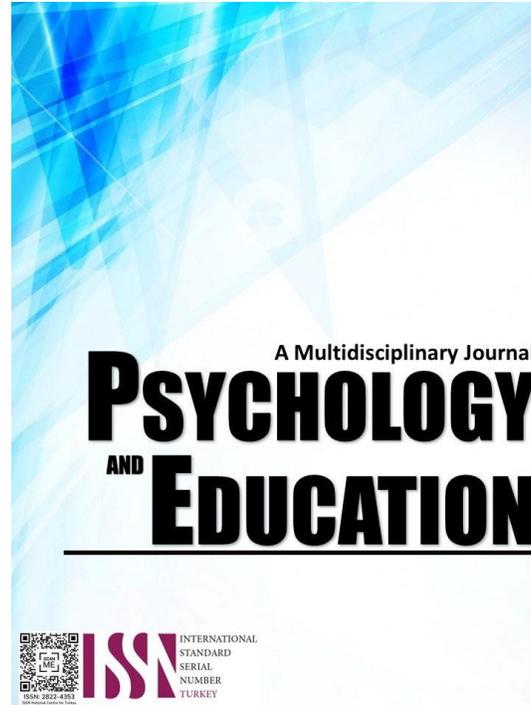# TEACHERS' COMPETENCE AS ENABLING PREDICTOR TOWARDS READINESS IN DIGITAL LEARNING

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Teachers' Competence as Enabling Predictor towards Readiness in Digital Learning

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Abstract

The success of digital learning initiatives is heavily dependent on teachers' ability to use digital tools, create pedagogically effective learning experiences, and master their subject matter. This study used a quantitative research approach with a descriptive survey design to investigate the role of teachers' competence as a predictor of their readiness for digital learning. The study included 208 randomly selected college teachers. The study made use of a 30-item self-made questionnaire. Content validity was ensured through evaluations by the experts, and feedback was incorporated into the final instrument. A pilot test with 30 participants resulted in acceptable internal consistency. The data were analyzed with both descriptive and inferential statistics. The findings revealed a significant and strong level of competence and readiness for digital learning among educators. Consistently high mean scores across various competencies indicate uniform proficiency in integrating digital tools into teaching. Additionally, the analysis showed strong, statistically significant positive relationships between various dimensions of competence and readiness for digital learning, with high correlation coefficients and a predictive power coefficient. This emphasizes the importance of teachers' competence in their readiness for digital learning.

Keywords: *digital learning, competence, readiness*

Introduction

Technological advancements, particularly the rapid development of artificial intelligence, have transformed the learning environment. Digital tools now play an important role in education, so individuals must adapt to these changes. Making sure that people can effectively navigate this technological landscape has become a primary goal of education.

DepEd Order No. 21, s. 2019, titled "Policy Guidelines on the K to 12 Basic Education Program," emphasizes the importance of teachers having pedagogical, digital, and content knowledge to provide effective education. This order is extremely relevant to our research because it establishes a framework for the competencies required of teachers to be effective in a digital learning environment. It emphasizes the importance of providing teachers with the necessary skills to integrate technology into their teaching practices, thereby directly connecting to the changing educational landscape caused by technological advancements.

As classrooms transition to digital learning environments, teachers' roles in facilitating effective learning experiences have received significant attention. Teachers' competence in utilizing digital tools, designing pedagogically sound learning experiences, and possessing content expertise plays a pivotal role in determining the success of digital learning initiatives.

For instance, Chai et al. (2020) emphasized the importance of pedagogical and learning design in enhancing student engagement and achievement in digital environments. This study highlighted how well-designed learning experiences can lead to better educational outcomes. Additionally, Collin et al. (2021) underscored the pivotal role of digital capability and literacy competence in facilitating teachers' effective integration of technology into instructional practices. Their findings suggested that teachers who are digitally literate can more seamlessly incorporate digital tools into their teaching. Furthermore, Kim et al. (2022) shed light on the criticality of content and learning competence and skills for optimizing learning outcomes in digital settings. They argued that teachers' depth of knowledge in their subject areas significantly impacts their ability to teach effectively using digital tools.

