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How digital competency for Indonesian TVET educators explored in the last decade: a systematic literature review based on the Australian qualification framework

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ABSTRACT

Indonesia's National Qualification Framework was adopted from the Australian Qualification Framework (AQF). However, there is still no certification scheme for digital competency among educators, despite the growing urgency of having digitally capable teachers in the Industrial Revolution 4.0. The aim of this study is to explore how digital competency among Indonesian Technical and Vocational Education and Training (TVET) educators has been researched in the last ten years. The study used a Systematic Literature Review following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Framework, with data sourced from reputable scientific journals indexed by Scopus and SINTA, as well as formal reports issued by the government. The competencies required in Digital Education for Educators based on the AQF were used to derive keywords, which were divided into three categories. The ongoing results show that digital competencies have been widely researched. However, unlike the AQF standard that uses foundation skills, the basis for digital competency among TVET educators in Indonesia remains unclear. Additionally, the literature on related topics is still integrated and used in policies aimed at improving digital qualifications for educators. The results of this research can contribute to the importance of adding a digital competency certification for TVET educators within Indonesia's National Qualification Framework.

Keywords: Australian Qualification Framework, Digital Competency, Educators, TVET

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INTRODUCTION

Increasing digital activity in society demands that the world of Indonesian education adapt quickly. Of course, this needs to be supported by good competencies and certification for stakeholders in the education sector. Teachers, as one of the most important stakeholders, are required to be competent and adaptive to the various changes that occur. Teachers in Indonesia must have four competencies: (1) pedagogic competence, which focuses on the ability to educate and develop the potential of students; (2) professional competence, centered on mastery of teaching materials and their supports; (3) personality competence, which includes the ability to act in accordance with prevailing norms and values; and (4) social competence, which includes the ability to interact with society. One of the references and competency standards that can be

adopted is Australia. Teacher competency standards in Australia, regulated by The National Professional Standards for Teachers, state that teachers must have: (1) professional knowledge and professional practice, which includes: a) planning and implementing effective teaching and learning, b) creating and maintaining a supportive and safe learning environment, and c) assessing, providing feedback, and reporting on student learning; and (2) professional engagement, which includes: a) engaging in professional learning, and b) engaging professionally with colleagues and the community (Rezaei et al., 2018).

The development of educational competency standards for vocational teachers and lecturers based on the Australian Qualification Framework (AQF) needs to be improved. The AQF, which is one of the references for the Indonesian National Qualifications Framework (KKNI), has developed in response to the needs of the industrial revolution 4.0. In mid-2020, the Australian government formalized the draft foundation skills for future skills, which includes digital literacy. The Australian government, through the AQF, has standardized digital literacy as one of the foundation skills that teachers must possess. Therefore, this research aims to develop competency standards, adapted from the AQF, by incorporating the digital skills that TVET teachers need to possess. This is important to ensure that the skills of teachers in Indonesia are better prepared to face the changes and shifts caused by Industry 4.0.

The novelty of this research in digital education among Indonesian TVET (Technical and Vocational Education and Training) teachers lies in several areas. A report by UNESCO in 2022 provides a situational analysis of the digital learning landscape in Indonesia, focusing on digital content and platforms, internet access, infrastructure, device access, and the digital skills of teachers and students (UNESCO, 2022). This situation is particularly unexplored in the remote areas of Indonesia (Mohamad, Ahmad, et al., 2021). Furthermore, a systematic literature review emphasizes the lack of comprehensive research devoted to the development of TVET instructors' digital competence in using educational technologies (Kanwar et al., 2019). Therefore, it is important to gain a better understanding of where the research in digital education for TVET teachers stands in the academic landscape.

METHOD

A systematic evaluation of the literature was conducted to assess the literature related to digital competency among Indonesian TVET educators. The evaluation method consisted of four steps: database searching, record screening, eligibility assessment, and final selection. The database search was performed using specific keywords such as "ICT," "teacher" or "educators," "Indonesian," and "vocational" or "technical & vocational education" to identify relevant papers. Subsequently, a search was conducted using the Scopus database with the selected keywords.

Inclusion and exclusion criteria were applied to narrow down the search results. Articles published in English between 2013 and 2023 met the inclusion criteria. Documents from the government related to digital literacy and TVET education were also used to provide relevant supporting materials. After evaluating the search results, 13 publications were selected for review. The references were thoroughly studied and analyzed, and pertinent information was extracted. The retrieved data were then used to examine the trends in digital literacy competence among TVET educators in Indonesia. The overall process is illustrated in Figure 1.

