paramount for their efficacy in the classroom and, subsequently, for the future employability of their students (Aithal & Aithal, 2023; Chuang, 2021). Effective professional development programs should encompass hands-on experience, pedagogical training, mentorship, and adaptability to industry dynamics, while embracing the opportunities presented by technology (Ahmad et al., 2023; Varma & Malik, 2023). Policymakers, educational institutions, and industry stakeholders should collaborate to ensure that novice TVET teachers receive the necessary backing to excel in their roles. This literature review provides a foundation for understanding the challenges and opportunities in this field, setting the stage for the exploration of specific professional development strategies in subsequent sections of this article.

Methodology
Identification
The systematic review involves three key stages employed to select numerous relevant papers for this study. Initially, the first phase entails identifying keywords and searching for related terms through resources like thesauri, dictionaries, encyclopedias, and previous research. Once all relevant terms are determined, search queries were constructed and executed on the Scopus and Web of Science databases, as detailed in Table 1. In the initial phase of the systematic review, our study successfully retrieved 334 papers from both databases.

Table 1
Search String

| Scopus | TITLE-ABS-KEY (("Professional Development" OR "Skill Development" OR "Career Development" OR "Lifelong Learning") AND (novice OR beginner OR new) AND (teacher OR educator) AND (vocational)) AND (LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2023)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBSTAGE , "final"))
 Access Date: 02 November 2023 |
| WoS | ("Professional Development" OR "Skill Development" OR "Career Development" OR "Lifelong Learning") AND (novice OR beginner OR new) AND (vocational) AND (teacher OR educator) (Topic) and 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2015 or 2016 or 2014 (Publication Years) and Article (Document Types) and English (Languages)
 Access Date: 02 November 2023 |

Screening

Ignoring duplicate papers is important in the initial screening stage. There is no duplicate article papers were found. Researchers established specific inclusion and exclusion criteria, excluding 218 papers in the first phase, while 116 articles were evaluated in the second phase. The primary focus was on research articles as they are a primary source of valuable knowledge. This study did not consider other forms of publications such as book series, books, chapters, conference proceedings, review and publications that were still in press. Furthermore, the review was restricted to studies conducted in the English language only. The study timeline was set for ten years, from 2014 to 2023 (see Table 2).

Table 2
The Selection Criterion is Searching

Criteria	Inclusion	Exclusion
Language	English	Non- English
Document Type	Article	Book, Book Chapter Conference, Review Paper, Conference Review Paper
Source Type	Journal	Conference Proceeding, Book, Book Series
Year/Timeline	2014- 2023	< 2014
Accessibility	Accessible and full text available	Inaccessible

Eligibility

At the eligibility level, there are 116 articles available. During this stage, a thorough evaluation of article titles and crucial content was conducted to verify their alignment with

the inclusion criteria and the objectives of the ongoing study. Consequently, 84 articles were excluded because due to the out of field, title not significantly and abstract not related on the objective of the study based on empirical evidence. This led to the retention of 32 articles for subsequent review.

