Research Article

Digital Competence of Teachers and the Academic Performance of Students in Tertiary Education

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ABSTRACT

This study is quantitative research that employed a descriptive-correlational design to determine the digital competence of teachers and the academic performance of selected tertiary-level students of a local university in Manila City, Philippines. The study revealed that most respondents were 20 to 21 years old. Teachers were perceived to possess high levels of digital competence, particularly in pedagogical integration and adaptability to new technologies. Students generally demonstrated satisfactory academic performance, with most achieving a general weighted average between 85 and 89. Findings showed no significant difference in academic performance when grouped by age ($p = 0.34$) and gender ($p = 0.28$). However, a moderate, positive, and significant correlation was found between digital competence of teachers and academic performance of students ($r = 0.51$, $p = 0.048$), indicating that teachers' digital skills positively influence students' learning outcomes and academic success. The study recommends strengthening teachers' digital competence through continuous professional development focused on meaningful technology integration and adaptable instructional strategies. Higher education institutions should invest in robust digital infrastructure, provide structured training based on established frameworks such as TPACK and DigCompEdu, and promote collaborative innovation to ensure inclusive and equitable technology use. Policymakers are urged to support sustained digital transformation by allocating resources for training and access, establishing national standards, and aligning initiatives with workforce demands. Future research should further examine the long-term impacts of digital competence and the role of emerging technologies in enhancing learning outcomes.

Keywords: Digital Competence, Technological Skills, Pedagogical Integration, Academic Performance

1. INTRODUCTION

In today's rapidly advancing technological age, digitalization plays a major role in the landscape of the educational environment. The integration of digital resources and tools has revolutionized conventional teaching techniques, making digital competence an essential skill for educators at all levels. Teachers who possess digital competency can effectively design, deliver, and assess learning using technology-based strategies that improve student understanding and involvement.

The European Framework for the DigCompEdu (Digital Competence of Educators), which offers a holistic structure for evaluating the digital competence of teachers. The framework recognizes six areas of digital competence, ranging from professional engagement to facilitating learners' digital competence, highlighting the fundamental skills educators require to integrate digital tools into their teaching effectively. This framework is particularly relevant to tertiary education, as it highlights how digitally competent teachers can enhance teaching strategies, foster student engagement, and improve learning outcomes (Redecker, 2017). Moreover, the ICT CFT, or Information and Communication Technology Competency Framework for Teachers, emphasizes the pivotal role of teachers in leveraging technology to upgrade the quality of instruction. This framework outlines stages of ICT integration in pedagogy, from basic technology literacy to knowledge creation, illustrating how teachers can progressively develop and apply digital skills to enrich student-learning experiences. By aligning teaching practices with ICT competencies, the framework establishes a strong connection between teacher digital proficiency and student academic

performance, particularly in technology-driven educational environments such as higher education (UNESCO, 2018). Likewise, the well-known TPACK (Technological Pedagogical Content Knowledge) framework (Mishra & Koehler, 2006) conceptualizes the synergy between content knowledge, pedagogy, and technology in effective teaching. According to this model, digital competence involves not just technical ability but also knowing how to choose and use digital tools that align with pedagogical goals and subject matter.

Recent studies further reinforce and expand these frameworks within the tertiary education context. A comprehensive analysis reported low to medium-low levels of digital competence among many university instructors, particularly in areas involving the evaluation of educational practices, despite the growing body of research on digital competencies in higher education (Basilotta Gomez Pablos et al., 2022). This study highlights the need for more personalized and hands-on professional development for faculty.

Recent Asia-Pacific research reinforces the centrality of teachers' digital skills to educational outcomes. A systematic review of studies in China found that disparities in the digital environment, the availability of ICT resources, and the quality of teacher training strongly shape teachers' digital competence, and that improving school-level infrastructure and targeted professional development are key strategies for strengthening teachers' ability to use technology effectively in teaching (Yang et al., 2023).

