Technical and Non-Technical Skills Required by TVET Teacher in Digital Learning Based on TPACK Framework; A Systematic Literature Review

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Abstract

Research examining the implementation of Information and Communication Technologies (ICTs) in both general education and Technical and Vocational Education and Training (TVET) has identified several challenges faced by stakeholders in achieving successful integration such as shortage of time for preparing teaching materials and a lack of knowledge and skills in presenting advanced ICT teaching materials, lack of motivation among TVET teachers and lack of hands-on experience may hinder their ability to effectively translate theoretical concepts into real-world applications. In this regard, the purpose of this research is to identify the technical, non-technical skills required by TVET teachers in digital learning and to customize the technical and non-technical skills by following the TPACK framework. PRISMA model will be used includes the processes of identification, screening, eligibility, and inclusion. Qualitative method with thematic analysis will be used that include open, axial and selective code. There are 4 technical skill required by the TVET teacher which are Digital Tool Skill, Re-mix Digital Learning Resource, Digital Management and Pedagogic Skill while 3 non-technical skills which are Personal-ethical Skill, Communication Skill and Adaptability Skill in digital learning. There are 20 articles, journals and books which are relevant to this research. The proposed model for technical and non-technical skills based on the TPACK framework is developed for TVET teacher in higher institution learning.

1. Introduction

Malaysia requires highly skilled labour to close the current demand-supply gap in various industries, particularly those driving economic transformation. The government has identified the Technical and Vocational Education and Training (TVET) sector as the primary source of highly skilled human resources and one of the key economic drivers for Malaysia to achieve high-income status. The 11th Malaysian Plan empowers the mission to improve TVET governance by empowering the quality and delivery approach, as well as strengthening the TVET brand and image among the grassroots as one of the selected curriculums programmed among students and educational organisations (Omar, Ismail, Abdullah & Shwu Pyng, 2021). Following this blueprint, the 12th Malaysian Plan reported the need to overhaul TVET governance, promote TVET as a brand, improve TVET program quality, and create databases related to TVET pathways and careers. The aim is to produce high-quality graduates who possess the relevant skills needed to meet the dynamic needs of the industry (EiMas, 2021). Malaysia, as a country moving towards technology and knowledge-intensive industries, is also on the verge of a revolution. The fourth industrial

revolution, also recognised as the Internet age, is a globalisation era without borders. Malaysia is a prominent player in the Industrial Revolution 4.0, actively participating in the globalised landscape characterised by technology-driven advancements for economic prosperity. The nation harnesses the power of digital technology, utilising the interconnected capabilities of the Internet of Things (IoT), big data, virtual and augmented reality, artificial intelligence, and various IT paradigms that permeate diverse industries. This technological transformation has yielded positive impacts, presenting opportunities for heightened productivity and strategic advancements within the manufacturing sector and the realm of Malaysian education. Consequently, the influence of these technological strides on the education paradigm has given rise to Education 4.0, anticipating the benefits of a new vision that aligns with emerging trends in learning skills and knowledge. In this context, students must undergo training, mentorship, and facilitation through innovative pedagogical approaches that resonate with the possibilities ushered in by this technological era (Bujang, Selamat, Krejcar, Maresova & Nguyen, 2020).

Indeed, the significance of digital learning has become more pronounced in the context of TVET education. Digital learning has emerged as a transformative force within TVET, revolutionising the traditional vocational education landscape (Bujang et al., 2020). This paradigm shift leverages technology to enhance the accessibility, flexibility, and effectiveness of educational experiences in TVET. E-learning platforms, online courses, and interactive multimedia content have become integral components, providing learners a dynamic and engaging environment. Virtual labs and simulations simulate real-world scenarios, fostering hands-on experience in a digital realm. Digital assessments, flexible learning models, and industry-relevant content ensure that TVET education remains adaptive to evolving technological landscapes and industry demands. Collaboration and networking opportunities within online platforms further enrich the educational experience, connecting learners with peers and industry professionals. While digital learning holds immense promise, it also necessitates addressing challenges such as the digital divide and ensuring equitable access for all. In essence, integrating digital learning in TVET education signifies a shift towards a more inclusive, dynamic, and industry-aligned approach to vocational training (Razak, Noordin & Khanan, 2022).

1.1 Problem Background

The lack of preparedness, knowledge, and positive attitude among teachers in managing technology-driven learning environments has been consistently overlooked and not given due emphasis (Joseph, Jamaluddin & Abdullah, 2023). This oversight is often attributed to limited internet facilities in many schools, with the absence of widespread broadband networks compounding the issue. Despite substantial financial investments by the Ministry of Finance in information and communication technology, particularly in digital learning applications, the study results indicate that these efforts have not yielded a robust response or significant positive development (Min & Nair, 2020). The commitment of TVET teachers becomes crucial in producing a skilled workforce aligned with current developments (Bujang et al.,2020). Moreover, their role as knowledge conveyors and facilitators of active learning is paramount. However, the application of digital learning in TVET classrooms has not been fully explored, and its integration remains moderate. Some teachers persist in using conventional methods, hindering students' comprehension of concepts and skills, especially in practical teachings. Time constraints impede TVET teachers, especially in preparation and relevance when incorporating digital learning applications. The lack of knowledge about digital learning becomes a constraint, impacting the application of information literacy in the teaching and learning process. Given these justifications, a comprehensive study of the dominant factors influencing the use of digital learning among secondary school TVET teachers is imperative. Understanding the relationships between readiness, knowledge, and attitude will shed light on the factors influencing the implementation of digital learning in the teaching and learning process (Pangeni & Karki, 2021).

Next, the lack of motivation among TVET teachers when instructing new subjects beyond their expertise is a significant challenge in the education sector. When educators are tasked with teaching unfamiliar subjects, it can lead to a sense of inadequacy, reducing their motivation and enthusiasm for the teaching profession. TVET teachers may lack confidence in delivering accurate and engaging content, decreasing job satisfaction. The challenge is compounded by the additional time and effort required to familiarise themselves with the new subject matter, often at the expense of their well-established expertise. This situation affects the quality of teaching and has implications for student engagement and learning outcomes. To address this issue, it is crucial for educational institutions to invest in professional development programs, training opportunities, and support mechanisms that empower teachers to acquire the necessary skills and knowledge in new subjects. Recognising and valuing TVET teachers' expertise in their designated areas can contribute to a more motivated and effective teaching force (Ismail et al., 2018).