Data Abstraction and Analysis

In this study, an integrative analysis technique was employed as one of the assessment strategies to evaluate and consolidate various research approaches, encompassing quantitative, qualitative, and mixed methods. The primary objective of the proficient investigation lay in the identification of relevant subjects and subtopics. Data gathering marked the initial phase of theme development. Subsequently, the most recent publications on Scopus and WoS were reviewed by the authors. Ongoing investigations cover both the research findings and the methodology employed in all the studies. Collaboration with other co-authors was undertaken to derive themes from the study's data context. A log documenting analyses, opinions, challenges, or relevant thoughts during the data analysis process was maintained. The findings underwent scrutiny to identify disparities in the theme design approach. It's crucial to emphasize that any differences in ideas were discussed by the authors. The created themes were eventually modified to ensure consistency. Two specialists, expert in professional development conducted the analysis. This expert review process delineates the domain and guarantees clarity, significance, and appropriateness for each subtheme. Figure 2 illustrates the screening and selection process using a flow PRISMA diagram.
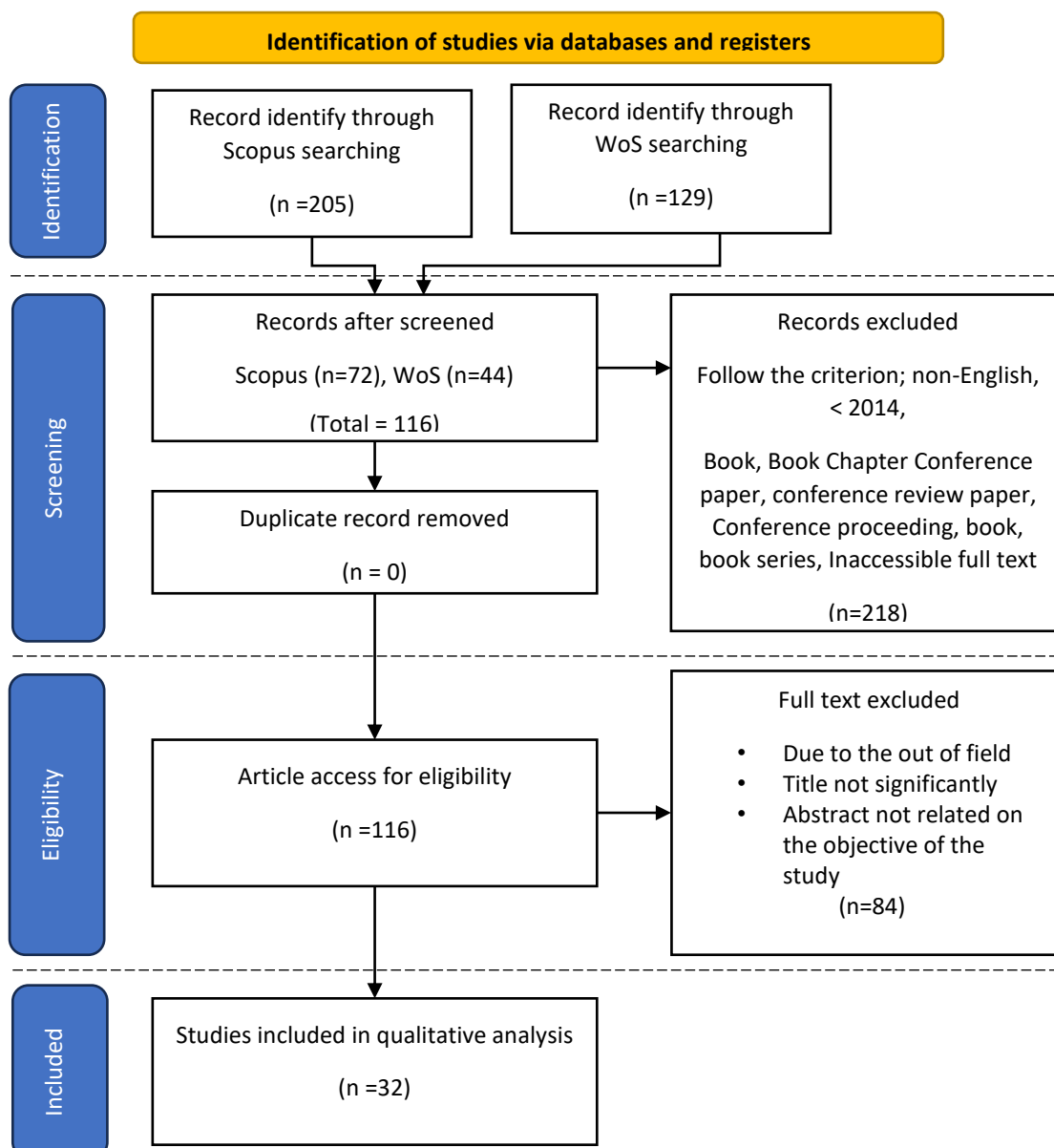
Fig. 2 Flow diagram of the proposed search study (Mustafa, 2022)

