

Digital Competence and Self-Efficacy of TVET Instructors: An Empirical Study at University Malaysia Pahang Al-Sultan Abdullah (UMPSA)

Nur Azwni Abdul Wahid¹, Marlina Mohamad^{1*}, Azita Ali¹

Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia

*Corresponding Author

DOI: <https://doi.org/10.47772/IJRISS.2026.100600533>

Received: 07 June 2026; Accepted: 12 June 2026; Published: 29 June 2026

ABSTRACT

The increasing integration of digital technologies in Technical and Vocational Education and Training (TVET) has placed growing demands on instructors to demonstrate not only technical proficiency but also the pedagogical capacity to effectively embed digital tools in skills-based learning environments. Despite this, empirical research examining the determinants of digital competence among TVET instructors particularly the role of digital self-efficacy remains limited in the Malaysian higher education context. This study addresses this gap by investigating the levels of digital competence and digital self-efficacy among TVET instructors at a single institution, Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA), and by examining the relationship between these two constructs. Guided by the European Framework for the Digital Competence of Educators (DigCompEdu) and grounded in Bandura's self-efficacy theory, the study employed a quantitative survey design. Data were collected via self-reported online questionnaires from a sample of 202 TVET instructors (out of a population of 423) obtained through total population sampling, achieving a 47.8% response rate. The findings reveal that instructors perceive a high level of digital competence across the DigCompEdu domains, with no notable variation attributed to teaching experience. A positive relationship was identified between digital self-efficacy and digital competence, suggesting that instructors' confidence in their digital capabilities is a contributing factor to their overall competence. However, as self-efficacy alone does not fully account for competence outcomes, other institutional and contextual factors including access to technology, quality of professional development, and pedagogical support are likely to play equally significant roles. While the single-institution focus may limit broader generalizability, these findings carry important implications for institutional policy and structured professional development, underscoring the need for multi-faceted strategies to sustain and enhance digital competence among TVET instructors in Malaysia.

Keywords: Digital competence, TVET Instructors, DigCompEdu

INTRODUCTION

The rapid advancement of digital technologies, particularly under the Fourth Industrial Revolution (IR 4.0), has significantly reshaped the landscape of Technical and Vocational Education and Training (TVET). Emerging technologies such as Artificial Intelligence (AI), Internet of Things (IoT), Big Data, and digital simulation tools are increasingly embedded in industrial practices, requiring TVET institutions to ensure that their curricula and instructional approaches remain relevant to industry needs (Schwab, 2018; Razak et al., 2022). Consequently, TVET instructors play a critical role in preparing students for a technology-driven workforce, which requires a high level of digital competence.

Digital competence in education goes beyond basic technical skills and involves the effective, critical, and pedagogical use of digital technologies to enhance teaching and learning processes (Redecker, 2017). For TVET instructors, digital competence is particularly important due to the practical and skills-based nature of vocational education, where digital tools such as Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), industrial simulations, and online collaboration platforms are increasingly used to support learning activities (Hatta Md Hani et al., 2024). International organisations, including UNESCO and the International Labour

Organization (ILO), have emphasised that strengthening educators' digital competence is essential for sustainable skills development and alignment with labour market demands (UNESCO, 2018; ILO, 2020). In Malaysia, this emphasis aligns with the National IR 4.0 Policy, which calls for higher education institutions such as Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) to enhance the digital capabilities of academic staff to support national development goals (MOSTI, 2021).

Despite growing interest in educators' digital competence, the existing literature reveals a specific gap in TVET education: most studies measuring digital competence among TVET instructors have done so at a descriptive level, focusing on identifying competence levels without examining the psychosocial factors that predict or constrain them (Diao & Qu, 2024; Boonpu & Chaisuk, 2022). In particular, digital self-efficacy instructors' confidence in their ability to deploy digital technologies effectively in vocational teaching contexts has received limited empirical attention in TVET settings in Malaysia. Moreover, the application of DigCompEdu in TVET has been predominantly confined to European and East Asian contexts (Caena & Redecker, 2019; Diao & Qu, 2024), with limited validation in Southeast Asian TVET institutions where institutional resources, infrastructure, and professional development culture differ substantially.