Despite these advancements, there exists a research gap in comprehensively understanding the interplay between these variables pedagogical design, digital literacy, and content knowledge and their collective influence on teachers' readiness for digital learning. This gap warrants further empirical inquiry to inform educational policy and practice.

This research investigated the extent to which teachers' competence acts as an enabling predictor of readiness for digital learning, focusing on key variables including pedagogical and learning design, digital capability and literacy competence, and content and learning competence and skills. By addressing this gap, the study sought to provide insights that would inform and enhance educational policy and practice, ultimately contributing to more effective digital learning environments.

Research Questions

This study sought to answer the following questions:

1. What is the level of teachers' competence in digital learning in terms of pedagogical and learning design, digital capability, and content and learning?
2. What is the level of teachers' readiness in digital learning in terms of technical and pedagogical skills, digital capability, and content and learning skills in ICT?
3. Is there a significant relationship between the level of competence of teachers and their readiness in digital learning?

4. Does teachers' competence predict their readiness for digital learning?

Literature Review

This study is founded on the Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and others in 2006, which highlights the critical interplay between pedagogy, content knowledge, and technological proficiency. Henriksen et al. (2021) expounded on the idea of digital pedagogy, identifying four essential dimensions for crafting meaningful learning experiences in digital contexts. Their framework offers valuable insights into how teachers' competency in both pedagogy and learning design can act as a predictor of their readiness for digital learning.

Ertmer et al. (2019) delved into the complex dynamics of teacher technology adoption, stressing the crucial role that knowledge, confidence, beliefs, and culture play in shaping a teacher's readiness for digital learning environments. They underscored that pedagogical knowledge and expertise in instructional design are key to successfully integrating technology into teaching practices. Meanwhile, Hsu et al. (2021) investigated the interplay between digital literacy, personality traits, and social engagement, shedding light on the diverse factors that influence teachers' digital competencies and literacy skills. These studies collectively point to the importance of developing digital proficiencies among educators to increase their readiness for digital learning environments.

Voogt et al. (2019) contributed in-depth insights into the integration of information technology in primary and secondary education, focusing on the importance of teachers' competencies in content knowledge and instructional methods. Additionally, Koehler et al. (2020) examined the expansion of TPACK, illustrating the significance of teachers' abilities to effectively combine content, pedagogy, and technology. Their research accentuates the necessity for teachers to be well-equipped with relevant competencies to enhance learning outcomes in digital spaces. Taken together, these reviews emphasize the multifaceted role of teacher competence as a predictor of their readiness to engage in digital learning.

Methodology

Research Design

This study used a quantitative research design, with a descriptive survey to collect data on teachers' competencies and their impact on digital learning readiness. This design was chosen because it effectively depicts and quantifies the extent, variations, and interrelationships of the research variables. According to McCombes (2022), descriptive surveys are especially useful for assessing the characteristics, frequencies, trends, and categorizations of different variables within a population, which aligns with our objectives of evaluating various aspects of teacher competencies.

Furthermore, the descriptive survey method aligns with our research objectives by allowing for the systematic collection and analysis of quantitative data. As Apuke (2017) points out, this approach entails a systematic analysis of numerical data using statistical methods, which is critical for obtaining clear, objective results that quantify how teacher competencies predict their readiness to engage in digital learning. Using this methodology, the study was able to rigorously analyze relationships and establish correlations between teachers' digital competencies and their effectiveness in a digital teaching environment, yielding valuable insights into factors that improve digital learning readiness.