Result & Finding

In Figure 3, the chart illustrates over the past 10 years, the percentage of published articles has shown fluctuations. In 2014, it was 3%, gradually increasing to 9% in 2015 and 2017. There was a dip in 2016 but a steady rise in the following years, reaching 16% in 2021 and peaking at 22% in 2022. In 2023, there was a slight decline to 13%. This pattern indicates variations in publication activity, with notable peaks in 2022 and 2021.
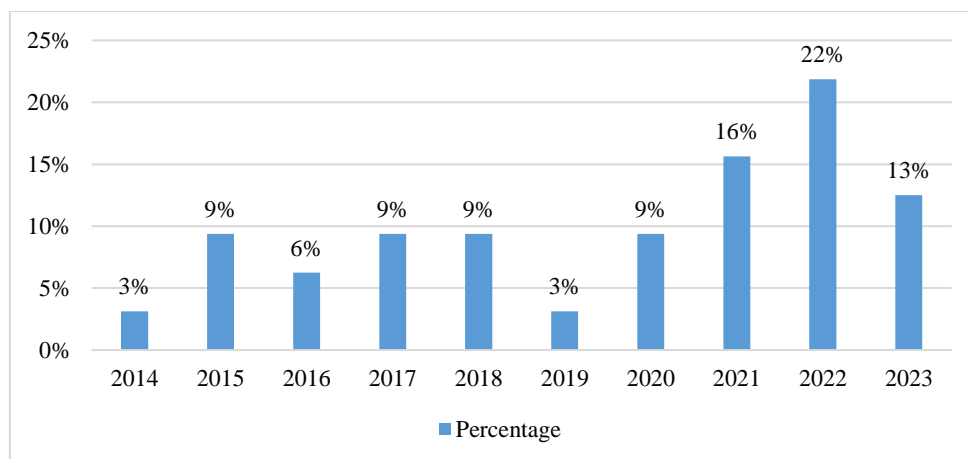
Fig. 1 Distribution of publication years of selected studies

Through the search process, 32 articles were selected from an initial pool of 334 for this review. In the exploration towards the finding, analysis led to three key themes. Table 3 shows that enhancing Novice TVET Teacher Professional Development (13 articles) delves into strategies and components vital for boosting the skills and confidence of new educators. The second theme, Vocational Education and Training in the Modern Context (8 articles), highlights the evolving landscape of vocational education, emphasizing the importance of staying current and innovative. Lastly, Teacher Training and Continuing Education (11 articles) focuses on the ongoing support crucial for the growth and adaptability of TVET teachers.

Table 3

Articles were Selected from an Initial Pool of 334 for this Review.

Authors	Title	Method	Findings	Theme
Meristo and Eisenschmidt (2014)	Novice teachers' perceptions of school climate and self-efficacy	Analyzed self-efficacy and school climate's impact on novice teachers. Surveyed 112 first-year novice teachers.	Novice teachers at small schools with K-5 students had high self-efficacy and positive school climate perception, while those at larger schools or vocational schools had lower self-efficacy. A supportive school climate boosts novice teachers' self-efficacy.	Enhancing Professional Development
Neuhouser, Latz and Mulvihill (2023)	Remembering New Vocationalism: Reinforcing the Future of Workforce and	Examined the evolution of new vocationalism and its relevance in community colleges amid the	New vocationalism principles have enhanced opportunities for diverse learners, emphasizing equity	Modern Context