From these perspectives and findings, this study was aimed at investigating the relationship between teachers' digital competence and the academic performance of students in tertiary education. Specifically, it sought to determine (1) how teachers' proficiency in using digital technologies such as interactive media, digital communication tools, and online learning platforms affects students' motivation, participation, and learning outcomes; (2) whether a higher level of digital competence among teachers contributes to more effective instruction and improved academic achievement among tertiary learners; and (3) the significance of empowering teachers with adequate digital skills to meet the demands of modern education. Ultimately, the study highlighted how digital competence not only enhances quality of teaching but also plays a significant role in fostering academic success in today's technology-driven learning environments.

2. MATERIALS AND METHODS

This study is quantitative research that employed a descriptive-correlational design to determine the digital competence of teachers and the academic performance of selected tertiary-level students.

Research Locale and Participants

The study was conducted in a local university in Manila City, Philippines, from September to November 2025, involving 162 tertiary-level students enrolled in the science degree program of the College of Education. The sample size was determined using Slovin's formula based on the total population of enrolled science education students for the academic year 2025-2026. After computing the required minimum sample, respondents were selected through simple random sampling. A complete list of students across all year levels served as the sampling frame. To ensure proportionate representation, the number of students drawn from each year level was determined relative to its population size. Only officially enrolled students were included, while those on leave or with incomplete enrollment status were excluded. This procedure ensured that all eligible students had an equal chance of being selected and strengthened the methodological transparency of the study.

Instruments

Data were gathered using a researcher-made survey questionnaire composed of items to determine the following: the demographic profile of the respondents in terms of age and gender; the digital competence of teachers as perceived by the respondents in terms of technological proficiency, pedagogical integration, and adaptability to new technology; and the respondents' academic performance in terms of their GWA (general weighted average) that was answered using the Likert's 5-point scale.

The initial pool of items was generated through an extensive review of existing frameworks on digital competence, such as the European Framework for the DigCompEdu, and empirical studies on technology integration in higher education. Draft items were then evaluated by three experts in the fields of educational technology, research methodology, and higher education instruction. These experts assessed the clarity, relevance, and alignment of each item with the intended constructs. Revisions were made based on expert suggestions before pilot testing.

A pilot test was conducted with a small group of respondents not included in the final sample. Reliability analysis using Cronbach's alpha yielded a coefficient of 0.91, demonstrating high internal consistency.

Data Collection

Printed questionnaires were distributed to the respondents for the collection of data. The collected data from the

respondents was systematically organized, tallied, and tabulated to facilitate more effective interpretation and analysis.

Data Analysis

Data were analyzed statistically using frequency and percentage distributions, weighted mean, ANOVA, and Pearson's *r*.

3. RESULTS AND DISCUSSION

Demographic Profile of the Respondents

Out of the total respondents, 12% belonged to the age range 18 to 19 years old, 79% belonged to the age range 20 to 21 years old, 7% belonged to the age range 22 to 23 years old, and 2% were 24 years old and above, as shown in Figure 1. The result shows that the majority of the respondents were aged 20 to 21 years old, representing the typical age range of tertiary-level students. This suggests that most respondents were in the expected stage of young adulthood, a developmental period characterized by independence, goal orientation, and academic motivation. The gender distribution revealed that males made up the largest group (48%), followed by females (43%), and a smaller percentage (9%) identifying as LGBTQIA+, as shown in Figure 2. This diversity indicates that the sample was inclusive and represented varying gender identities, which may contribute to different perspectives and experiences in digital learning environments.

Tertiary students between the ages of 18 and 22 typically demonstrate strong academic outcomes and self-directed learning behaviors, particularly when engaged in technology-enhanced learning environments. As digital natives, young adults in this age range generally adapt easily to digital platforms and online academic activities. Higher-education learners frequently engage in self-directed learning through digital tools, with self-regulation and technological facilitation emerging as significant predictors of actual technology use (Lai et al., 2022). This aligns with the current findings, where most respondents were 20 to 21 years old, and the integration of digital competence at this developmental stage can contribute positively to learning performance and academic success.