Respondents

In this study, the technique of stratified sampling was employed to select a representative cohort of two hundred eight (208) teachers from the domain of higher education. The essence of stratified sampling rests in its ability to enhance the representativeness of a sample by ensuring that key subpopulations (strata) within the larger group are adequately represented. This method stands out for its capacity to accommodate and control for variability across different strata, thereby enabling researchers to obtain more precise estimates of population parameters.

The rationale behind choosing stratified sampling for this study stems from the diverse nature of teaching specializations, levels of digital literacy, and experience with digital learning platforms among teachers in higher education. By dividing the larger population into strata that reflect these variations, stratified sampling ensures that each subgroup is represented in the sample. This approach is paramount in generating accurate insights regarding the competencies that predict teachers' readiness for digital learning, addressing the variability that naturally exists within such a varied population.

Instrument

The development of the self-constructed questionnaire was based on the National ICT Competency Standards for Teachers. Four expert evaluators assess the questionnaire's content validity, utilizing criteria that encompassed the relevance, clarity, and comprehensiveness of the items, as well as their adherence to psychological testing principles and contextual cultural appropriateness. Acknowledging the evaluators' vast expertise, each piece of their feedback regarding item relevance to the research goals, clarity of expression for participant understanding, technical suitability for measuring teaching competencies, and contextual sensitivity was meticulously examined and applied to refine the questionnaire; adjustments following this feedback included revision of items. Subsequently, a pilot test of this refined questionnaire with thirty participants from the target populace allowed for assessment of the instrument's

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functionality, leading to a final round for optimization, and the internal consistency, post-refinement, was validated with a satisfactory Cronbach's Alpha coefficient of 0.72, endorsing the instrument's reliability for the main research deployment.

Procedure

The researcher sought permission to gather data from the institution for the study. Upon receiving approval, the researcher then approached the dean of the higher education department to request permission for conducting the study. Consequently, the participating teachers received an e-letter of agreement and consent to partake in the research as respondents. The questionnaires were then distributed to these teachers, accompanied by an explanation of the study's objectives. They were assured that the questionnaire was solely for this research endeavor and that all gathered information would be treated with strict confidentiality, solely for the purpose of this study. To facilitate an efficient process, Google Forms were utilized by the researcher for data collection.

Data Analysis

The researcher employed a 5-point Likert scale to compute survey scores derived from the questionnaire. This scale categorizes responses from teacher participants as follows: 1 - never/very low, 2 - rarely/low, 3 - sometimes/neutral, 4 - often/high, and 5 - always/very high. Subsequently, the gathered data were recorded and organized for statistical analysis. For the first two problems, descriptive statistical methods were applied, utilizing mean and standard deviation. In the third problem, Pearson's correlation coefficient (Pearson's r) was utilized to ascertain any significant relationships between the variables. Lastly, for the fourth problem, regression analysis was employed to determine the predictive relationships between two variables: teachers' competence and readiness in digital learning.

Results and Discussion

This section provides an analysis and interpretation of the gathered data. The structured results are derived from the data collected to address the specific issues outlined in the introduction.

Table 1. *Mean Distribution of the Respondents' Level of Competence in Pedagogical and Learning Design*

Indicators	Mean	SD	Interpretation
1. I am able to guide students in using databases, spreadsheets, concept mapping tools, and communication tools.	4.51	0.65	Very High
2. I can motivate students to engage in data analysis, problem-solving, and using concept mapping and communication tools.	4.43	0.62	Very High
3. I can incorporate digitally enhanced formative and summative assessments into the teaching and learning process.	4.48	0.62	Very High
4. I can use emails, group sites, and blogs to directly share information with students, colleagues, and parents.	4.49	0.68	Very High
5. I can utilize technology and digital tools to synthesize and apply both qualitative and quantitative data.	4.52	0.63	Very High
Overall	4.49	0.04	Very High

Legend: 1.00-1.79: Very Low; 1.80-2.59: Low; 2.60-3.39: Neutral; 3.40-4.19: High; 4.20-5:00: Very High