Novice teachers, recent graduates entering the teaching profession without prior industry experience, face significant challenges in effectively translating theoretical concepts into practical applications within the dynamic realm of digital tools and technologies. Their limited exposure to industry practices hinders their ability to provide contextually relevant digital learning experiences for students, compromising the depth and effectiveness of instruction. The need for hands-on experience becomes evident in navigating and leveraging digital tools for enhanced educational outcomes. Additionally, these teachers may struggle to establish credibility with students

who value industry expertise, potentially leading to scepticism about the relevance of imparted knowledge. Developing industry-relevant curricula and staying current with trends pose further challenges, as does the struggle to design hands-on activities without a background in the field. The transition from student to classroom manager requires rapid development of technological pedagogical skills, and building professional networks within the industry becomes challenging without established connections. Addressing these issues necessitates targeted mentorship, professional development, and ongoing support to empower novice teachers in navigating the demands of TVET education without prior industry exposure. Thu, the objective of this is to identify the technical and non-technical skills required by TVET teachers in digital learning and to customise the technical and non-technical skills by following the TPACK (Technological Pedagogical Content Knowledge) framework.

1.2 Theoretical Framework

The researcher has opted to employ the TPACK model as the foundational framework for the study as in Figure 1. This model integrates technological, pedagogical, and content knowledge, offering a comprehensive lens through which to examine these elements' intersections in the context of education. By selecting the TPACK model, the researcher aims to provide a structured framework for understanding how technology can be effectively integrated into teaching practices, ensuring a balanced consideration of technological skills, pedagogical strategies, and content expertise. Information about technology is intricately connected to innovation and its application in education. The TPACK system provides many valuable resources for exploring teacher education, facilitating professional development for educators, and understanding the utilisation of technology in teaching practices (Ringotama, 2020).
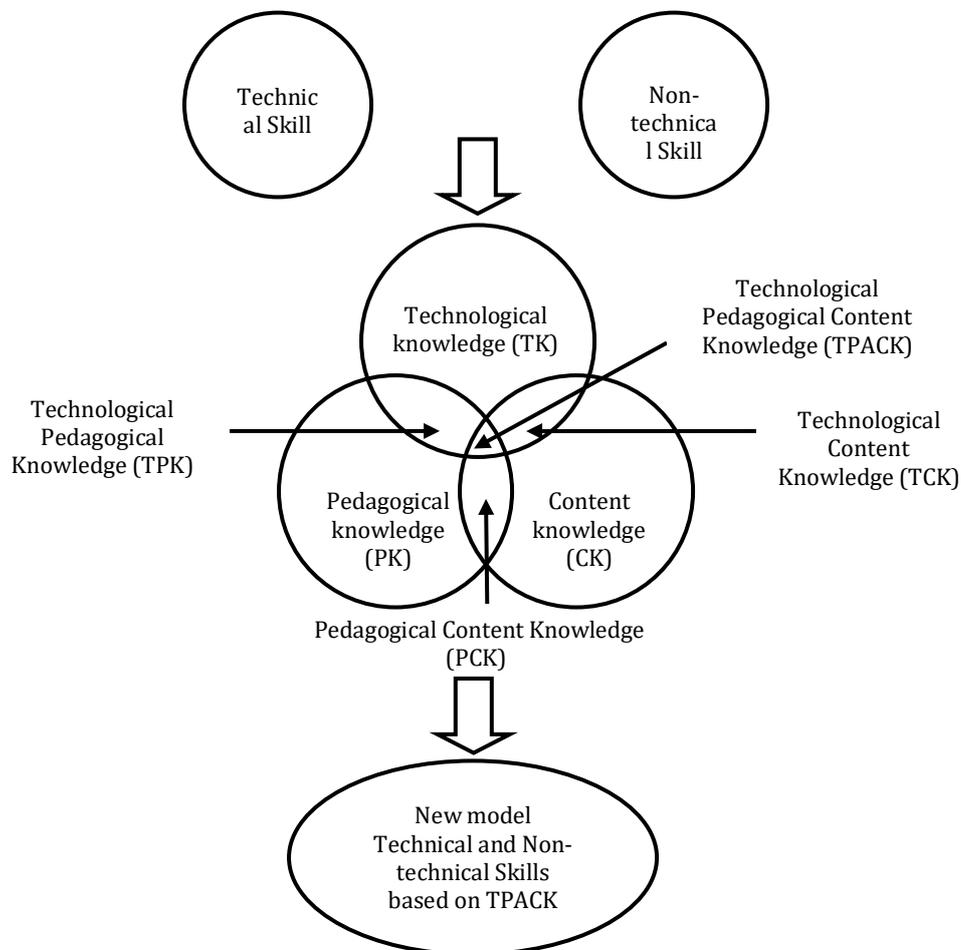
Fig. 1 *Theoretical research framework adapted from (Ringotama, 2020)*

2. Research Methodology

This research design uses a systematic literature review involving papers from articles, journals, proceedings, and other sources from current research using explicit, accountable, rigorous research methodologies. Materials were selected rigorously according to the PRISMA flow diagram (Preferred Reporting Items for Systematic Reviews and

Meta-Analyses) flow diagram (Menggist, Soromessa & Feyisa, 2019). PRISMA is a recognised standard systematic literature review method. In general, publication standards are crucial to providing authors with the pertinent and important knowledge they need to assess and look into the calibre and rigour of a review.