Authors	Title	Method	Findings	Theme
	Professional Development in the Community College	post-COVID-19 economy.	and professional development, making it vital for educational leaders to prioritize these principles.	
Aripin *et al.* (2021)	Role of Malaysia TVET Teachers' Training Institutions toward Industry and Education 4.0	Examined Malaysian TVET teacher training institutions and identified drivers for adapting to technology-driven skills development.	Malaysian TVET institutions need strategies to adapt to technology, emphasizing the importance of innovation and readiness for technological changes.	Modern Context
Saitbaeva, Ganaeva and Muratova (2022)	Management approaches to solving the problem of personnel shortage in the education system	Analyzed teacher shortage causes using comparative literature analysis.	Shortages result from regulatory issues, applicant self-determination, lack of novice teacher support, and stagnant professional development. Comprehensive solutions include better recruitment, working conditions, financial incentives, and teacher support, along with boosting the profession's prestige.	Continuing Education
Jiang, Li and Wang (2022)	An ecological approach to understanding university English teachers' professional agency in implementing formative assessment	Examined teacher professional agency in Chinese university settings using questionnaires, interviews, and observations.	Teacher agency is influenced by capacity, beliefs, and context, impacting teaching approaches and development at various career stages.	Continuing Education

Authors	Title	Method	Findings	Theme
Willemse, Boei and Pillen (2016)	Fostering Teacher Educators' Professional Development on Practice-Based Research Through Communities of Inquiry	Teacher educators engaged in collaborative research via a community of inquiry.	Teacher educators developed research skills, beliefs, and practices through the community, identifying key characteristics for such development.	Enhancing Professional Development
Asghar *et al.* (2022)	Evaluation of In-Service Vocational Teacher Training Program: A Blend of Face-to-Face, Online and Offline Learning Approaches	Surveyed 629 in-service vocational teachers using structural equation modeling, following the Kirkpatrick model.	The in-service vocational teachers were satisfied at all four levels of the Kirkpatrick model, including reaction, learning, behavior, and results, with hierarchical relationships between them.	Continuing Education
Urbani (2020)	Teacher continuing professional development and team-working competences: A case study from Italy	Analyzed VET policies to create a new competency model for preschool teachers, conducted a survey assessing teachers' competences in various areas.	Preschool teachers need traditional and innovative competences, especially in governance and teamwork. To improve teacher professionalism, focus on informal learning communities and fostering generative development.	Enhancing Professional Development
Diao and Yang (2021)	Multiple-role perspective on assessing teaching ability: reframing TVET teachers' competency in the	Developed a framework and assessment tool for vocational teacher competency.	Study enhances vocational teacher skills, provides assessment tools, and aims to improve ICT teaching.	Enhancing Professional Development

Authors	Title	Method	Findings	Theme
	information age			
Jin *et al.* (2022)	Novice teachers' appraisal of expert feedback in a teacher professional development programme in Chinese vocational education	Interviewed 12 novice teachers in a vocational school teacher professional development program, built an appraisal framework from interview analysis.	Novice teachers' appraisal of expert feedback revealed concerns and expectations. The study offers a framework for future research on teacher professional development feedback.	Enhancing Professional Development
Geeraerts *et al.* (2015)	Peer-group mentoring as a tool for teacher development	Surveyed 116 teachers (69 in general education, 47 in vocational education) to examine their experiences with Peer-group mentoring (PGM).	PGM is valuable for professional development, with little difference between general and vocational educators. Key components include skills development, professional identity, and building a supportive work community.	Enhancing Professional Development
Köpsén and Andersson (2017)	Reformation of VET and demands on teachers' subject knowledge– Swedish vocational teachers' recurrent participation in a national CPD initiative	Explored CPD of vocational teachers in Sweden, with a focus on recurrent participation. Utilized socio-cultural perspective.	Recurrent participation influenced by municipality type, school ownership, and gender, impacting boundary-crossing in CPD.	Enhancing Professional Development
Geerdink *et al.* (2016)	Fostering teacher educators' professional development in research	Explored the impact of professional development activities on teacher	Sharing experiences and discussions with colleagues were the most valuable aspects of these activities,	Enhancing Professional Development