LITERATURE REVIEW

Despite these policy directions, previous studies have reported gaps between the digital competencies required by IR 4.0 industries and the actual competencies possessed by TVET instructors (Aziz et al., 2021; Boonpu & Chaisuk, 2022). Limited access to continuous professional development, outdated technological infrastructure, and the rapid pace of technological change pose challenges to effective digital integration in teaching and learning. As a result, instructors may struggle to provide interactive, technology-enhanced learning experiences, which can negatively affect student engagement and skill acquisition (Coppe et al., 2021; Lim & Tan, 2022).

In addition to digital competence, digital self-efficacy is an important factor influencing technology integration. Digital self-efficacy refers to an individual's belief in their ability to use digital technologies effectively to perform specific tasks (Bandura, 1997; Bandura, 2021). Studies have shown that instructors with higher digital self-efficacy are more likely to adopt and utilise digital tools in their teaching, whereas low self-efficacy may lead to technology avoidance and limited instructional innovation (Odondi et al., 2022; Widhiyanti et al., 2024). Teaching experience alone does not necessarily ensure effective digital integration, as confidence and perceived ability often determine actual technology use, particularly in online and blended learning environments (Hamid et al., 2023).

Given these challenges, there is a need to systematically examine both digital competence and digital self-efficacy among TVET instructors. Therefore, this study aims to identify the level of digital competence and digital self-efficacy among TVET instructors at UMPSA and to examine the relationship between these two variables using the European Framework for the Digital Competence of Educators (DigCompEdu). The findings of this study are expected to provide empirical evidence to support institutional planning and the development of structured professional development programmes, thereby enhancing the quality of TVET delivery in Malaysia.

To provide a structured and comprehensive assessment of instructors' digital competence, this study adopts the European Framework for the Digital Competence of Educators (DigCompEdu). DigCompEdu was developed by the European Commission as a reference framework to describe the specific digital competences required by educators in professional teaching contexts (Redecker, 2017). The framework consists of six interrelated competence areas, namely professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence. These areas cover both pedagogical and technological aspects of digital teaching, emphasising not only the use of digital tools but also their meaningful integration to support learning outcomes. DigCompEdu has been widely used in educational research to evaluate educators' digital competence across different educational levels and contexts, including vocational education, due to its holistic and educator-focused approach (Caena & Redecker, 2019). Therefore, the use of DigCompEdu in this study provides a valid and systematic basis for examining the digital competence of TVET instructors at UMPSA in relation to their digital self-efficacy and teaching practices.

While several digital competence frameworks exist, DigCompEdu is particularly well-suited for assessing TVET instructors for several reasons. Unlike the UNESCO ICT Competency Framework for Teachers (ICT-CFT), which is primarily designed for general school education, DigCompEdu was developed to address the full spectrum of educator-specific digital practices, encompassing professional engagement, resource management, pedagogical application and learner empowerment (Redecker, 2017). These dimensions directly align with the competencies required in TVET settings, where instructors must integrate digital tools not only for content delivery but also for skills-based assessment and the facilitation of industry-ready digital competencies in learners (Diao & Qu, 2024). Furthermore, DigCompEdu's hierarchical proficiency levels from Newcomer to Pioneer, enable nuanced identification of developmental needs, making it directly actionable for institutional professional development planning in TVET institutions.

The conceptual framework of this study is developed based on the European Framework for the Digital Competence of Educators (DigCompEdu) and self-efficacy theory. As illustrated in Figure 1, digital competence is positioned as the main outcome variable and is conceptualised through six DigCompEdu domains, namely professional engagement, digital resources, teaching and learning, assessment, empowering learners and facilitating learners' digital competence. Digital self-efficacy is proposed as a key influencing factor, reflecting instructors' confidence in their ability to use digital technologies effectively in teaching and learning activities. In addition, teaching experience is included as a grouping variable to examine potential differences in digital competence among instructors with varying years of service, rather than as a direct predictor. This framework provides a structured basis for examining the level of digital competence, its relationship with digital self-efficacy, and differences based on teaching experience among TVET instructors at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA).