Research has shown that university students' readiness for digital learning environments and their positive attitudes toward these environments are significant predictors of their academic motivation (Abildina et al., 2023). This further supports the notion that students in the young-adult tertiary stage, who are comfortable with technology, are well-positioned to leverage digital learning for better academic outcomes.
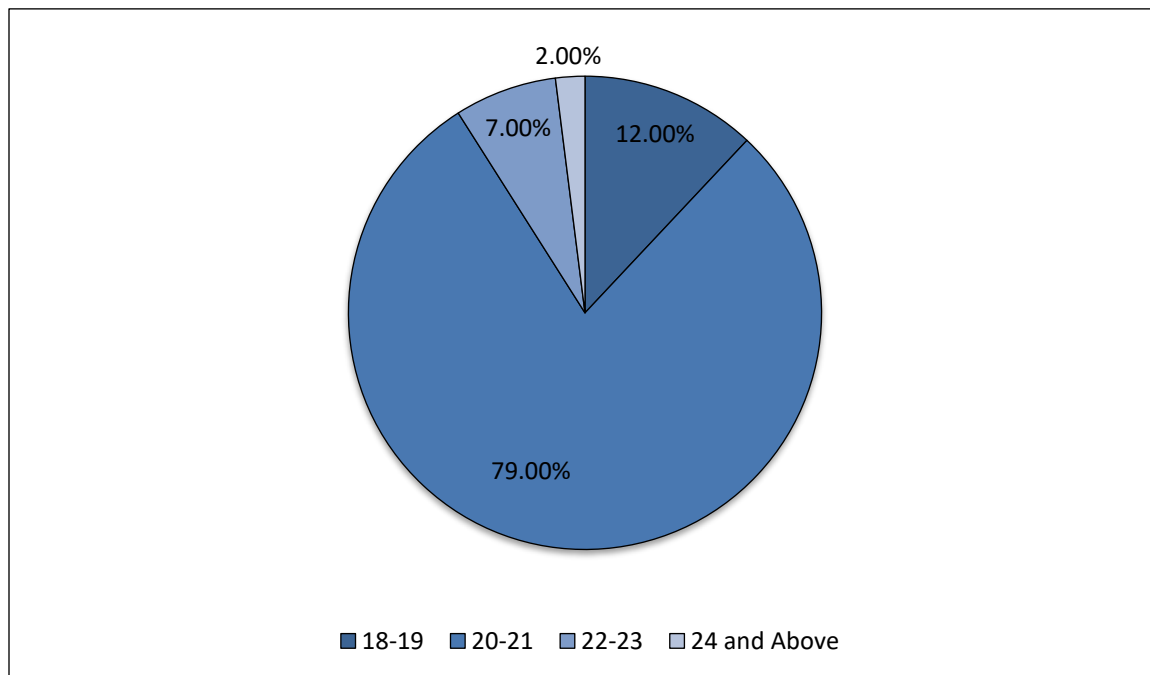