Additionally, PRISMA strongly emphasises reviews that analyse randomised trials and can be used as the foundation for systematic reviews of other forms of research. According to Saipudin & Suhairom (2021), there are three key benefits: 1) it establishes precise research questions that permit systematic research; 2) it establishes inclusion and exclusion criteria; and 3) it aims to examine a sizable database of scientific literature in a predetermined amount of time. The identification, screening, eligibility, and included stages were the four stages that construct the PRISMA flow diagram as in Figure 2.
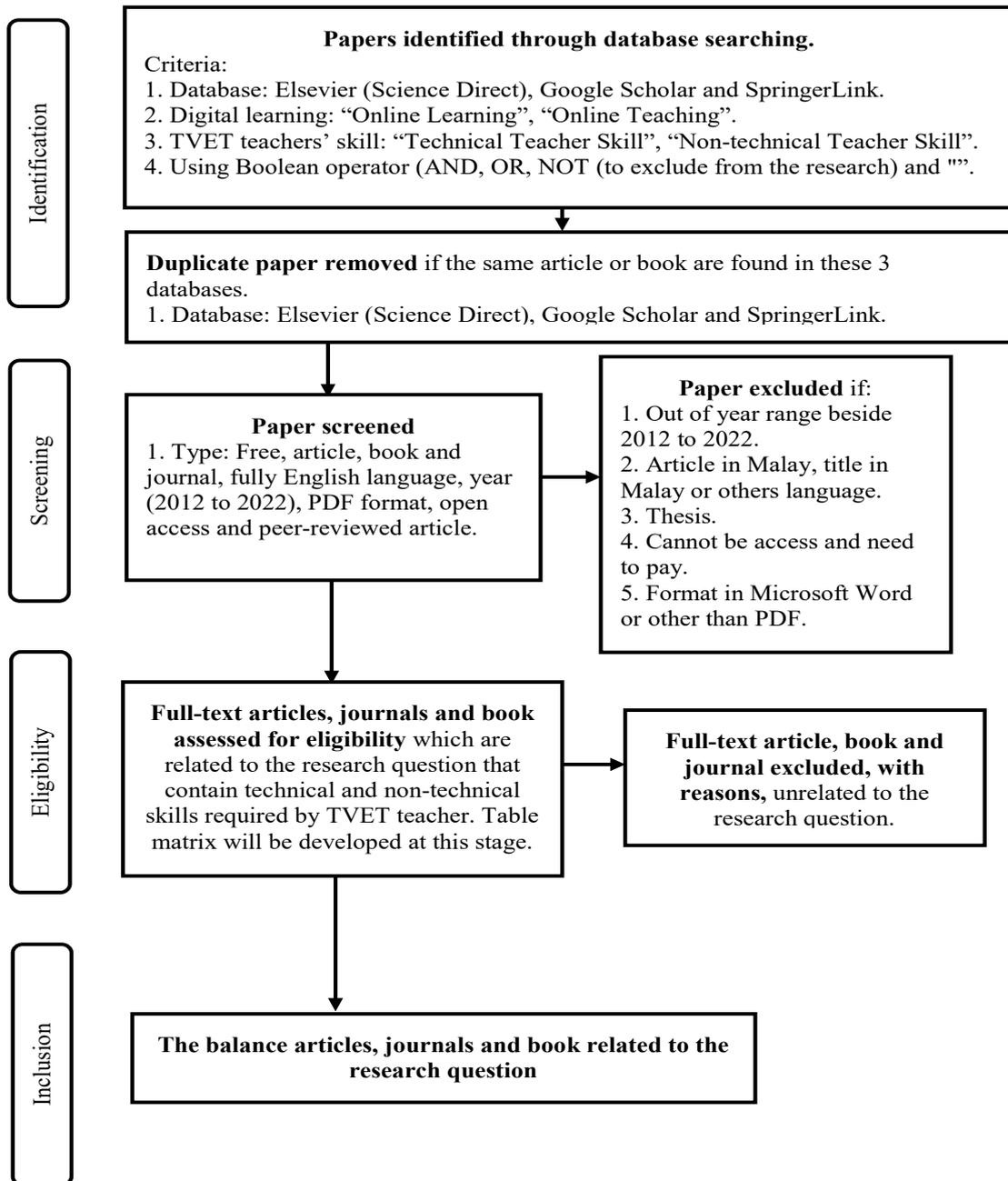
Identification

Papers identified through database searching.
Criteria:
1. Database: Elsevier (Science Direct), Google Scholar and SpringerLink.
2. Digital learning: "Online Learning", "Online Teaching".
3. TVET teachers' skill: "Technical Teacher Skill", "Non-technical Teacher Skill".
4. Using Boolean operator (AND, OR, NOT (to exclude from the research) and "".

Duplicate paper removed if the same article or book are found in these 3 databases.
1. Database: Elsevier (Science Direct), Google Scholar and SpringerLink.

Screening

Paper screened
1. Type: Free, article, book and journal, fully English language, year (2012 to 2022), PDF format, open access and peer-reviewed article.

Paper excluded if:
1. Out of year range beside 2012 to 2022.
2. Article in Malay, title in Malay or others language.
3. Thesis.
4. Cannot be access and need to pay.
5. Format in Microsoft Word or other than PDF.

Eligibility

Full-text articles, journals and book assessed for eligibility which are related to the research question that contain technical and non-technical skills required by TVET teacher. Table matrix will be developed at this stage.

Full-text article, book and journal excluded, with reasons, unrelated to the research question.

Inclusion

The balance articles, journals and book related to the research question

Fig. 2 *Systematic literature review*

i) Identification

The researcher used alternative terms and synonyms as in Table 1, which were 'Digital Learning', 'Online Learning', 'Online Teaching', 'Technical Teacher Skill' and 'Non-technical Teacher Skill' to find the article, journal and book through the 3 databases, which was Elsevier, (Science Direct), Google Scholar and SpringerLink. Boolean operator AND, OR and quotation mark ('') were used. Boolean operator AND function were used to find the article between different groups OR was used to find an article or book between close meanings or gaols within the same discipline, while quotation mark ('') was used as the keyword was comprised between two words. The researcher found out that the article, book and journal were from Google Scholar (n=163,000), Elsevier (Science Direct) (n=251,657) and SpringerLink (n=17,871).

Then, the number of articles, journals and books which have been excluded due to the duplicates was 5. A total of 5 articles, journals and books were eliminated from consideration due to the identical titles. This means that items with the same title but from different databases existed, and they were excluded. For example, Google Scholar has the same title as the one that has been discovered in Elsevier (Science Direct). The researcher has chosen to remove his or her title for the articles from Elsevier (Science Direct) while keeping the title in Google Scholar. The same thing goes for the other databases; once the researchers have completed the identification for Google Scholar, they must also complete the identification for Elsevier (Science Direct) and SpringerLink. As a result, the articles that have the same titles in the second, third, or other databases have to be removed. This process ensured that no duplicate articles with identical titles were included in the research dataset.

ii) Screening

The initial database utilised by the researcher was Google Scholar, with a custom date range spanning from 2012 to 2022. Google Scholar was chosen as the first database due to the convenient accessibility of articles, journals, and books on the Google platform. During the search process, the researcher employed alternative terms, synonyms, and Boolean operators. Following this, the researcher manually constructed a table using Microsoft Excel, incorporating elements such as the title of the article or journal or book, page numbers, redundancy, out-of-range status, unrelated status, related status, and exclusions. For each article, journal, or book found in Google Scholar, the researcher read the title, abstract, and conclusion, then copied and pasted the title into the Excel table manually. The researcher applied this method for each item retrieved from Google Scholar. According to Subramanyam (2013), the recommended approach is for the reader to review the title, abstract, and conclusions initially. Similar to a movie title that captivates a cinema enthusiast, the title of an article serves as the initial attraction for a reader. A well-crafted title provides valuable insights to the potential reader, aiding in the decision to delve into the paper or disregard it. The abstract plays a crucial role in helping the researcher assess whether to proceed with reading the complete article. Many journals offer the abstract freely online, enabling us to decide whether to acquire the entire article. Systematically reviewing the abstract involves addressing key questions such as the subject of the study, its purpose, methodology, findings, and their implications (Subramanyam R., 2013). Other than articles, books and journals written in the English language, inaccessible, need to pay and other than PDF format is automatically excluded.

Next, the Elsevier (Science Direct) database was used. The researcher accessed the database using a student account login. The year of publication was set from 2012 to 2022, the article, book and journal type were chosen (review articles, research articles, book chapters and book review), and publication title were chosen (computer and education, the internet and higher education, computers in human behaviour, teaching and teacher education), subject areas were chosen (social sciences and computer sciences), and open access was chosen. For each article or journal or book found in Elsevier (Science Direct), the researcher read the title, abstract, and conclusion, then copied and pasted the title into the Excel table manually. Other than articles, books and journals written in the English language, inaccessible, need to pay and other than PDF format is automatically excluded.