Authors	Title	Method	Findings	Theme
	and in supervising student teachers' research	educators transitioning to research roles.	emphasizing alignment with daily practices.	
Romanova *et al.* (2022)	Digital technologies as a driver of professional development of teachers of vocational education establishments	Used theoretical and empirical methods and conducted a pedagogical experiment to enhance VET teachers' digital readiness.	Training improved teachers' digital competence, with significant increases in high and medium readiness levels.	Modern Context
Ye *et al.* (2023)	Exploring the Interplay between Work Engagement, Self-Preparation, and Adaptability among Novice Teachers in Chinese Vocational Colleges	Surveyed novice teachers in Chinese vocational colleges (433 respondents) and tested engagement-related hypotheses.	Work engagement positively influences self-preparation and career adaptability, while self-preparation positively impacts career adaptability in early career stages.	Enhancing Professional Development
Snoek *et al.* (2017)	Increasing the impact of a Master's programme on teacher leadership and school development by means of boundary crossing	Conducted case study with 42 experienced teachers using interviews to explore teacher leadership development.	Effective boundary crossing, shared ownership, and the use of boundary objects fostered teacher leadership development within schools through a Master's program.	Continuing Education
Bowden (2015)	NCVER building researcher capacity scholarship: A rural participant's perspective	Utilized autoethnographic approach to describe the novice practitioner-researcher's experience in an	Aspirations of the scholarship program were achieved in addressing low completion rates among Indigenous learners through teacher attributes	Continuing Education

Authors	Title	Method	Findings	Theme
		NCVER community of practice.	and holistic teaching practices.	
Jin *et al.* (2021)	Learning from novice–expert interaction in teachers' continuing professional development	Explored learning processes of four novice VET teachers through interviews and novice-expert interactions.	Novice teachers learned through active reflection and practice, with expert teachers providing important support and feedback.	Continuing Education
van den Bogaart, Hummel and Kirschner (2018)	Explicating development of personal professional theories from higher vocational education to beginning a professional career through computer-supported drawing of concept maps	Monitored PPT development using repeated concept map measurements for junior accountants and novice teachers.	On average, PPTs became more complex, with richness increasing for teachers. PPT development is critical for expertise development.	Continuing Education
Jafar *et al.* (2020)	TVET teacher professional competency framework in industry 4.0 era	Conducted a systematic literature review to identify TVET teacher professional competency constructs for Industry 4.0.	Identified various competency constructs including technical, non-technical, personal, mental, and physical attributes, as well as motive and self-concept. TVET institutions should focus on adaptability and lifelong learning.	Modern Context
Widiati, Suryati and Hayati (2018)	Unraveling the challenges of Indonesian novice teachers of English	Qualitative case study with 11 novice English teachers in Indonesian secondary schools.	Novice teachers face challenges in lesson planning, classroom management, and professional development. Challenges are related to	Enhancing Professional Development

Authors	Title	Method	Findings	Theme
			curriculum, teaching strategies, and assessment.	
Vähäsantanen and Hämäläinen (2019)	Professional identity in relation to vocational teachers' work: an identity-centred approach to professional development	Study on vocational teachers' professional identity and work.	Vocational teachers' work involves teaching, development, technology, professional duties in and outside school. There's a need for support in identity work and technology adoption.	Modern Context
Nurgaliyeva *et al.* (2018)	On the issue of modernization of the system of professional development of teachers of high schools of Kazakhstan	Enhances high school teacher competencies, values, and teaching methods to improve national education competitiveness.	Higher education institutions recognize the value of teacher professional development in adapting to evolving societal and economic conditions.	Modern Context
Koskimäki *et al.* (2021)	Continuing professional development among social- and health-care educators	Qualitative approach, group interviews with experienced social- and health-care educators.	Educators use diverse methods for professional development; barriers include lack of planning and resources. Individualized needs matter.	Enhancing Professional Development
Husband (2015)	The impact of lecturers' initial teacher training on continuing professional development needs for teaching and learning in post-	Qualitative research with 18 lecturers from different colleges in the UK, using narrative accounts and semi-structured interviews.	Lecturer training lacks emphasis on vocational skills and classroom management. CPD in teaching is vital but engagement is limited.	Continuing Education