The data reveals a very high level of competence in digital learning among respondents, with a mean score of 4.49 across pedagogical and learning design indicators. This suggests strong abilities in facilitating student use of digital tools, promoting data analysis and problem-solving skills, integrating digital assessments, and using communication tools effectively. The findings align with studies by Mishra et al. (2019), Sangrá et al. (2020), Ertmer et al. (2021), and Voogt et al. (2022), which highlight the importance of pedagogical content knowledge (PCK) and digital competence in enhancing student learning outcomes through innovative teaching practices and seamless technology integration. This consistent proficiency indicates that educators are effectively using digital tools to enhance teaching and learning processes.

Table 2. *Mean Distribution of the Respondents' Level of Competence in Digital Capability*

Indicators	Mean	SD	Interpretation
1. I can model digital citizenship for students by appropriately using digital tools and resources.	4.48	0.63	Very High
2. I can show an understanding of intellectual property rights by adhering to copyright laws, intellectual property regulations, and fair use guidelines.	4.49	0.65	Very High
3. I can guarantee full access and participation for all learners by using high-quality technology tools and resources.	4.44	0.66	Very High
4. I can demonstrate global awareness by engaging with other cultures using advanced communication and collaboration tools.	4.46	0.62	Very High
5. I can use technology to promote cooperative learning and the exchange of ideas and information, ensuring its proper use.	4.56	0.60	Very High
Overall	4.49	0.05	Very High

Legend: 1.00-1.79: Very Low; 1.80-2.59: Low; 2.60-3.39: Neutral; 3.40-4.19: High; 4.20-5:00: Very High

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The data reveals that respondents exhibit strong digital learning competencies, notably in digital capability and citizenship. They are proficient in understanding intellectual property rights, ensuring inclusive technology access, fostering global awareness, and facilitating cooperative learning. High mean scores across these areas indicate consistent proficiency in leveraging digital tools for education. Supporting studies by Ribble et al. (2020) and UNESCO (2019) underscore the significance of digital citizenship and literacy for responsible technology use and equitable education access. Additionally, research by Wanner et al. (2021) and Hsu et al. (2022) emphasizes the importance of global competence and intercultural communication, aligning with the respondents' high competence in using technology for global awareness and cultural exchange.

Table 3. *Mean Distribution of the Respondents' Level of Competence in Content and Learning Competence*

Indicators	Mean	SD	Interpretation
1. I can create technology-enriched learning experiences that motivate all students to explore their individual interests.	4.46	0.69	Very High
2. I can assist students in evaluating their progress using digital tools.	4.54	0.62	Very High
3. I can assess suitable digital tools to challenge students to think critically and ensure reliability.	4.46	0.64	Very High
4. I can use appropriate digital resources to help students create, communicate their ideas, and collaborate effectively.	4.50	0.61	Very High
5. I can establish a conducive digital learning environment for students.	4.45	0.65	Very High
Overall	4.48	0.04	Very High

Legend: 1.00-1.79: Very Low; 1.80-2.59: Low; 2.60-3.39: Neutral; 3.40-4.19: High; 4.20-5:00: Very High

The data shows that respondents have strong competencies in digital learning, particularly in designing technology-enriched learning experiences, assessing student progress with digital tools, evaluating digital resources, using digital tools for communication and collaboration, and creating conducive digital learning environments. High mean scores across all indicators reflect consistent proficiency in enhancing content delivery and learning experiences with digital tools. Research by Voogt et al. (2019) highlights the importance of technology-rich learning experiences for student engagement, while studies by Al Lily et al. (2021) and Kennedy et al. (2023) emphasize digital tools' role in formative assessment and critical thinking. Additionally, Hew et al. (2020) and Hodges et al. (2022) underscore the importance of creating collaborative and innovative digital learning environments, aligning with the high competence levels observed in the respondents.

