# Pre-Service Teachers' Digital Competence and Readiness for Innovative Pedagogies in Teacher Education Programmes

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**Abstract**

The rapid digital transformation of education has heightened the need for teachers who possess not only subject knowledge but also strong digital competence and readiness to implement innovative pedagogies. Pre-service teachers, as future educators, must be adequately prepared to integrate digital tools into teaching and learning processes. This study examined the relationship between pre-service teachers' digital competence and their readiness for innovative pedagogical practices. Using a quantitative survey design, data were collected from pre-service teachers enrolled in teacher education programmes at selected universities. Digital competence was measured across technological, pedagogical, and content-related dimensions, while readiness for innovative pedagogy was assessed in terms of instructional flexibility, learner-centered orientation, and confidence in technology integration. The findings revealed a significant positive relationship between digital competence and readiness for innovative pedagogies, with pedagogical digital competence emerging as the strongest predictor. The study underscores the importance of embedding structured digital competence development within teacher education curricula. Implications for teacher preparation, policy, and future research are discussed.

**Keywords:** digital competence, pre-service teachers, innovative pedagogy, teacher education, educational technology

## 1. Introduction

Digital technologies are reshaping educational systems globally, influencing how teaching and learning are designed, delivered, and assessed. In response to these changes, teachers are increasingly expected to integrate digital tools in ways that promote creativity, collaboration, and learner-centered instruction (OECD, 2019). As a result, teacher education programmes face growing pressure to prepare pre-service teachers with the competencies required to navigate digitally enriched learning environments.

Pre-service teachers' digital competence has become a critical focus in educational research and policy discourse. Digital competence extends beyond basic technical skills to include pedagogical understanding, ethical awareness, and the ability to design meaningful learning experiences using

technology (Redecker, 2017). Teachers who lack these competencies may struggle to adopt innovative pedagogies, even when digital infrastructure is available.

Innovative pedagogies such as problem-based learning, inquiry-based instruction, flipped classrooms, and collaborative learning heavily on effective technology integration. Readiness to implement such pedagogies involves teachers' confidence, beliefs, and willingness to depart from traditional instructional practices (Kirkwood & Price, 2014). However, evidence suggests that many pre-service teachers feel inadequately prepared to adopt innovative pedagogical approaches during their training (Instefjord & Munthe, 2017).

This study therefore investigates the extent to which pre-service teachers' digital competence influences their readiness for innovative pedagogies, contributing empirical evidence to the growing literature on teacher preparation in the digital age.

## 2. Literature Review

### 2.1 Conceptualising Digital Competence in Teacher Education

Digital competence has emerged as a central construct in contemporary teacher education discourse, reflecting the growing expectations placed on teachers to integrate digital technologies meaningfully into instructional practice. Rather than being limited to operational or technical skills, digital competence encompasses a broad set of knowledge, skills, attitudes, and ethical considerations required for effective professional practice in digital environments (European Commission, 2018).

In the context of teacher education, digital competence is commonly framed as a multidimensional construct integrating technological knowledge, pedagogical understanding, and content-related expertise. This perspective aligns closely with the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes the interconnected nature of these domains (Mishra & Koehler, 2006). Research suggests that pre-service teachers who develop integrated forms of digital competence are better positioned to design learning experiences that promote student engagement and higher-order thinking (Tondeur et al., 2018).

Policy frameworks such as the European Digital Competence Framework for Educators (DigCompEdu) further extend this conceptualization by highlighting professional engagement, digital resource management, teaching and learning, assessment, learner empowerment, and facilitation of learners' digital competence (Redecker, 2017). These frameworks have influenced curriculum reforms in many teacher education programmes globally, although their level of implementation varies significantly across institutions and contexts.

Empirical studies consistently report uneven levels of digital competence among pre-service teachers. While many demonstrate confidence in basic technology use, fewer exhibit the pedagogical depth required to integrate digital tools into innovative instructional practices

(Instefjord & Munthe, 2017). This gap underscores the need for structured and pedagogically grounded digital competence development within teacher education curricula.

### 2.2 Innovative Pedagogies in Contemporary Education

Innovative pedagogies refer to teaching approaches that move beyond traditional, teacher-centered instruction toward practices that emphasize active learning, collaboration, creativity, and learner autonomy. Such pedagogies include inquiry-based learning, problem-based learning, project-based learning, flipped classrooms, and technology-supported collaborative learning (Fullan & Langworthy, 2014).