Authors	Title	Method	Findings	Theme
	compulsory education			
Eze *et al.* (2022)	Occupational decision motives of potential TVET teachers: New standards of pre-service TVET teachers' recruitment and career development	Quantitative research using self-administered questionnaires from 78 pre-service TVET teachers.	Key motivators for pre-service TVET teachers include role models, job demands, imparting knowledge, helping financially disadvantaged students, and perceived demand for TVET teachers. Gender differences were found in altruistic and intrinsic motivations.	Continuing Education
Gorbunova and Sabirova (2017)	Pedagogical design of future teachers' personal and professional route	Modeling approach for designing future teachers' personal and professional development.	The study advocates pedagogical design in education, transitioning from knowledge-centered to diverse approaches for more effective teacher training. It underscores the importance of personal and professional development in modern teacher education.	Continuing Education
Scott, Hughes and Davids (2021)	Facilitating health professional education research development; an action research approach	Developed a course based on Social Development Theory, involving peer teaching, and applied action research.	Challenges included limited time and irregular attendance, which affected knowledge and skills development and individual research engagement.	Continuing Education
Jin and Shi (2023)	Novice Teachers' Teaching	Analyzed 29 feedback sessions between	Expert teachers commonly provided feedback on	Modern Context

Authors	Title	Method	Findings	Theme
	Practices From The Perspectives of Expert Teachers in The Chinese Vocational Education Context	novice and expert teachers using thematic analysis.	"teaching performance," suggesting the inclusion of a greater variety of activities and materials to improve novice teachers' practices, while considering students' characteristics.	
Burns *et al.* (2020)	Supporting the development of digitally competent vet teachers in Serbia and Russia	The research employed document analysis, theoretical analysis, synthesis, comparative, modeling, and expert estimation methods to develop a model for the digitally competent development of VET teachers.	A model for VET teachers' digitally competent development program in the context of online learning was developed, encompassing structural and functional components.	Enhancing Professional Development
Njenga (2023)	TVET teacher mentoring in Kenya: valued but poorly implemented	The study employed a concurrent mixed-methods approach, combining a questionnaire survey with semi-structured interviews. The survey involved 170 participants from six TVET institutes in Kenya's Nairobi Metropolitan Area. Thematic analysis of	TVET teacher mentoring practices in Kenya are limited to basic introductions and incidental supportive dialogue, lacking structured guidance. New teachers receive inadequate mentoring.	Enhancing Professional Development

Authors	Title	Method	Findings	Theme
		interview data and descriptive and inferential analysis of the survey data were conducted.		
Jam and Puteh (2022)	Exploring the teaching and learning indicators towards education 4.0 in MTUN, Malaysia	The study engaged seven experts in instructional design technology and TVET. Semi-structured interviews were conducted, and thematic analysis was used to analyze the data.	Eight essential elements encompass Industry 4.0 elements, course design, projects, practical aspects, simulation, educator readiness, up-skilling and re-skilling training, and industrial experience.	Modern Context

Discussion

The first theme in this article encompasses a wide array of studies that delve into the growth, challenges, and competence of novice TVET (Technical and Vocational Education and Training) teachers. The research highlights several key findings related to novice teacher development. It is observed that novice teachers in small K-5 schools exhibit high self-efficacy and a positive perception of school climate, while those in larger or vocational schools tend to have lower self-efficacy. The presence of a supportive school climate is recognized as a vital factor in bolstering the self-efficacy of novice teachers. Additionally, teacher educators are found to enhance their research skills, beliefs, and practices through the community. The professional development of preschool teachers, particularly in governance and teamwork, is stressed to improve overall teacher professionalism, emphasizing informal learning communities and generative development. Moreover, the studies aim to boost vocational teacher skills, provide assessment tools, and enhance ICT teaching. Overall, this theme underlines the significance of comprehensive professional development for novice TVET teachers, with a focus on factors such as self-efficacy, school climate, community engagement, and the importance of non-technical competencies in vocational education.