Table 4. *Mean Distribution of the Respondents' Level of Readiness Skills in Technical and Pedagogical*

Indicators	Mean	SD	Interpretation
1. I can effectively use office and teaching productivity tools.	4.50	0.63	Very High
2. I can demonstrate knowledge and skills in information and data management.	4.54	0.62	Very High
3. I can create open and flexible learning environments where technology facilitates various interactions among students.	4.45	0.67	Very High
4. I can assess the use of ICT in the teaching-learning process and use the results to improve the design of learning activities.	4.40	0.72	Very High
5. I can utilize computers and other technologies to collect and communicate information to students, colleagues, and parents.	4.53	0.62	Very High
Overall	4.48	0.06	Very High

Legend: 1.00-1.79: Very Low; 1.80-2.59: Low; 2.60-3.39: Neutral; 3.40-4.19: High; 4.20-5:00: Very High

The data shows that respondents possess strong readiness skills in digital learning, focusing on technical and pedagogical indicators. They excel in using office and teaching productivity tools, managing information and data, creating open and flexible learning environments, evaluating ICT usage in teaching, and utilizing technology for communication. High mean scores across these indicators reflect consistent proficiency in both technical and pedagogical aspects of digital learning. Research by Law et al. (2019) underscores the importance of teachers' competence in using technology for productivity and communication, while studies by Wai et al. (2021) and Park et al. (2023) highlight the role of pedagogical skills in creating interactive, technology-supported learning environments. Additionally, Ertmer et al. (2020) and Harris et al. (2022) emphasize evaluating ICT integration in teaching to enhance learning outcomes, aligning with the high readiness skills observed in the respondents.

The table 6 reveals that respondents possess very high readiness skills in digital learning, with an overall mean score of 4.55. They demonstrate strong capabilities in managing technology-enriched classrooms, designing instructional materials for student-centered learning, utilizing diverse online learning modules, organizing information efficiently, and effectively using online communication platforms. Consistently high mean scores across all indicators reflect their proficiency in leveraging digital tools for educational purposes. Research by Lee et al. (2019) emphasizes the importance of managing technology-rich classrooms, while studies by Ching et al. (2021) and Khan et al. (2023) highlight the role of differentiated instruction and diverse online modules in enhancing student engagement. Additionally, Wang et al. (2020) and Mishra et al. (2022) underscore the significance of organizing information and using online communication platforms to facilitate effective digital learning, aligning with the high readiness skills observed in the respondents.

Table 6. *Mean Distribution of the Respondents' Level of Readiness Skills in Digital Capability*

Indicators	Mean	SD	Interpretation
1. I can manage and oversee student learning in a technology-enriched classroom.	4.64	0.57	Very High
2. I can design digital instructional materials with differentiated instruction to support student-centered learning.	4.53	0.65	Very High
3. I can utilize various learning modules for online education, such as Blended Learning, Flipped Classroom, Google Classroom, Distance Education, and Mobile Learning.	4.52	0.64	Very High
4. I can efficiently store and organize collected information using directories, drives, and databases.	4.49	0.63	Very High
5. I can use online applications and communication platforms such as web browsers, Facebook, Workplace, Microsoft Teams, Zoom, Hangouts, Quizmaker, and Google Meet to communicate with my students.	4.57	0.61	Very High
Overall	4.55	0.06	Very High

Legend: 1.00-1.79: Very Low; 1.80-2.59: Low; 2.60-3.39: Neutral; 3.40-4.19: High; 4.20-5:00: Very High

Table 7. *Mean Distribution of the Respondents' Level of Readiness Skills in Content and Learning*

Indicators	Mean	SD	Interpretation
1. I can understand the basic functions of an operating system.	4.47	0.67	Very High
2. I can distribute, share, publish, and print information both in print and online.	4.52	0.61	Very High
3. I can use technology to promote cooperative learning and the exchange of ideas and information.	4.56	0.57	Very High
4. I can explore the use of electronic assessment tools, such as online testing and project submissions via email or online platforms.	4.48	0.66	Very High
5. I can use various synchronous and asynchronous communication tools, including email, chat, whiteboards, forums, and blogs.	4.48	0.65	Very High
Overall	4.5	0.04	Very High