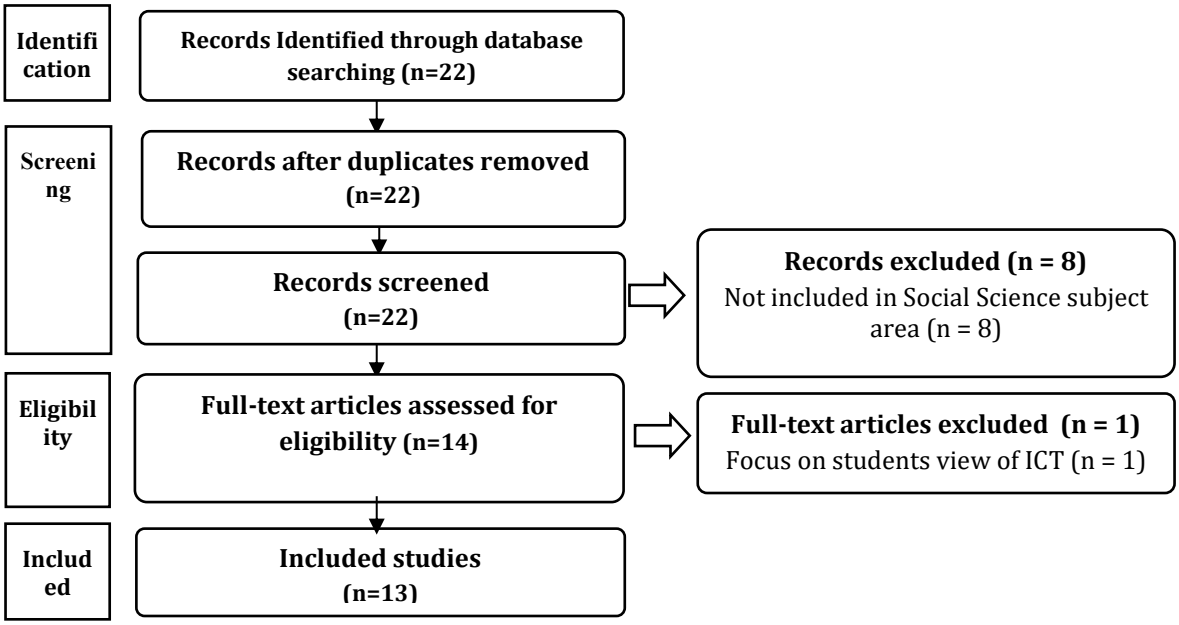

Figure. 1 PRISMA flow diagram

A comprehensive methodology is required to assess the need for digital competency among Indonesian TVET educators. This involves gathering studies related to the use of ICT in TVET learning, using the established keywords. The string of search queries with the keywords is: TITLE-ABS-KEY((ict) AND ((teachers) OR (educators)) AND (vocational) AND (indonesia OR indonesian)) AND (EXCLUDE(DOCTYPE,"cr")) AND (LIMIT-TO(SUBJAREA, "SOCI")).

RESULTS AND DISCUSSION

The Australian Qualification Framework (AQF) defines digital competence in a training package titled TAE80316 Graduate Certificate in Digital Education. This package includes three mandatory units and two elective units that teachers or prospective training participants must complete to obtain the qualification. The AQF also describes the qualification as follows:

"This qualification reflects the roles of individuals who apply substantial specialised skills and knowledge in the field of education and capability development, using ICT. In these roles they make high-level, independent judgements in major planning, design, operational and educational outcomes within highly varied and specialised contexts. The qualification is designed to enhance, but not replace, a teaching or training qualification. The volume of learning of a Graduate Certificate in Digital Education is typically six months to one year."

Based on the description, it is clear that educators are required to use ICT as a complementary tool to enhance learning and teaching practices in an educational setting. This qualification is particularly important for teachers and instructors working in vocational schools, as these institutions often require up-to-date technology skills aligned with specific vocational fields (Nurjanah et al., 2022; Olabiyi, 2022, 2024). However, despite the growing need for digital competency among Indonesian educators, there is still no specific qualification in the Indonesian Skill Qualifications Framework (KKNI). Therefore, to understand how this competency has been addressed, it is necessary to examine the training package TAE80316 Graduate Certificate in Digital Education as a benchmark. The core competency units in this qualification are detailed in Table 1. It should also be noted that the units of competency shown are the core units, and prospective students of this training are required to complete two additional elective units that match their interests.