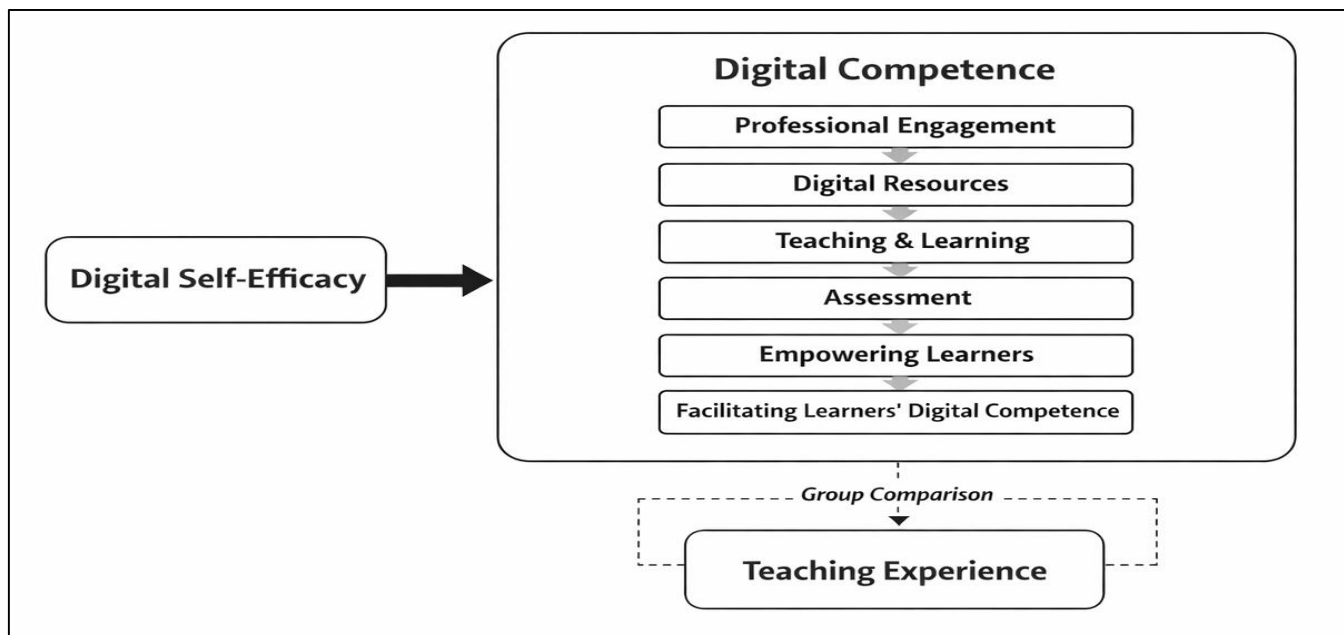


Figure 1: Conceptual Framework based on DigCompEdu

As illustrated in the revised Figure 1, the conceptual framework positions digital competence as a multidimensional outcome shaped by an interplay of individual and contextual factors. While this study focuses empirically on the relationship between digital self-efficacy and digital competence, the framework acknowledges that other significant determinants including institutional support, access to technology, quality of professional development and pedagogical knowledge also contribute to instructors' digital competence levels. This broader framing is consistent with socio-ecological perspectives on technology integration in education (Tondeur et al., 2017) and helps explain why digital self-efficacy alone accounts for only a limited proportion of variance in digital competence outcomes. Future research should empirically test this more comprehensive model.

METHODOLOGY

This study aims to examine the digital competence of Technical and Vocational Education and Training (TVET) instructors at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) based on the six competence domains of the European Framework for the Digital Competence of Educators (DigCompEdu). Specifically, the study seeks to determine the overall level of digital competence among TVET instructors and to identify whether there are significant differences in digital competence based on instructors' teaching experience. In addition, this study aims to examine the relationship between digital self-efficacy and digital competence among TVET instructors in order to understand how instructors' confidence in using digital technologies influences their level of digital competence.

To achieve these objectives, a quantitative research approach using a survey design was employed. A survey method is appropriate for studies that aim to measure perceptions, self-reported competencies and relationships between variables within a large population (Creswell & Creswell, 2018). In this study, an online survey was used as it enables efficient data collection from geographically dispersed respondents, reduces administrative costs and allows participants to respond at their convenience, which can improve response rates among working professionals such as academic staff (Evans & Mathur, 2018). In addition, online surveys are widely used in educational research to assess digital competence and technology-related constructs, as they are consistent with the digital context being investigated (Saunders et al., 2019).