The third database used by the researcher was SpringerLink. The researcher accessed the database using a student account login. The year of publication was set from 2012 to 2022, and content type (article, book and journal), disciplinary (education), subdiscipline (educational technology, teaching and teacher education), language (English) and open access were chosen. For each article or, journal or book found in SpringerLink, the researcher read the title, abstract, and conclusion, then copied and pasted the title into the Excel table manually. Other than articles, books and journals written in English language (German and Turkish), inaccessible, need to pay and other than PDF format is automatically excluded. A number of articles, journals and books that have been screened based on the inclusion criteria was 1,074.

Table 1 *Alternative term and synonym*

Filter	Main Keyword	Alternative Term
Title	Digital Learning	"Online Learning", "Online Teaching"
	TVET Teachers Competency	
		"Technical Teacher Skill", "Non-technical Teacher Skill"

iii) Eligibility

As a result, the number of articles and books that have been accepted due to eligibility was 44. In this section, the researcher may include publications that do not satisfy the criteria after the completed screening phase. The researcher can manually exclude them from consideration by carefully reading the article, book and journal if necessary. Therefore, determining eligibility is a critical manual step that allows researchers to reduce the likelihood of database errors.

iv) Inclusion

A total of 20 articles, journals and books were selected based on their relevance to the specified keywords, which were 'Digital Learning', 'online learning', 'online teaching', 'technical teacher skills' and 'non-technical teacher skills' from 3 databases which the most frequently utilised articles are from the year 2022, while the least utilised are represented by one paper each for the years 2013, 2020 and 2021. These resources were identified by searching three databases: Elsevier (Science Direct), Google Scholar, and SpringerLink. The identified articles and books underwent a rigorous selection process based on specific criteria. The inclusion criteria included being freely accessible, written entirely in English, published between 2012 and 2022, available in PDF format, categorised as open access, and recognised as peer-reviewed articles. Articles, books and journals that fell outside these criteria, such as those beyond the specified publication year range, written in other than English language, categorised as a thesis, inaccessible, requiring payment, or available in Microsoft Word format, were excluded. These chosen articles, journals and books were deemed suitable for further screening through the literature matrix and thematic analysis.

2.2 Data Analysis

In this research, thematic analysis was employed as the chosen method for data analysis, following a comprehensive literature review that included the evaluation of 20 articles, journals, and books and Matrix Table was developed. The researcher familiarised themselves with the data through iterative textual content readings from each source, creating memos to ensure a comprehensive understanding. The document analysis, utilising core, category, and core category codes was performed using Microsoft Word. The second phase involved inductive coding, employing in-vivo codes for years of publications data and open codes for technical and non-technical abilities of TVET teachers in digital learning. The third phase introduced axial coding, identifying pattern codes categorised under themes such as Personal-Ethical Skill and Digital Tool Skill. The fourth phase focused on generating themes, highlighting technical and non-technical skills, with specific terms allocated to each category. In the fifth phase, the themes were reviewed and named, resulting in the identification of two overarching themes: Technical skills and non-technical skills. The sixth phase concluded with creating a report, outlining the major and sub-themes, with seven sub-themes under each major theme. Table 2 showed the tools used in data analysis.

Table 2 *Tools used in data analysis*

Tools	Criteria
Table Matrix	Author, Year, Objectives, Methodology, Findings
Document Analysis	Author, Year, Excerpt, Initial Code, Themes
Code, Category and Code Category	Author, Year, Code, Category, Core Category

3. Result and Discussion

The analysis revealed two overarching themes: technical and non-technical skills. Non-technical skills were categorised into 3 groups: ' Personal Ethical Skill', 'Communication Skill' and 'Adaptability Skill'. On the other hand,

technical skills comprised 4 categories, which were 'Digital Tool Skill', 'Pedagogic Skill', 'Re-mix Digital Learning Resources' and 'Digital Management'. All the skills were displayed as graph in Figure 3 and Figure 4.
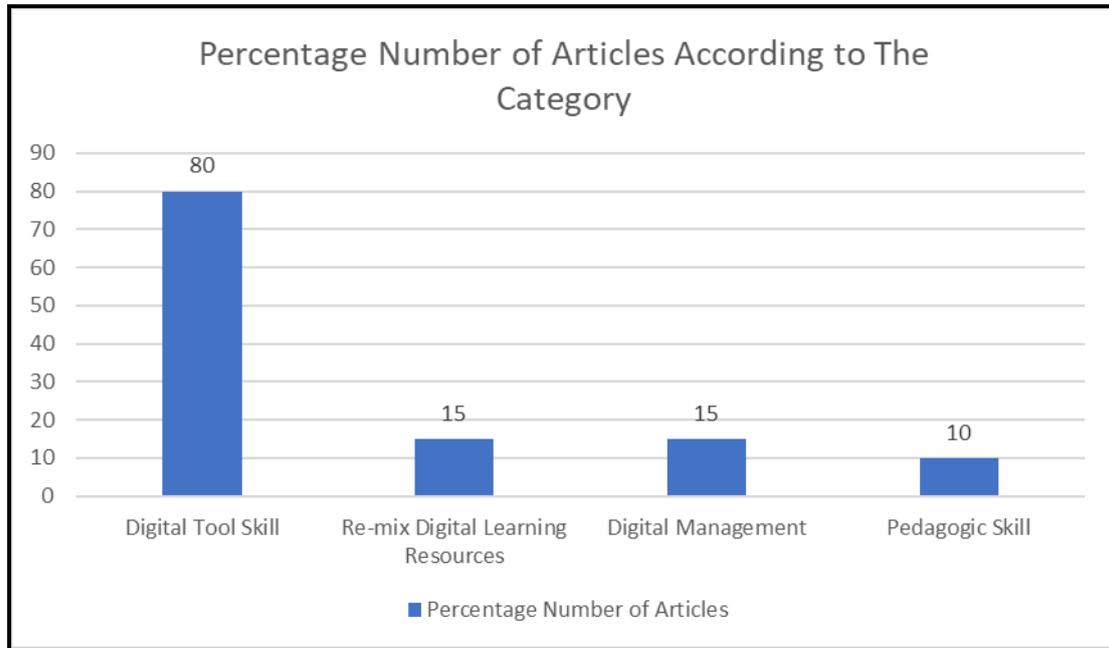