Table 1 TAE80316 Graduate Certificate in Digital Education Core Units

Unit of Competency	Performance Criteria	Keywords
TAEDEL801 Evaluate, implement and use ICT-based educational platforms	1. Evaluate the accuracy and usefulness of ICT resources supporting project-based learning 2. Analyse network hardware and software for learning environment 3. Analyse current ICT technologies allowing communication and collaboration between learners and other stakeholders 4. Develop a pilot ICT educational platform solution	ICT, Education
TAEDEL802 Use e-learning with social media	1. Identify and recommend an appropriate environment for a particular e-learning task 2. Plan the implementation of the selected social media environment 3. Implement and evaluate the selected social media community	e-learning, social media

Unit of Competency	Performance Criteria	Keywords
	4. Design and establish strategies to sustain the social media community	
TAELED801 Design pedagogy for e-learning	1. Evaluate the pedagogical effects of e-learning 2. Generate e-learning options to cater for diversity 3. Initiate self-directed learning using technology 4. Use technology to personalize learning	e-learning, diversity, self-directed learning, personalize learning

The derived keywords show the information that should be considered when examining studies in the particular qualification. To contextualize the findings, the data were then narrowed down to studies conducted in Indonesia and in TVET education. In detail, the keywords and publications found through the data mining process are mapped as shown in Table 2.

Table 2 Study of the Utilization of ICT in Indonesia TVET and its relation to educators digital competence. (Source: research data)

Keyword	Description
ICT	This keyword includes articles that discuss the use of ICT as a learning model or tools in TVET learning, which represents the digital competence.
Teachers OR Educators	This keyword includes articles which have discussed the teachers competency or teachers skills regarding digital literacy or the use of ICT based on the teacher's perspective.
Vocational	This keyword was included to focus the scope of articles to TVET only.
Indonesia OR Indonesian	This keyword was included to focus the articles that were conducted in Indonesia or have a context of Indonesia TVET learning.

Table 3 Publications and Unit Competency Mapping

Author(s)	Brief Summary	TAEDEL801 Evaluate, implement and use ICT-based educational platforms	TAEDEL802 Use e-learning with social media	TAELED801 Design pedagogy for e-learning
(Marcos Sánchez et al., 2022)	The need of TVET teachers training in the application of ICT.	1		1
(Abdullah et al., 2020)	The needs of improving ICT competence in Vocational High School (VHS) teachers to meet the challenges of the 21st century.	1		1
(Ana et al., 2018)	The need to improve ICT based communication skills.	1	1	
(Muhammad & Jaafar, 2014)	The Teacher Professional Education (TPE) as a part of professional development (PD) programs in integrating 21st century skills, including ICT related skills.	1	1	1
(Ana et al., 2020)	The need to improve ICT competence as a part of four teacher competencies in Indonesia.	1		
(Khan & Markauskaite, 2018)	Most VHS teachers in Surakarta are familiar with mobile ICT, but the use is still limited to basic operation (i.e: uploading files, using search engines, etc).	1	1	1
(Dora et al., 2020)	This research shows that the blended learning model can increase a student's HOTS (Higher Order Thinking Skills).	1		1
(Bekri et al., 2015)	The VHS teachers beliefs in integration of ICT in education (behavior beliefs, normative beliefs, and control beliefs).	1	1	1
(Khan & Markauskaite, 2018)	There is still the need for teachers training in the utilization of ICT.	1	1	1
(Grosch, 2017)	The need to increase teachers training in ICT competence for ELT.	1		
(Marcos Sánchez et al., 2022)	The need to increase teachers training in ICT competence to improve teachers performance.	1		1
(Posillico & Edwards, 2024)	The teachers are encouraged to use ICT appropriately for optimal impact on students' positive attitudes and better learning processes.	1		1
(Cupido & Jokonya, 2024)	The development of adaptive ICT curriculum models is relevant for VHS stakeholder.	1		1