Legend: 1.00-1.79: Very Low; 1.80-2.59: Low; 2.60-3.39: Neutral; 3.40-4.19: High; 4.20-5:00: Very High

The data indicates that respondents possess strong readiness skills in digital learning, focusing on content and learning skills in ICT. They demonstrate proficiency in understanding basic operating system functions, distributing information through various channels, facilitating cooperative learning with technology, exploring electronic assessment tools, and using synchronous and asynchronous communication tools for collaboration. High mean scores across all indicators reflect their consistent proficiency in leveraging ICT for educational purposes. Research by Jung et al. (2019) highlights the importance of basic ICT functions in digital literacy, while studies by Chai et al. (2021) and Teo et al. (2023) emphasize ICT's role in promoting collaborative learning and assessment. Additionally, Barak et al. (2020) and Yildirim et al. (2022) underscore the significance of synchronous and asynchronous communication tools in enhancing student engagement, aligning with the high readiness skills observed among respondents.

Table 8. *Correlation Coefficients and Significance of Relationship between Teachers' Competence and Their Readiness Skills in Digital Learning*

Variable		Technical and Pedagogical Skills	Digital Capability Skills	Content and Learning Skills	Interpretation
Pedagogical and Learning Design	Pearson's r	0.753	0.775	0.814	Significant
	p-value	< .001	< .001	< .001	
Digital Capability Competence	Pearson's r	0.794	0.778	0.803	Significant
	p-value	< .001	< .001	< .001	
Content and Learning Competence	Pearson's r	0.799	0.731	0.799	Significant
	p-value	< .001	< .001	< .001	

Legend: 0.0-0.20.: Very Weak; 0.21-0.40: Weak; 0.41-0.60: Moderate; 0.61-0.80: Strong; 0.81-0.1.00: Very Strong Significant at <0.05 level

The data shows a strong to very strong correlation between teachers' competence and their readiness skills in digital learning across three domains: pedagogical and learning design, digital capability competence, and content and learning competence. Pearson correlation coefficients range from 0.731 to 0.814, all significant at p < .001. Specifically, pedagogical and learning design has very strong correlations with content and learning skills (r = 0.814) and strong correlations with technical and pedagogical skills (r = 0.753) and digital capability skills (r = 0.775). Digital capability competence also shows strong correlations with all three readiness skills, especially with technical and pedagogical skills (r = 0.794) and content and learning skills (r = 0.803). Similarly, content and learning competence exhibits strong correlations with technical and pedagogical skills (r = 0.799) and digital capability skills (r = 0.731). These findings indicate that teachers with higher competence in various digital learning domains also show greater readiness skills in digital learning, underscoring the importance of comprehensive competence in digital learning for effective teaching practices.

These findings align with the literature suggesting that effective digital learning integration requires robust technical, pedagogical, and content knowledge, as proposed by the TPACK framework. Mishra et al. (2019) highlight the significance of the TPACK framework in integrating technology into teaching practices. Research by Voogt et al. (2020) emphasizes the importance of teacher learning in collaborative curriculum design to promote technology integration in education. Additionally, studies by Sangrá et al. (2021) and Ertmer et al. (2023) stress the importance of teachers' digital competence and pedagogical skills in fostering innovative and engaging learning experiences. These findings support the observed strong positive correlations between different dimensions of teacher competence and readiness skills in digital learning, highlighting the interconnected nature of these constructs in shaping effective digital teaching practices.