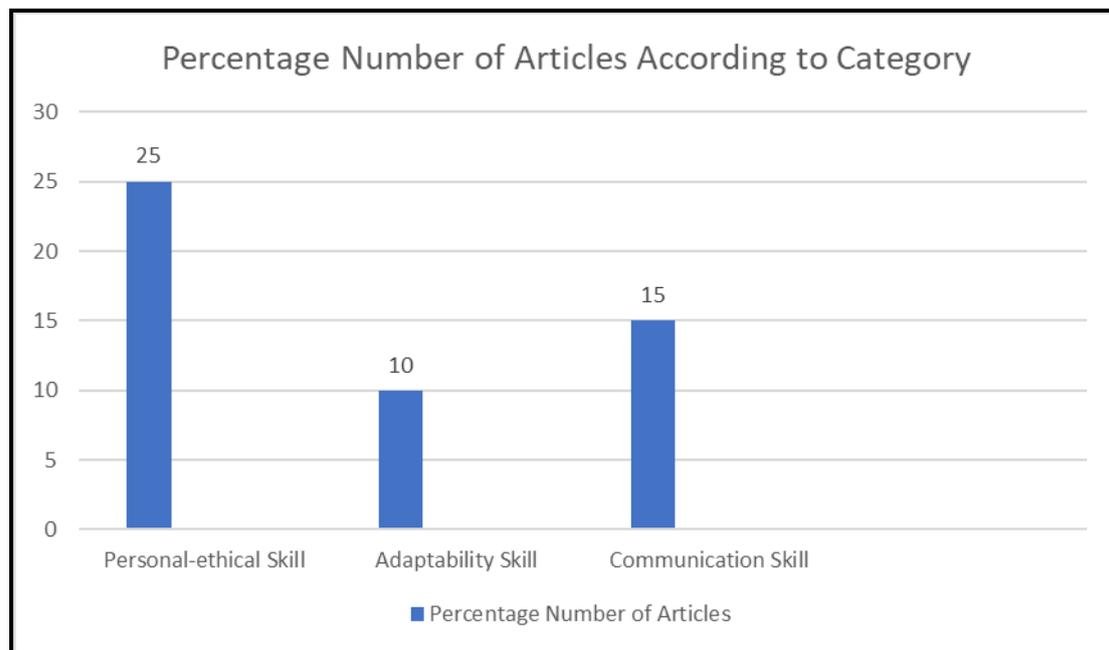**Fig. 3** *Percentage number of articles for technical skills according to the category*

Fig. 4 *Percentage number of articles for non-technical skills according to the category*

3.1 The Technical Skills Required by TVET Teachers in Digital Learning

TVET teachers should possess the ability to assess the technological resources at their disposal before choosing suitable learning tools and materials. It is crucial for them to strategically plan, design, and organise curriculum materials, as well as formulate lesson plans that align with the available technological resources to optimise the learning experience. Given that contemporary students have been exposed to smart devices from an early age, it becomes imperative for TVET teachers to plan and prepare their teaching activities adeptly. Additionally, these

educators must tailor their teaching methods to suit individual learners and adeptly integrate educational content digitally through e-learning to address the unique learning needs of the current generation (Jaafar et al., 2020).

In the digital era, the primary challenge TVET teachers face in educational institutions is no longer identifying potential technology applications in instruction. Instead, it revolves around the recognition and decision-making processes concerning when and how to incorporate technology into education effectively. TVET teachers must be well-prepared to integrate ICT into instructional management, possessing the requisite ICT skills. The competence of teachers in ICT is crucial for effective instruction, as the current focus extends beyond the mere delivery of lesson content to encompass the proficient use of technology. Numerous educational policies underscore the significance of leveraging digital technology to meet future requirements. Regarding the utilisation of ICT and adherence to educational policies that define the vision and structure of the ICT curriculum, TVET teachers must actively promote learning and enhance their comprehension of educational policies. It is imperative for them to acquire additional teaching skills related to digital technology and consistently practice using these skills to adapt to evolving changes.

In TVET, it is crucial for teachers to be proficient in Microsoft PowerPoint and other media tools. These skills enable TVET teachers to create engaging presentations and instructional materials. Proficiency in PowerPoint (UNESCO, 2022) allows for effectively presenting complex technical information, incorporating visual aids such as diagrams and videos. Using media tools enhances classroom engagement, making lessons dynamic and catering to diverse learning styles. Additionally, TVET teachers with these skills are better equipped for e-learning environments, where they can create online modules and interactive presentations. Overall, using Microsoft PowerPoint and media tools is essential for TVET teachers to communicate technical concepts effectively and prepare students for the demands of the modern workforce.

Next, the TVET teacher must master Re-mix Digital Learning Resources. In TVET, innovative instructional methods such as live streaming, hybrid learning, and blended learning have gained prominence, transforming the traditional educational landscape. Live streaming in TVET involves the real-time broadcast of educational content, enabling remote participation in lectures, demonstrations, and practical sessions. This synchronous delivery allows students to engage in discussions and interact with instructors from different locations, providing a dynamic online learning experience. Hybrid learning, often synonymous with blended learning, combines traditional face-to-face instruction with online elements. In the context of TVET, this entails a mix of in-person practical sessions, workshops, and online modules or resources. Hybrid learning offers flexibility, catering to diverse learning styles by allowing students to attend on-site practical sessions while accessing theoretical content online (Thanasam Rujira, Nilsook, & Wannapiroon, 2021). Blended learning, specifically tailored for TVET, seamlessly integrates traditional classroom teaching with online resources, assessments, and collaborative activities. This approach optimally balances hands-on practical training with the benefits of digital learning, creating a cohesive and interactive educational experience (Zhu & Bonk, 2019). In summary, these instructional methods in TVET harness the potential of technology to enhance accessibility, engagement, and the overall effectiveness of vocational education.

Educators in TVET establishments should also design lessons that promote cultivating 21st-century skills in their students. These skills enable students to become proactive problem solvers, collaborative team players, and adept digital citizens. Achieving this objective necessitates educators to undergo suitable training or professional development, empowering them to incorporate these skills into their pedagogy skills seamlessly. According to Duran, Yaussy, and Yaussy (2011), student performance saw improvement when they collaborated and applied their 21st-century skills. Therefore, the utilisation of technology is crucial for TVET educators to provide and support electronic education in the contemporary digital era. Pedagogy skills are essential for TVET teachers to effectively impart knowledge and skills to their students (Jaafar et al., 2020). Firstly, TVET teachers need a deep understanding of pedagogical approaches that align with the nature of technical and vocational subjects. This includes developing and implementing instructional strategies that cater to diverse learning styles and ensuring that theoretical concepts and practical skills are effectively communicated. Furthermore, TVET teachers should be adept at assessing student progress and providing constructive feedback to facilitate continuous improvement.