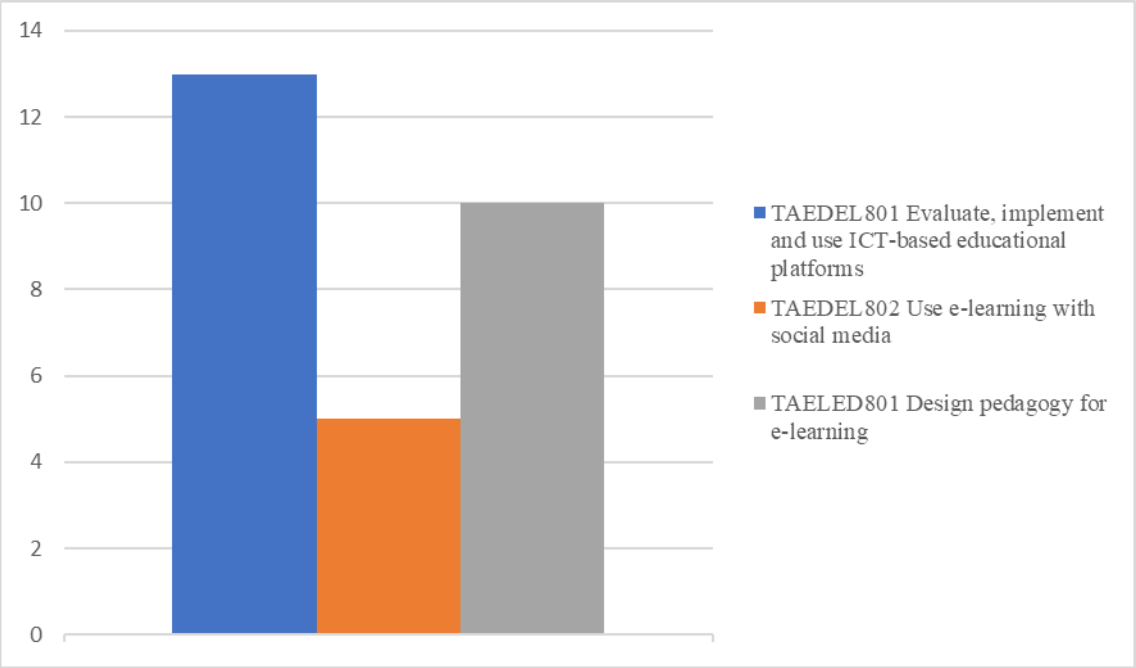

Figure 2 The mapping of data to AQF Digital Competency

Based on the findings presented in Table 3 and Figure 1, it is clear that the thirteen publications are not evenly distributed. While all papers cover topics related to ICT, and eleven papers address the theme of design pedagogy for e-learning, the topic of social media as an e-learning platform is noticeably underexplored. Furthermore, to understand the extent to which these papers discuss digital competency among TVET teachers, a closer examination and more detailed discussion are needed, particularly by analyzing the performance criteria in each unit of competency.

Evaluate, Implement and Use of ICT-based Educational Platform

The use of ICT in the educational context has become a necessity in the Industry 4.0 era, as suggested by many studies (Cupido & Jokonya, 2024; Olabiyi, 2024). Indonesia is no exception. To implement ICT in the classroom, teachers play a crucial role in ensuring that lessons are delivered effectively (Marcos Sánchez et al., 2022; Plaza-Angulo & López-Toro, 2024). According to AQF, one of the qualification units that determine the competency of teachers in digital education is the ability to evaluate, implement, and use ICT-based educational platforms. Beyond the use of these platforms, the required performance criteria include the ability to evaluate the accuracy and usefulness of ICT resources supporting project-based learning, analyze network hardware and software for the learning environment, assess current ICT technologies that facilitate communication and collaboration among learners and other stakeholders, and develop a pilot ICT educational platform solution.

Upon closer examination, the majority of the papers collected indeed discuss the evaluation of ICT-based projects in classroom settings. For example, discusses ICT-based projects in culinary

schools. However, only half of the papers address the use of software and hardware in the learning environment (Pule', 2019; van Laar et al., 2020).

Several papers also mention that collaboration and communication are among the most important skills for teachers to develop in using ICT for educational purposes (Bekri et al., 2015; Bettiol et al., 2020; Burger et al., 2019; Khan & Markauskaite, 2018). Khan & Markauskaite (2018) even stated that communication is the hardest skill to acquire when developing ICT skills for teachers. Developing a pilot ICT educational platform, on the other hand, was rarely discussed in the papers found in this research. The only publication that mentioned an ICT educational platform is Burger et.al (2019) which focused on the importance of multiple resources to help teachers integrate 4Cs (creativity and innovation, critical thinking and problem-solving, collaboration, and communication) into classrooms. Interestingly, almost all publications share the same view that teacher training is crucial to integrating ICT into classrooms, as many teachers apparently struggle to adapt and have a low willingness to acquire new skills related to ICT.