Figure 1. *Percentage distribution of respondents' demographic profile by age*
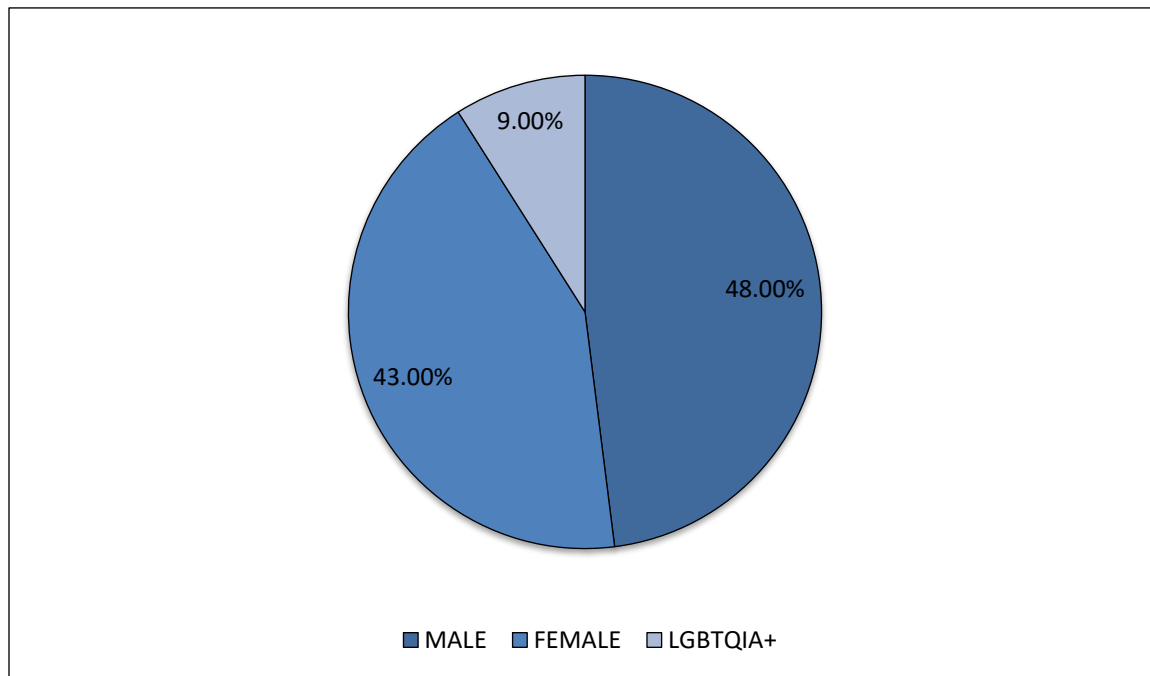
Figure 2. *Percentage distribution of respondents' demographic profile by gender*

Digital Competence of Teachers

The digital competence of teachers, as perceived by the respondents, in terms of technological proficiency was highly demonstrated; for pedagogical integration, it was very highly demonstrated; and for adaptability to new technology, it was very highly demonstrated, as presented in Table 1. The findings indicate that, from the students' viewpoint, teachers exhibited a very high level of digital competence, specifically in the areas of pedagogical integration and adaptability to new technology. The high demonstration of technical proficiency suggests that teachers possess the necessary skills to effectively operate digital tools and platforms for instructional purposes. Moreover, the very high level of pedagogical integration implies that teachers are not only capable of using technology but also able to incorporate it meaningfully into teaching and learning processes, enhancing student engagement and understanding. Likewise, the very high adaptability to new technology highlights teachers' openness and responsiveness to innovations in digital education, an essential trait in the constantly evolving landscape of tertiary education. These results reflect a positive trend in teacher readiness toward digital transformation in higher education, where technology is integral to curriculum delivery, student assessment, and academic communication.

Table 1
Digital competence of teachers

Digital competence	Weighted mean	Interpretation
Technological proficiency	4.19	Highly demonstrated
Pedagogical integration	4.29	Very highly demonstrated
Adaptability to new technology	4.29	Very highly demonstrated

Digitally competent educators are those who can effectively combine technical skills with pedagogical strategies and a willingness to adapt to emerging technologies. In the European Framework for the DigCompEdu, digital competence is described as a multidimensional construct that includes not only the ability to use technology but also the capacity to integrate it pedagogically to enhance learning outcomes (Redecker, 2017). This supports the present study's findings, where teachers' high levels of technological proficiency, pedagogical integration, and adaptability reflect the key competencies outlined in the DigCompEdu framework. Such competence ensures that educators can respond effectively to the diverse and changing demands of digital teaching environments in tertiary education.

Research using the DigCompEdu framework with 207 elementary teachers in the Azores found that, although teachers generally feel capable of using digital tools, they still need stronger skills to adapt and create digital resources for learning, highlighting that digital competence is multidimensional and relies on targeted professional development

(Loureiro et al., 2024). Similarly, an analysis of tertiary education faculty showed that, while teachers demonstrate solid proficiency in communication and collaboration through digital media, structured training is still necessary to improve creative and evaluative uses of technology (Cabero-Almenara & Palacios-Rodriguez, 2023). These findings highlight that ongoing professional development remains crucial for sustaining high levels of digital adaptability and pedagogical innovation in modern classrooms.