The population of the study consisted of 423 TVET instructors at UMPSA. Based on sample size determination guidelines by Krejcie and Morgan (1970), a minimum sample of approximately 201 respondents is sufficient for a population of this size. Accordingly, a total of 202 instructors participated in the study by responding to the online questionnaire, which is considered adequate for generalisation within the study context. The respondents represented diverse demographic backgrounds, including different age groups, academic positions and levels of teaching experience.

Data were collected using a structured online questionnaire consisting of four sections: respondent demographics, teaching experience, digital competence based on the six DigCompEdu domains and digital self-efficacy. The digital competence items were developed based on the DigCompEdu framework (Redecker, 2017), while the digital self-efficacy items were adapted from previous studies grounded in self-efficacy theory (Bandura, 1997). The questionnaire was reviewed by three experts in educational technology and TVET to ensure content validity. A pilot study was conducted prior to the main data collection to improve clarity and reliability of the instrument, as recommended by Hair et al. (2019).

The data were analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to determine the levels of digital competence and digital self-efficacy, while inferential analyses, including independent samples t-tests, one-way ANOVA, and Pearson correlation analysis, were conducted to examine differences and relationships among the variables (Pallant, 2020).

FINDINGS

Data analysis was conducted using both descriptive and inferential statistics to address the research objectives. A total of 202 responses were analysed.

Digital Competence of TVET Instructors

Descriptive analysis revealed that TVET instructors at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) demonstrated a high level of digital competence, with an overall mean score of 3.54. As stated in Table 1, across the six DigCompEdu domains, the majority of instructors were categorised at the Leader and Pioneer levels, indicating advanced engagement with digital technologies in teaching and learning.

In particular, the highest concentration of instructors at the Pioneer level was observed in the domains of Assessment (58.9%) and Empowering Learners (55.0%), suggesting strong capability in using digital tools for evaluating student learning and supporting learner engagement. High levels of competence were also evident in

Facilitating Learners' Digital Competence (53.0%) and Professional Engagement (44.1%). For the domains of Teaching and Learning and Digital Resources, most instructors were positioned at the Leader level, reflecting effective integration of digital tools into instructional practices. These findings indicate that instructors generally possess strong pedagogical and technological capabilities aligned with the DigCompEdu framework.

Table 1: Digital Competence Levels based on DigCompEdu

Dimension	Newcomer	Explorer	Integrator	Expert	Leader	Pioneer
Dimension 1: Professional Engagement	0	0	16 (7.9%)	62 (30.7%)	35 (17.3%)	89 (44.1%)
Dimension 2: Digital Resources	0	4 (2.0%)	41 (20.3%)	70 (34.7%)	48 (23.8%)	39 (19.3%)
Dimension 3: Teaching and Learning	0	6 (3.0%)	8 (4.0%)	58 (28.7%)	78 (38.6%)	52 (25.7%)
Dimension 4: Assessment	0	0	4 (2.0%)	25 (12.4%)	54 (26.7%)	119 (58.9%)
Dimension 5: Empowering Learners	0	1 (0.5%)	6 (3.0%)	32 (15.8%)	52 (25.7%)	111 (55%)
Dimension 6: Facilitating Learners' Digital Competence	0	0	4 (2.0%)	20 (9.9%)	71 (35.1%)	107 (53%)

Differences in Digital Competence Based on Teaching Experience

To examine whether digital competence differed according to teaching experience, a one-way Analysis of Variance (ANOVA) was conducted. The results indicated no statistically significant difference in digital competence among instructors with different years of teaching experience, $F(2,199) = 0.036$, $p = 0.965$. This finding suggests that digital competence levels among TVET instructors at UMPSA are relatively consistent regardless of teaching experience, indicating that both novice and experienced instructors demonstrate comparable levels of digital competence.

Digital Self-Efficacy and Its Relationship with Digital Competence

Descriptive analysis of digital self-efficacy showed that instructors generally reported a high level of confidence in using digital technologies for teaching and learning. Most respondents indicated positive perceptions of their ability to manage digital tools, online learning platforms, and technology-based instructional activities.