For TVET teachers, employing diverse teaching strategies tailored to different learning situations is crucial to accommodate the unique needs of vocational education. A demonstration-based strategy can be highly effective in practical hands-on sessions, such as technical workshops or laboratory settings. Teachers can showcase skills and techniques, allowing students to observe before engaging in practical application themselves. Small-group collaborative learning is another valuable strategy in situations where teamwork and problem-solving skills are essential, promoting peer interaction and knowledge sharing. Incorporating interactive methods like case studies, discussions, and multimedia presentations can enhance engagement and comprehension in theoretical or classroom settings.

Furthermore, adapting to individual learning styles is key; some students may thrive with visual aids, while others benefit more from hands-on experiences. Personalised learning plans and self-paced modules can accommodate these differences. Continuous assessment, including both formative and summative evaluations, allows teachers to gauge student progress and adjust instructional strategies accordingly. Flexibility and creativity

in choosing and combining these strategies ensure that TVET teachers effectively meet the varied learning needs of their students in different educational contexts (Panita et al., 2021).

In addition, digital management is also a technical skill that TVET teachers need. Digital management for TVET teachers involves effectively utilising technologies to enhance various aspects of teaching and administrative responsibilities (Falloon, 2020). Firstly, digital management encompasses organising and storing instructional materials, resources, and lesson plans in digital formats, ensuring easy accessibility and retrieval. Learning management systems (LMS) can be employed to provide a centralised platform for teachers to share resources and communicate with students (Phan et al., 2020). For administrative tasks, digital management includes tools for attendance tracking, grading, and communication with students and parents. Online platforms and communication tools enable efficient collaboration and information exchange. Moreover, digital management plays a crucial role in assessment and feedback. Automated grading systems and digital assessment tools streamline the evaluation process, providing timely feedback to students (Phan et al., 2020).

Furthermore, updating industry trends and technological advancements is essential for TVET teachers. Continuous professional development through online courses, webinars, and digital resources ensures that teachers remain abreast of the latest developments in their fields, enhancing the quality of instruction. Digital management for TVET teachers involves leveraging technology to streamline instructional processes, enhance learning experiences, and stay connected in an ever-evolving educational landscape.

Table 3 *List of sub-themes of technical skills for document analysis*

Author	Database	Digital Tool Competence	Pedagogic Competence	Re-mix Digital Learning Resources	Digital Management
Awang Jaafar et al., (2020)	Google Scholar	✓	✓	✓	
Junfeng Diao et al., (2022)	Google Scholar	✓			
Chi Phan et al., (2020)	Google Scholar	✓			✓
Ainul Najhwar et al., (2022)	Google Scholar	✓			
UNESCO (2022)	Google Scholar	✓			
Panita et al., (2021)	Google Scholar	✓			✓
Shagataeva et al., (2021)	Google Scholar	✓			
Mat Jam et al., (2020)	Google Scholar	✓			
Cox et al., (2020)	Google Scholar	✓			
Christopher Obeta et al., (2022)	Google Scholar	✓			
Saripudin S et al., (2020)	Google Scholar	✓			
Zakaria et al., (2022)	Elsevier (Science Direct)			✓	
Samson et al., (2013)	Google Scholar	✓			
Sudira et al., (2021)	Google Scholar	✓			
Zimmer et al., (2022)	Google Scholar				
Falloon (2020)	SpringerLink				✓
Abdul Rahman et al., (2022)	Google Scholar	✓			
Hinon et al., (2022)	Google Scholar			✓	
Total Number of Articles		14	1	3	3
Total Percentage (%)		70	5	15	15

3.2 The Non-technical Skills Required by TVET Teachers in Digital Learning

Proficient TVET teachers must maintain a balance between their technical expertise and non-technical skills to stay pertinent. To attain this equilibrium, TVET educators should enhance their professionalism by cultivating

robust, non-technical, essential skills. Due to the rapid change in technological advancement, which necessitates acquiring new skill sets, continuous learning has become a fundamental requirement for the career development of TVET teachers. Remaining abreast of emerging educational technologies independently is crucial, emphasising their willingness to learn and adapt.

Personal ethical skills are essential for TVET teachers to maintain integrity, professionalism, and a positive learning environment. Firstly, honesty and transparency are critical ethical skills. Teachers must provide accurate information to students, be transparent about expectations, avoid dishonest practices, and foster trust in the teacher-student relationship. Respect for diversity and inclusivity is another crucial ethical skill. TVET classrooms often comprise students with various backgrounds and abilities. Teachers must create an inclusive environment, treating all students respectfully and recognising and valuing diversity in perspectives, skills, and experiences.

Integrity in assessment practices is vital. TVET teachers must ensure fairness, avoid favouritism and provide equal opportunities for all students. Upholding confidentiality in handling student information is equally important as respecting privacy and maintaining trust. Professionalism in interpersonal relationships is an ethical skill that TVET teachers should possess. This includes maintaining appropriate boundaries with students, colleagues, and other stakeholders. Teachers should avoid engaging in discriminatory behaviour and ensure that their actions align with professional standards (Jaafar et al., 2020).

Furthermore, responsibility and accountability are key ethical attributes. TVET teachers should take responsibility for their actions, decisions, and students' learning outcomes. This involves being accountable for the quality of instruction and ensuring that students are adequately prepared for their future careers. Ethical decision-making is an overarching skill that encompasses all these elements. TVET teachers often face complex situations requiring ethical judgment. The ability to make sound ethical decisions involves considering the welfare of students, maintaining honesty, and adhering to professional standards (Jaafar et al., 2020).

Moreover, collaboration and communication skills are imperative for TVET teachers in digital learning. These educators must engage in virtual collaboration with other members of the educational community, sharing learning materials, effective teaching strategies, and information about learner progress. The success of collaboration relies on effective communication, necessitating TVET teachers to possess proficient written, listening, and communicative skills. Additionally, they should be adept at communicating in diverse languages and can utilise internet-based technologies for effective communication (Falloon, 2020).

Communication skills are crucial for TVET teachers to effectively convey information, facilitate learning, and foster positive relationships in the classroom. Firstly, clarity in communication is paramount (Falloon, 2020). TVET teachers must articulate their ideas, instructions, and explanations clearly and understandably, considering the technical nature of the content. Moreover, effective listening skills are essential. TVET teachers must listen attentively to students' questions, concerns, and feedback, demonstrating empathy and understanding. This two-way communication enhances student engagement and addresses individual learning needs (Akgunduz, 2021). Non-verbal communication plays a significant role. TVET teachers should be mindful of their body language, gestures, and facial expressions, contributing to the overall communication atmosphere. Positive non-verbal cues can create a welcoming and encouraging learning environment. Encouraging open communication is vital for fostering a supportive learning environment. TVET teachers should create opportunities for students to express their thoughts, ask questions, and engage in discussions. This promotes a collaborative and participatory atmosphere in the classroom (Jaafar et al., 2020).