The adoption of innovative pedagogies is increasingly viewed as essential for preparing learners to navigate complex, knowledge-driven societies. These approaches align with constructivist learning theories, which posit that learners actively construct knowledge through interaction, exploration, and reflection (Vygotsky, 1978). Digital technologies play a critical enabling role in this process by providing access to diverse resources, facilitating communication, and supporting personalized learning pathways.

Despite their documented benefits, innovative pedagogies are not widely implemented in practice. Studies indicate that many teachers, including pre-service teachers, continue to rely on traditional instructional methods due to curriculum constraints, assessment pressures, and limited pedagogical confidence (Ertmer & Ottenbreit-Leftwich, 2013). Readiness for innovative pedagogy therefore involves not only access to digital tools but also teachers' beliefs, self-efficacy, and professional competence.

### 2.3 Pre-Service Teachers' Readiness for Innovative Pedagogies

Readiness for innovative pedagogy refers to pre-service teachers' preparedness, confidence, and willingness to adopt learner-centered and technology-enhanced instructional practices. It encompasses cognitive readiness (knowledge and understanding), affective readiness (attitudes and beliefs), and behavioral readiness (intentions and actions) (Kirkwood & Price, 2014).

Research suggests that pre-service teachers' readiness for pedagogical innovation is shaped significantly during their initial teacher education. Experiences that model innovative teaching practices, provide opportunities for experimentation, and encourage reflective practice have been shown to enhance readiness (Tondeur et al., 2018). Conversely, programmes that emphasize theoretical instruction without practical application may limit pre-service teachers' confidence and willingness to innovate.

Self-efficacy theory offers a useful lens for understanding pedagogical readiness. According to Bandura (1997), individuals are more likely to adopt new practices when they believe in their capability to perform the required tasks successfully. In educational contexts, teachers with higher levels of instructional self-efficacy are more inclined to experiment with innovative and technology-supported pedagogies.

### 2.4 Linking Digital Competence and Pedagogical Readiness

A growing body of literature highlights a strong relationship between teachers' digital competence and their readiness to implement innovative pedagogies. Studies indicate that pre-service teachers with higher levels of digital competence demonstrate more positive attitudes toward technology integration and greater confidence in adopting learner-centered instructional approaches (Instefjord & Munthe, 2017; Scherer et al., 2018).

Importantly, not all dimensions of digital competence contribute equally to pedagogical readiness. Pedagogical digital competence defined as the ability to align digital tools with instructional goals and learning theories has been identified as a particularly strong predictor of innovative teaching practices (Ertmer & Ottenbreit-Leftwich, 2013). This suggests that technical proficiency alone is insufficient to drive pedagogical change.

Despite these insights, existing studies often focus on in-service teachers or rely on small-scale qualitative designs. There remains a need for empirical research that systematically examines how different dimensions of digital competence predict readiness for innovative pedagogy among pre-service teachers. Addressing this gap is critical for informing curriculum design and policy decisions in teacher education.

### 2.5 Summary and Research Gap

The reviewed literature underscores the central role of digital competence in preparing pre-service teachers for innovative pedagogical practices. While frameworks such as TPACK and DigCompEdu provide valuable conceptual guidance, empirical evidence suggests that many teacher education programmes struggle to translate these frameworks into effective practice.

Moreover, although prior studies establish a general link between digital competence and pedagogical innovation, limited research has examined the relative contributions of technological, pedagogical, and content-related digital competence to pre-service teachers' readiness for innovative pedagogy. This study addresses this gap by empirically investigating these relationships within teacher education programmes, thereby contributing to both theory and practice.

## 3. Theoretical Framework

This study is anchored in the Technological Pedagogical Content Knowledge (TPACK) framework, which posits that effective technology integration occurs through the interaction of technological knowledge, pedagogical knowledge, and content knowledge (Mishra & Koehler, 2006). The framework provides a useful lens for understanding how pre-service teachers' digital competence supports readiness for innovative pedagogies. In addition, self-efficacy theory (Bandura, 1997) informs the study by explaining how teachers' confidence in their abilities influences their willingness to adopt new instructional practices.