Use e-learning with social media

Social media has become an inseparable part of our lives, and people have been using it for various purposes and means (Al-Minhas et al., 2020; Irving, 2016; Narayan & Herrington, 2014) . Used by people across a wide range of age groups and socio-economic backgrounds, social media is effective in spreading information rapidly, often at little to no cost. It allows some degree of anonymity that encourages people to speak more freely, including in communicating ideas. Despite the risks of misinformation, social media is seen as an alternative means to educate people, especially youth, as they are the largest social media users on certain platforms (Duan et al., 2024).

In the AQF, being able to use e-learning with social media is one of the main qualifications for digital education among teachers. The performance criteria in this unit are to identify and recommend an appropriate environment for a particular e-learning task, plan the implementation of the selected social media environment, implement and evaluate the selected social media community, and design and establish strategies to sustain the social media community. However, only five papers discuss social media, and none of them analyze its use in the educational context in detail.

Among these five publications, all briefly mention determining the appropriate e-learning environment for different learning tasks (Alsina et al., 2017; Mohamad, Zakaria, et al., 2021). None of them specifically mention the use of social media for educational purposes, either in planning, implementation, evaluation, or maintaining social media communities. In the formal education context in Indonesia, the use of social media remains largely unexplored. Interestingly, in more informal contexts such as religious preaching (Kanwar et al., 2019; Moldovan, 2020) or cultural studies (Alnıaçık et al., 2019; Riebe & Jackson, 2014), there are many studies that discuss

social media in the educational context. Although these topics need further scientific analysis, it is clear that social media is an aspect that has become ingrained in our educational system, albeit not specifically in TVET fields formally (Kanwar et al., 2019; Resources, 2014).

Design pedagogy for e-learning

E-learning is associated with enhancing students' learning experiences and outcomes. Therefore, its effectiveness should be examined through the pedagogical aspects of e-learning (Aji et al., 2018; Brink & Costigan, 2015). Pedagogy for e-learning is linked to individualized learning, shared goals, positive attitudes, and reflections. These findings align with what the AQF describes as the core unit of digital education competency. The AQF sets four performance criteria in the design pedagogy for e-learning: evaluate the pedagogical effects of e-learning, generate e-learning options to cater to diversity, initiate self-directed learning using technology, and use technology to personalize learning.

Ten publications are identified as being associated with e-learning. In evaluating the pedagogical effects of e-learning, all ten papers address these topics. However, most of them do not go into detail or focus specifically on e-learning. Many are more inclined to discuss ICT and technology, which only briefly touch on e-learning (Aji et al., 2018; Khaled et al., 2014; Rivas et al., 2014). The only paper that directly mentions e-learning is by Aji et al. (2018), which discusses blended learning.

In terms of catering to diversity by generating e-learning options, Aji et.al. (2018) is the only publication that discusses catering to different needs. However, it should be noted that this paper focuses heavily on the learning options from the teachers' perspective. Similarly, only two papers mention self-directed learning (Irving, 2016; van Vuuren & van der Bank, 2023; Zakaria et al., 2021) and personalized learning (Wang, 2020).

From these findings, it is clear that the pedagogical aspects of e-learning are not widely discussed in the context of TVET. However, it should be noted that the scope of the publications reviewed is narrow, and this research would likely expand if the limitations were broadened. The results of this research are consistent with findings from other studies that have also emphasized the need for competency standards adapted from the AQF. However, this research differs by specifically incorporating digital skills as a key requirement for TVET teachers, addressing the evolving demands of modern education and technology integration.

CONCLUSION

This study emphasizes the importance of digital competence among TVET educators as part of Industry 4.0 skills. Although there are many publications on ICT and e-learning, those specifically discussing digital education in the TVET context are very limited, particularly regarding the use of social media in formal educational settings. Additionally, unlike the AQF

standard, which incorporates foundation skills, the basis of digital competency among TVET educators in Indonesia remains unclear. Furthermore, the literature on related topics has yet to be integrated and applied in policies aimed at improving digital qualifications among educators. The results of this research could contribute to the importance of adding digital competency certification for TVET educators to Indonesia's National Qualification Framework (KKNI). As many areas remain underexplored, this opens up opportunities for future research to fill the scientific gaps concerning digital education qualifications for Indonesian teachers, based on the AQF standard.

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