Additionally, feedback is an integral aspect of communication in TVET. Teachers should provide constructive feedback on students' performance, offering guidance on how to improve. This feedback loop contributes to continuous improvement and enhances the overall learning experience. Lastly, effective communication extends beyond the classroom. TVET teachers often collaborate with colleagues, industry partners, and other stakeholders. Strong communication skills enable teachers to convey technical information to diverse audiences, fostering productive partnerships and ensuring relevance to industry standards.

Next on the list is the adaptability of teachers. Given the swift progress of technology, educators must be at ease with and adaptable to technological advancements. TVET teachers should readily embrace emerging technologies and adjust their strategies to cater to the evolving needs of students. Flexibility is essential, enabling them to work in various settings to support students. Additionally, TVET teachers should exhibit strong teamwork attributes, including initiative, discipline, a positive work attitude, cooperation, interactivity, productivity, responsibility, outcome orientation, efficiency, independence, dedication, and professionalism (Jaafar et al., 2020).

Adaptability is a crucial skill for TVET teachers, given the dynamic nature of technology, industries, and educational methods. Firstly, technological advancements continually reshape the landscape of technical fields. An adaptable TVET teacher is open to incorporating new technologies into their instructional methods, ensuring students are exposed to the latest tools and practices relevant to their chosen professions. Moreover, industries evolve, introducing new practices and requirements. An adaptable TVET teacher stays informed about industry trends, adjusts curriculum content accordingly, and integrates real-world scenarios into the classroom. This ensures that students have skills and knowledge that align with current industry standards (Diao et al., 2022).

Changes in educational methodologies and the diverse needs of students also require adaptability. TVET teachers should be flexible in adjusting their teaching approaches to cater to different learning styles, abilities, and preferences. This might involve modifying instructional methods, providing alternative assessments, or incorporating varied resources to accommodate the diverse needs of the student population. In addition, an adaptable TVET teacher is responsive to feedback. They continuously evaluate the effectiveness of their teaching methods, seeking input from students and colleagues, and making necessary adjustments. This feedback-driven approach promotes a continuous improvement mindset, enhancing the overall quality of education in technical and vocational fields (Najhwar et al., 2022).

Certainly, both technical and non-technical skills are crucial in the context of digital learning. Technical skill is essential for effectively navigating and utilizing digital tools, platforms, and technologies in the educational landscape. On the other hand, non-technical skills, such as communication skills, adaptability, collaboration, and problem-solving abilities, are equally important. These skills enhance the overall teaching and learning experience in a digital environment. Therefore, a balanced combination of both technical and non-technical skills is essential for educators to thrive in the dynamic and evolving landscape of digital learning.
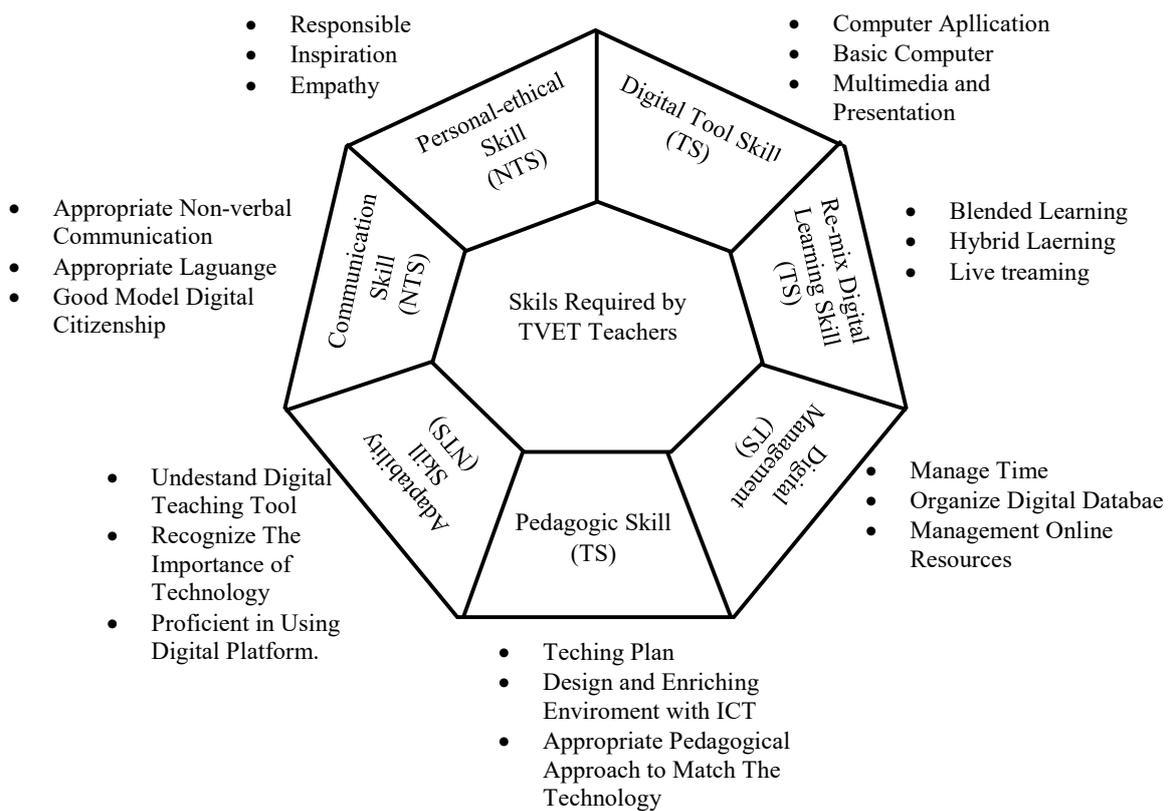
- Responsible
- Inspiration
- Empathy

- Computer Apllication
- Basic Computer
- Multimedia and Presentation

Personal-ethical Skill (NTS)

Digital Tool Skill (TS)

- Appropriate Non-verbal Communication
- Appropriate Laguange
- Good Model Digital Citizenship

Communication Skill (NTS)

Skils Required by TVET Teachers

Re-mix Digital Learning Skill (TS)

- Blended Learning
- Hybrid Laerning
- Live treaming

- Undestand Digital Teaching Tool
- Recognize The Importance of Technology
- Proficient in Using Digital Platform.