The second theme, Vocational Education and Training in the modern context explores the dynamic landscape of vocational education and training in contemporary settings. It addresses the importance of adapting to changing technologies, fostering innovation, and equipping learners with essential skills. These studies underline the principles of the new vocationalism, emphasizing equity and professional development for diverse learners, which educational leaders must prioritize. The need for Malaysian TVET institutions to devise strategies for embracing technology and being ready for technological shifts is highlighted. Furthermore, the theme delves into the novice teachers' experiences and feedback, shedding light on their concerns and expectations. It offers a framework for future research in teacher

professional development feedback, encouraging effective boundary crossing and shared ownership for teacher leadership development through Master's programs. The studies within this theme also underscore the role of expert teachers in nurturing novice teachers through active reflection and practice. Moreover, the integrative model for future teachers' personal and professional growth emphasizes the evolving role of teachers and the importance of cross-subject interaction, advocating for pluralistic approaches in modern teacher education to enhance efficiency and promote the personal and professional development of young specialists in education. In conclusion, the second theme encapsulates the dynamic nature of vocational education and training, calling for adaptability, innovation, and a focus on equipping learners and educators with the necessary skills to thrive in modern contexts.

The third theme, focused on the professional development of educators. These studies delve into the challenges and opportunities in the field of teacher training and continuing education, shedding light on the issues that novice and experienced teachers face. The findings underscore the importance of comprehensive solutions, such as recruitment enhancements, improved working conditions, financial incentives, and teacher support to address teacher shortages and elevate the profession's prestige. Furthermore, the theme emphasizes the influence of teacher agency, encompassing capacity, beliefs, and context, on teaching approaches and career development across different stages. The research on in-service vocational teacher training highlights overall satisfaction and offers insights for designing effective training programs. The influence of recurrent participation in training, shaped by various factors, is explored in relation to boundary-crossing in continuing professional development. The value of sharing experiences and discussions with colleagues in professional development activities is emphasized, aligning with daily teaching practices. Moreover, the theme highlights the positive impact of training on teachers' digital competence and work engagement, positively influencing self-preparation and career adaptability in early career stages. The challenges faced by novice teachers in lesson planning, classroom management, and professional development are examined in the context of curriculum, teaching strategies, and assessment, with recommendations to bridge the gap between pre-service and in-service teacher education. Additionally, vocational teachers' work, which encompasses various aspects of teaching, development, technology, and professional duties, is shown to influence their professional identity and development. The need for support in identity work and technology adoption is evident. Finally, higher education institutions' recognition of the value of teacher professional development in adapting to evolving societal and economic conditions is highlighted, with educators employing diverse methods for professional development while facing barriers related to planning and resources. The theme collectively underscores the critical role of ongoing teacher training and continuing education in addressing challenges and fostering professional growth across various career stages.

Conclusion
This study highlights critical findings about the professional development of novice TVET teachers. First of all, the significant influence of school size and climate on novice teachers' self-efficacy, that shows the importance of a supportive environment in fostering teacher confidence and growth. Community engagement and generative development were identified as one fundamental in advancing teacher professionalism. In addition, diverse

dynamic landscape of TVET demands adaptability, innovation, and skill enhancement for both educators and learners. The integration of technology, expert feedback, and feedback mechanisms were found to be instrumental in supporting teachers' evolving roles. Thus, professional development strategies, including continuing education, mentorship, and training in digital competencies, were shown to address challenges like teacher shortages and enhance career adaptability and work engagement. Based on these findings, it is suggested that educational institutions need to prioritize structured and comprehensive professional development programs. These programs should incorporate mentorship, digital training, and practical teaching strategies to bridge the gap between theoretical knowledge and industry needs. Additionally, fostering a culture of collaboration and continuous learning within schools and training institutions can further support novice TVET teachers in adapting to the modern demands of vocational education. By addressing these recommendations, the teaching profession's quality and the overall effectiveness of TVET systems can be significantly improved.

Acknowledgement

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