Further analysis using Pearson correlation revealed a statistically significant positive relationship between digital self-efficacy and digital competence ($r = 0.132$, $p < 0.05$). Although the strength of the relationship was weak, the result indicates that instructors with higher levels of digital self-efficacy tend to demonstrate higher levels of digital competence. This finding suggests that confidence in using digital technologies is related to digital competence, although other factors may also influence instructors' overall competence levels.

In summary, the findings indicate that TVET instructors at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) demonstrate a high level of digital competence across all six DigCompEdu domains, with most instructors classified at the Leader and Pioneer levels. The highest concentrations of advanced competence were observed in the domains of Assessment, Empowering Learners, and Facilitating Learners' Digital Competence. Inferential analysis revealed no significant differences in digital competence based on teaching experience, indicating consistent competence levels among instructors regardless of years of service. In addition, a statistically significant but weak positive relationship was found between digital self-efficacy and digital

competence, suggesting that instructors' confidence in using digital technologies is related to, but does not strongly determine, their overall level of digital competence.

DISCUSSION

The findings of this study provide important empirical evidence on the digital competence and digital self-efficacy of TVET instructors at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA). Overall, the results demonstrate that instructors exhibit a high level of digital competence across all six DigCompEdu domains, reflecting a strong level of digital readiness for technology-enhanced teaching and learning. The high proportion of instructors classified at the Leader and Pioneer levels indicates advanced engagement with digital technologies, particularly in assessment practices and learner empowerment. This outcome is consistent with previous studies reporting that institutional digitalisation initiatives and the widespread use of learning management systems have strengthened educators' digital capabilities. In the TVET context, such competence is especially critical, as digital technologies increasingly support practical instruction, skills assessment, and alignment with industry requirements.

The analysis further revealed no statistically significant differences in digital competence based on teaching experience. This finding demonstrates that years of teaching service do not substantially influence instructors' digital competence levels. One possible explanation is that digital competence is increasingly shaped by institutional factors, including shared digital infrastructure, compulsory use of digital platforms and continuous professional development, rather than by teaching experience alone. In digitally developed institutions such as UMPSA, instructors, regardless of experience level are likely to receive comparable exposure to training opportunities and digital tools. This result reinforces previous research indicating that traditional teaching experience does not necessarily correspond to higher digital competence in rapidly evolving digital learning environments.

In addition, the study identified a statistically significant positive relationship between digital self-efficacy and digital competence. However, the strength of this relationship was weak, indicating that while instructors' confidence in using digital technologies is associated with their digital competence, it accounts for only a limited proportion of variance. This finding supports self-efficacy theory, which posits that perceived capability influences behaviour, while also highlighting that digital competence is a multidimensional construct shaped by additional factors such as access to resources, pedagogical knowledge, quality of training, and institutional support. The weak correlation may also be attributed to a ceiling effect, whereby generally high competence levels among respondents reduce score variability and attenuate the strength of the observed relationship.

Taken together, these findings confirm that UMPSA has established a solid foundation of digital competence among its TVET instructors. Nevertheless, sustaining and further enhancing this competence requires ongoing and targeted professional development initiatives. While digital self-efficacy contributes to instructors' engagement with technology, institutions should continue to prioritise structured training that integrates pedagogical strategies with advanced digital applications. Such efforts are essential to ensure that TVET instructors remain responsive to technological advancements and continue to deliver high-quality, industry-relevant education in line with Industry 4.0 demands.

CONCLUSION

This study examined the digital competence and digital self-efficacy of Technical and Vocational Education and Training (TVET) instructors at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) using the DigCompEdu framework. The findings demonstrate that TVET instructors generally possess a high level of digital competence across all six DigCompEdu domains, with most instructors classified at the Leader and Pioneer levels. This indicates a strong level of digital readiness to support technology-enhanced teaching and learning in the TVET context.