Table 9. *Regression Weights of Predictive Power of Teacher Competence over Readiness Skills*

Standardized	βcoefficient	S.E.	R2	p-value	Interpretation
TC à TR	.995	.048	.989	p<.001	Significant

p<.001; TC: Teacher Competence; TR: Teacher Readiness; S.E: Standard Error

The table shows that the regression weights focusing on the relationship between Teacher Competence (TC) and Teacher Readiness (TR). The standardized beta coefficient of .995 indicates a very strong positive relationship between Teacher Competence and Teacher Readiness. This suggests that as Teacher Competence increases, Teacher Readiness also increases significantly. The standard error (S.E.) of .048 reflects the precision of the estimate of the regression coefficient. A lower standard error indicates a more accurate estimate of the relationship between the variables. The R-squared value of .989 signifies that Teacher Competence explains approximately 98.9% of the variability in Teacher Readiness. This high R-squared value indicates that Teacher Competence is a major predictor of Teacher Readiness. The p-value of (p<.001) highlights the statistical significance of the relationship between Teacher Competence and Teacher Readiness indicating a highly significant relationship between the two variables. Based on the findings in Table 8, it can be inferred that Teacher Competence plays a crucial role in determining Teacher Readiness, with a strong and statistically significant impact on the readiness of teachers in their educational roles.

Recent studies confirm these findings by emphasizing the critical role of teacher competence in fostering effective digital learning environments. Tondeur et al. (2020) highlighted that professional development in digital competencies significantly enhances teachers' preparedness and confidence in integrating technology into their teaching practices. Similarly, a study by König et al. (2021) found that digital competence directly impacts teachers' ability to design and implement digital learning activities, which in turn affects student engagement and learning outcomes. Moreover, research by Lundin et al. (2022) underscored the importance of continuous professional development in maintaining and upgrading teachers' digital competencies, which is essential for adapting to the rapidly changing educational technologies. The predictive relationship between teacher competence and readiness aligns with these findings, suggesting that investment in developing teachers' professional and digital skills is crucial for successful digital learning implementation.

Conclusions

The research aimed to assess the level of competence and readiness in digital learning among teachers, uncovering a notably high level of digital learning competencies and readiness among the participants. The key findings from the study reveal that respondents display commendable proficiency across various dimensions such as pedagogical and learning design, digital capability, content and learning competence, and readiness skills in digital learning. The consistency of high mean scores and relatively low standard deviations across these areas reflects a significant uniformity in the respondents' capabilities to integrate digital tools within educational settings effectively. Additionally, the results from correlation analysis reinforce these findings by demonstrating strong, positive relationships between different competence dimensions and readiness skills in digital learning, indicating that teachers' competencies are formidable indicators of their readiness for digital teaching and learning.

The implications of these findings for educational practice, policy, and future research are profound and multifaceted. For educational practice, these competencies can be harnessed to design and implement more dynamic, flexible, and personalized learning experiences for students. Educators can support digital skills to employ a wider array of multimedia resources, interactive tools, and collaborative platforms to cater to diverse learning styles and needs, thereby enhancing student engagement and learning outcomes. From a policy perspective, the findings suggest the need for continuing support for teacher professional development in digital competencies. This could involve providing resources for ongoing training, investing in digital infrastructure, and creating policies that recognize and reward the integration of digital technologies in teaching. Ensuring that educators are well-equipped with the latest digital tools and strategies is essential for maintaining the momentum of digital transformation in education.

For future research, these results open several avenues for exploration. Researchers may investigate the specific strategies and practices that educators find most effective in utilizing their digital competencies for teaching and learning. Further studies could also examine the impact of various forms of professional development on teachers' digital competencies and readiness, including the effectiveness of online versus in-person training modalities. Additionally, given the rapid evolution of technology, continuous research is needed to understand how emerging digital tools and platforms can be integrated into pedagogical practices effectively. By closely examining the dynamic relationship between digital competencies, readiness, and educational outcomes, future research can provide critical

insights that help educators, policymakers, and stakeholders navigate the challenges and opportunities presented by digital transformation in education.

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