Adaptability Skill (NTS)

Digital Mangement (TS)

- Manage Time
- Organize Digital Databae
- Management Online Resources

Pedagogic Skill (TS)

- Teching Plan
- Design and Enriching Enviroment with ICT
- Appropriate Pedagogical Approach to Match The Technology

Fig. 5 *Summary of technical and non-technical Skills by TVET teacher*

3.3 Proposed Technical and Non-technical Skills Required by TVET Teacher in Digital Learning by Following TPACK Model
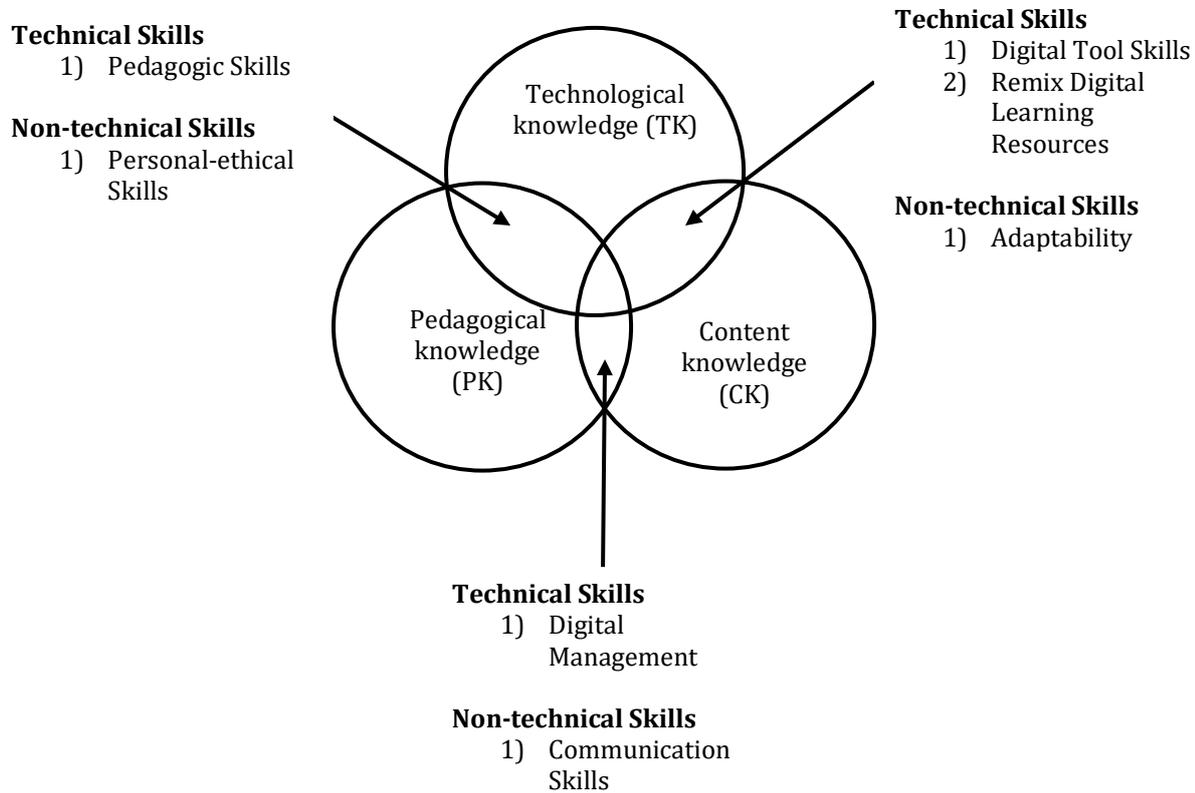

Technical Skills
1) Pedagogic Skills

Non-technical Skills
1) Personal-ethical Skills

Technical Skills
1) Digital Tool Skills
2) Remix Digital Learning Resources

Non-technical Skills
1) Adaptability

Technical Skills
1) Digital Management

Non-technical Skills
1) Communication Skills

Fig. 6 *Proposed technical and non-technical skills required by TVET teacher in digital learning by following TPACK model*

Remix Digital Learning Resources, Digital Management, and Pedagogic Skills play a crucial role in enhancing the proficiency of TVET teachers at the higher education level. These technical skills are integral to the integration of Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK). Digital Tool Skill enables teachers to seamlessly incorporate technology into their teaching practices, bridging the gap between subject expertise and technological tools (Handayani, Hartati, Azhar, Yusfi & Bayu, 2024). Remix Digital Learning Resources emphasises adapting and customising digital materials to cater to diverse student needs, showcasing creativity in merging subject-specific content with technological elements (Ringotama, 2020). Pedagogic Skill effectively integrates instructional strategies and technology to engage students and address varied learning styles (Kanbul et al., 2022). Lastly, Digital Management focuses on organising and overseeing digital resources, supporting technology integration in education and ensuring a technologically enriched learning environment (Hamadi & El-Den, 2024). These technical skills collectively contribute to optimising the educational experience within the TPACK framework (Jaafar et al., 2020).

The TPACK model, emphasising the integration of Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK), proves to be a versatile and comprehensive framework for both technical and non-technical domains in educational settings, particularly in the context TVET. Non-technical skills, namely Personal Ethical Skills, Communication Skills, and Adaptability Skills play pivotal roles in enhancing the overall effectiveness of TVET teachers within this model. Personal Ethical Skill ensures ethical considerations in technology integration (Falloon, 2020). Communication Skill facilitates the clear transmission of complex subject matter (Safarov, 2024). Adaptability Skills are crucial for navigating the dynamic landscape of technology integration in vocational education (Iheukwumere & Chinwe-Edozie, 2024). These non-technical skills

complement the technical skills within the TPACK framework, collectively contributing to a positive, ethically sound, and adaptive learning environment that meets the diverse needs of TVET.

4. Conclusion

In conclusion, a systematic review guided by the PRISMA flow diagram is required to investigate technical and non-technical skills. Identification, screening, eligibility, and inclusion are all steps in the process. The researcher then implements a table matrix and thematic analysis in the inclusion section. As a result, it is concluded that there are two major themes: technical and non-technical skills. The technical skills comprise four sub-themes: Digital Tool Skills, Re-mix Digital Learning Resources, Digital Management and Pedagogic Skills. Meanwhile, the non-technical skills consist of personal-ethical skills, adaptability skills, and communication skills, which are the sub-themes. From all the databases used to search for the articles, there are only 20 articles, books and journals relevant to this research.

TVET teachers must master the technical aspects of digital tools and platforms to deliver effective and engaging instruction in a digital learning environment. TVET teachers should not see technical and non-technical skills in isolation to succeed in digital learning. Instead, they should integrate both sets of skills, recognising that effective digital education requires a combination of technical proficiency and interpersonal skills. Professional development programs should be designed to holistically address these skills, ensuring that TVET teachers are well-equipped to navigate the complexities of digital learning while fostering positive and engaging educational experiences for their students. Hence, all the TVET teachers must reskill their technical skills, such as digital tools, which are required for training and solidify their non-technical skills based on this research. The proposed TPACK model can benefit TVET teachers in higher institution learning due to its integrative approach to technology, pedagogy, and content knowledge. Future academics can write papers in various fields, such as electronic mechanical, automotive, oil and gas, and other fields. This is critical since TVET teachers need to adapt to digital learning. Besides that, future research can be done through interviews with industry professionals to form a robust foundation for future research endeavours to enhance the technical and non-technical skills of TVET teachers in digital technology. The findings can inform evidence-based practices, ensuring that TVET programs align closely with the evolving needs of industries and contribute to the overall preparedness of future educators.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

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