The results further revealed no significant differences in digital competence based on teaching experience, suggesting that years of service do not substantially influence instructors' digital competence levels. This finding highlights the role of institutional factors, such as shared digital infrastructure and continuous professional

development initiatives, in shaping digital competence among instructors. In addition, the study identified a statistically significant but weak positive relationship between digital self-efficacy and digital competence, indicating that while instructors' confidence in using digital technologies is related to their competence, it accounts for only a limited proportion of variance.

Importantly, the high level of digital competence observed in this study suggests that TVET instructors at UMPSA are well-positioned to engage with more advanced digital technologies, including emerging applications such as generative artificial intelligence. Competence across key DigCompEdu domains provides a strong foundation for the pedagogical, ethical, and technical considerations required for the effective adoption of advanced digital tools. However, realising this potential requires sustained and targeted professional development efforts.

In conclusion, this study contributes empirical evidence on digital competence and digital self-efficacy among TVET instructors in Malaysia and highlights the importance of continuous institutional support to maintain and extend digital capabilities. Future initiatives should focus on advancing instructors' digital skills towards emerging technologies to ensure the continued relevance, quality and innovation of TVET education.

ACKNOWLEDGMENT

The authors would like to express appreciation to Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) for granting permission to conduct this study. The authors also sincerely thank the 202 instructors who participated in the survey for their valuable time and cooperation throughout the data collection process. The researcher acknowledges the use of AI-assisted tools, which supported the writing process through organization, language refinement, and synthesis of credible online references. However, all interpretations, analyses, and conclusions presented in this research are entirely the researchers' original work, grounded in authentic data collection and critical reflection.

REFERENCES

1. Abd Hakim, J., & Singh, D. (2024). Teori kompetensi: Ulasan dari perspektif kemahiran digital. *Malaysian Journal of Information and Communication Technology (MyJICT)*, 5(1), 23. <https://doi.org/10.53840/myjict5-1-28>
2. Aziz, A., Omar, M. K., Rashid, A. M., & Abdullah, A. (2022). The secondary school students' interest toward the TVET programs: Demographic differences. *International Journal of Learning, Teaching and Educational Research*, 21(4), 80–96.
3. Bandura, A. (1997). Self-efficacy: The exercise of control. W. H. Freeman.
4. Bandura, A. (2021). Toward a psychology of human agency: Pathways and reflections. *Perspectives on Psychological Science*, 16(4), 666–679.
5. Boonpu, P., & Chaisuk, S. (2022). Technical vocational education and training (TVET) model in the disruptive technology era. *Academy of Strategic Management Journal*, 21(2), 1–14.
6. Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
7. Diao, J., & Qu, Y. (2024). Teaching competence of TVET teachers in the digital age: Implementation and evaluation of a training program in China. *Evaluation and Program Planning*, 103, Article 102402.
8. Evans, J. R., & Mathur, A. (2018). The value of online surveys. *Internet Research*, 28(4), 854–887. <https://doi.org/10.1108/IntR-03-2018-0089>
9. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage.
10. International Labour Organization. (2020). *Skills for a resilient youth*. ILO. <https://www.ilo.org>
11. Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
12. Mohammad Aniq bin Amdan, Janilus, N., Jasman, M. N. bin, & Kasdiah, M. A. H. bin. (2024). Advancement of AI tools in learning for technical vocational education and training (TVET) in Malaysia: Empowering students and tutors. *International Journal of Scientific Research and Archives*, 12(1), 2061–2068.

13. Muzaffar, M. S., Mohd Farid, A., & Noor Intan, T. (2020). Kesiediaan pengetahuan Revolusi Industri 4.0 dalam kalangan pensyarah Politeknik Kota. <https://www.researchgate.net/publication/343470488>
14. Nurlaila, L., Bastian, A., & Rahmat, A. (2022). Kompetensi digital guru SMP negeri di Kecamatan Ujung Batu Kabupaten Rokan Hulu pada masa pandemi COVID-19. *Fair Value: Jurnal Ilmiah Akuntansi dan Keuangan*, 5(1), 323–332.
15. Pallant, J. (2020). *SPSS survival manual* (7th ed.). McGraw-Hill Education.
16. Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union.
17. Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson Education.
18. Schwab, K. (2018). *The fourth industrial revolution*. Crown Business.
19. UNESCO. (2018). *ICT competency framework for teachers* (Version 3). UNESCO. <https://unesdoc.unesco.org>