## 4. Methodology

### 4.1 Research Design

A quantitative descriptive survey design was adopted to examine the relationship between pre-service teachers' digital competence and readiness for innovative pedagogies.

### 4.2 Population and Sample

The population comprised pre-service teachers enrolled in undergraduate teacher education programmes. A sample of 280 pre-service teachers was selected using stratified random sampling to ensure representation across disciplines and year levels.

### 4.3 Instrumentation

Data were collected using a structured questionnaire consisting of three sections:

- Demographic information
- Digital competence (technological, pedagogical, and content-related competence)
- Readiness for innovative pedagogy (instructional flexibility, learner-centered orientation, confidence)

Items were adapted from validated instruments in the literature (Redecker, 2017; Mishra & Koehler, 2006).

### 4.4 Data Analysis

Data were analyzed using descriptive statistics, Pearson correlation, and multiple regression analysis.

## 5. Results

### 5.1 Descriptive Statistics

**Table 1: Descriptive Statistics of Study Variables (N = 280)**

| Variable | Mean | SD |
|---|---|---|
| Technological Digital Competence | 3.71 | 0.68 |
| Pedagogical Digital Competence | 3.85 | 0.64 |

| Variable | Mean | SD |
|---|---|---|
| Content-Related Digital Competence | 3.62 | 0.70 |
| Readiness for Innovative Pedagogies | 3.79 | 0.66 |

The results of Table 1 indicate that pre-service teachers reported relatively high levels of digital competence and readiness for innovative pedagogies. Pedagogical digital competence recorded the highest mean, suggesting greater confidence in using technology to support teaching strategies rather than content delivery alone.

### 5.2 Correlation Analysis

**Table 2: Correlation between Digital Competence and Pedagogical Readiness**

| Variable | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Technological Competence | 1 | | | |
| 2. Pedagogical Competence | .54* | 1 | | |
| 3. Content-Related Competence | .49* | .57* | 1 | |
| 4. Pedagogical Readiness | .58* | .66* | .52* | 1 |

*p < .05

All dimensions of digital competence were significantly and positively correlated with readiness for innovative pedagogies. Pedagogical digital competence showed the strongest relationship (r = .66), indicating its central role in fostering innovative teaching readiness.

### 5.3 Regression Analysis

**Table 3: Multiple Regression Predicting Readiness for Innovative Pedagogies**

| Predictor Variable | β | t | p-value |
|---|---|---|---|
| Technological Competence | .24 | 4.12 | .000* |
| Pedagogical Digital Competence | .39 | 6.87 | .000* |
| Content-Related Competence | .21 | 3.74 | .001* |

| Predictor Variable | β | t | p-value |
|---|---|---|---|
| $R^2$ | .59 | | |
| F(3, 276) | 132.60 | | .000 |

*p < .05

Digital competence accounted for 59% of the variance in readiness for innovative pedagogies. Pedagogical digital competence emerged as the strongest predictor, underscoring the importance of integrating pedagogical thinking into technology training for pre-service teachers.

## 6. Discussion

The findings of this study reveal that pre-service teachers' digital competence significantly predicts their readiness to implement innovative pedagogies. This result aligns with prior studies emphasizing the importance of pedagogically grounded digital skills in teacher education (Tondeur et al., 2018; Instefjord & Munthe, 2017).

The strong predictive role of pedagogical digital competence supports the TPACK framework, which emphasizes the integration of pedagogy and technology rather than isolated technical skills (Mishra & Koehler, 2006). Pre-service teachers who understand how technology supports instructional strategies are more likely to adopt learner-centered and innovative teaching approaches.

Technological and content-related competences, while significant, played secondary roles. This suggests that basic technical proficiency alone is insufficient to drive pedagogical innovation, reinforcing arguments that teacher education programmes must move beyond skills-based training.

## 7. Conclusion

This study concludes that digital competence is a critical determinant of pre-service teachers' readiness for innovative pedagogies. Pedagogical digital competence, in particular, plays a central role in shaping teachers' confidence and willingness to integrate innovative teaching practices.

Teacher education programmes should therefore embed structured, pedagogy-driven digital competence development within their curricula. By strengthening pre-service teachers' readiness for innovation, institutions can better prepare future educators for the demands of contemporary classrooms.

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