Academic Performance of Tertiary-Level Students

As shown in Table 2, 8 (5%) had a general weighted average of below 75, 41 (25%) had a general weighted average between 75 and 79, 29 (18%) had a general weighted average between 80 and 84, 77 (48%) had a general weighted average between 85 and 89, 5 (3%) had a general weighted average between 90 and 94, and 2 (2%) had a general weighted average between 95 and 100. The distribution of general weighted averages (GWAs) among respondents shows that a large portion achieved a GWA between 85 and 89, which is likely in the "very good" or "above-average" academic performance range in many tertiary institutions. This suggests that most students are performing well academically. These results imply that students are capable of achieving solid academic results.

While the distribution of general weighted averages indicates that a substantial proportion of respondents attained GWAs within the 85 to 89 range, suggestive of generally strong academic performance, it is important to interpret these findings cautiously. The study design is primarily descriptive and correlational; therefore, the data do not permit conclusions about causation. Although the study identified a positive correlation between teachers' digital competence and students' academic performance, this relationship does not confirm that digital competence directly caused higher achievement.

Higher use of digital tools within an active learning framework was found to be significantly associated with better final grades and greater success in continuous evaluation activities among university students (Mosquera-Gende, 2023). Similarly, learners taught by educators with high levels of digital teaching competence demonstrated improved academic engagement and achievement, highlighting that effective integration of technology in tertiary education enhances both motivation and performance (Garcia-Peñalvo et al., 2021). This supports the idea that strong teacher digital competence (especially in pedagogical integration and adaptability) can foster environments where students achieve above-average academic outcomes, similar to what the data show.

Table 2
Frequency and percentage distribution of tertiary-level students' academic performance

General weighted average	Frequency	Percentage
Below 75	8	5%
75 – 79	41	25%
80 – 84	29	18%
85 – 89	77	48%
90 – 94	5	3%
95 – 100	2	1%

Significant Difference of the Respondents' Academic Performance when grouped according to Demographic Profile

The results reveal that the *p*-values for age (0.34) and gender (0.28) are both greater than the significance level of 0.05, as shown in Table 3, indicating no significant difference in the respondents' academic performance when grouped according to these variables. This implies that neither age nor gender had a measurable effect on students' academic outcomes. In other words, students, regardless of being younger or older, male, female, or LGBTQIA+, performed similarly in their academic work. This finding suggests that factors other than age and gender, such as learning environment, teaching strategies, and digital competence of teachers, may play a more substantial role in influencing academic performance. It also reflects a trend toward equity in tertiary education, where access to technology and digital learning tools may have minimized performance disparities among different demographic groups.

Although the results indicate no significant difference in academic performance when respondents were grouped according to age and gender, this finding should be interpreted within the limitations of the demographic data. The age range of participants is relatively narrow, meaning it does not capture diverse developmental stages that could otherwise produce more meaningful distinctions in academic outcomes. Likewise, gender-based performance differences in technology-supported learning environments are often minimal, especially in contemporary tertiary settings where digital tools, online platforms, and standardized learning requirements help reduce performance disparities. Because these demographic variables offer limited variability, they are not expected to produce strong differentiating effects. Thus, the

absence of significant differences may be due less to true equivalence and more to the limited discriminatory power of the variables measured. This underscores the need to consider a broader set of factors, such as digital access, learning conditions, pedagogy, and socioeconomic influences, to better explain variations in academic performance.

Greater institutional resources and support mechanisms, such as access to digital infrastructure and academic assistance, have been shown to predict academic performance more strongly than demographic variables like age or gender among undergraduates in Taiwan and Vietnam. This emphasizes that contextual factors, learning environments, and resource availability exert a greater influence on academic outcomes than demographic differences (Martens & Pham, 2025). This supports the current study's findings that age and gender are not significant determinants of academic achievement, emphasizing instead the importance of digital competence and active learning strategies in influencing student outcomes.

Table 3
Significant difference of the respondents' academic performance when grouped according to demographic profile

Demographic profile	P-value	Interpretation
Age	0.34	No significant difference
Gender	0.28	No significant difference

Correlation between the Teachers' Digital Competence and the Students' Academic Performance

A Pearson correlation analysis revealed a moderate, positive, and significant correlation between digital competence of teachers and academic performance of students ($r = 0.51$, $p = .048$), as shown in Table 4. This suggests that higher levels of digital competence among teachers are associated with better academic performance among tertiary students. The result highlights the critical role of digitally skilled teachers in promoting effective learning experiences. Teachers who can integrate digital tools meaningfully into instruction can enhance student engagement, support diverse learning styles, and provide more interactive and accessible learning opportunities. In tertiary education, where technology is deeply embedded in instructional delivery, the teachers' digital competence is positively associated with students' ability to learn efficiently and achieve higher academic outcomes.

A significant positive relationship has been found between teachers' digital competence and students' learning outcomes in tertiary education, with educators who demonstrate higher digital competence better able to design innovative learning environments, use technological resources effectively, and foster student motivation and achievement (Cabero-Almenara & Palacios-Rodriguez, 2021). This supports the present study's finding that teachers' digital competence contributes positively to students' academic performance, confirming that technology-enhanced pedagogy is a vital component of success in modern tertiary education.

Table 4
Correlation between the teachers' digital competence and the students' academic performance

Pearson's r	Correlation	P-value	Significance
0.51	Moderate positive	0.048	Significant

4. CONCLUSION

The findings of the study highlight the vital role of teachers' digital competence in shaping successful learning outcomes in higher education. The moderate, positive, and significant correlation between digital teaching proficiency and students' academic performance reinforces the relevance of established digital pedagogy frameworks such as TPACK and DigCompEdu, which emphasize the integration of technological skills with strong pedagogical practices.

When educators are able to strategically incorporate digital tools into instruction, beyond basic operational use, learners are more likely to participate deeply with learning and demonstrate improved academic achievement. These results highlight the necessity for continuous professional development that strengthens teachers' capacity to design technology-enhanced learning experiences, particularly in rapidly evolving digital environments. Fostering a digitally competent teaching workforce is essential in ensuring that tertiary education remains responsive, inclusive, and aligned with the demands of 21st-century learning.

To ensure that higher education remains adaptive and effective in an increasingly digital landscape, several key recommendations are proposed. For teachers, prioritizing continuous professional development in digital pedagogy is essential. Educators should be encouraged to deepen not only their technical skills but also their capacity to integrate digital tools meaningfully into instruction, fostering learner engagement and improved academic performance. Training programs should

emphasize instructional design for technology-enhanced learning, adaptable strategies for diverse learning contexts, and reflective practices that support on-going improvement.

For higher education institutions, investing in robust technological infrastructure and providing accessible support systems must be regarded as a critical priority. Institutions should establish structured professional development programs aligned with recognized digital competence frameworks such as TPACK and DigCompEdu. Additionally, there is a need to cultivate a collaborative culture where educators share best practices, explore innovative digital approaches, and receive incentives for advancing pedagogical innovation. Institutional policies should also ensure that technology integration supports inclusivity and equitable access for all learners.

For policymakers, strong advocacy and funding support are required to sustain long-term digital transformation in education. This includes allocating resources for continuous teacher training, guaranteeing reliable digital access across various learning environments, and developing national standards that promote high-quality digital teaching. They should also collaborate with academic institutions to monitor the impact of digital competence initiatives and ensure alignment with future workforce demands.

Finally, future researchers should explore the long-term effects of digital competence development on student outcomes and examine how emerging technologies can further enhance learning experiences. Continuous inquiry will help build resilient and evidence-based educational systems capable of thriving in a rapidly evolving digital world.

ETHICAL CONSIDERATION

The study was conducted following established ethical research standards. Approval to conduct the research was obtained from the office of the University Research. Informed consent was secured from all respondents after they were provided with adequate information regarding the procedures, purpose of the study, and their rights as respondents. Respondents were made aware that their participation in the study was completely voluntary and that they can withdraw at any time without facing any consequences. The anonymity of respondents and confidentiality of information were strictly maintained, and all data collected was used exclusively for research purposes. The researcher ensured that no harm, risk, or discomfort was posed to any participant throughout the study.

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