# Digital Literacy and Readiness in the Digital Era: A Bibliometric Mapping of Teacher Education Research

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| ARTICLE DETAILS | ABSTRACT |
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| **Research Paper** <br><br> **Accepted:** 17-02-2026 <br><br> **Published:** 10-03-2026 <br><br> **Keywords:** <br><br> *Digital literacy, Teacher readiness, Teacher education, Bibliometric analysis* | Over the last several years, and with particular intensity during the disruption caused by the COVID-19 pandemic, concerns around digital literacy and teacher readiness have come to occupy a central place in teacher education research. What was once treated as a supplementary issue has increasingly become a core concern. In response, a growing number of studies have appeared, though this literature has not developed evenly. Much of it continues to be shaped by a small set of dominant frameworks and by research drawn from a limited range of contexts. Against this backdrop, the present study conducts a bibliometric analysis of work on digital literacy and readiness in teacher education in order to better understand how the field has evolved. Drawing on thirty peer-reviewed studies, the analysis considers patterns in publication activity, thematic emphasis, conceptual orientation, and research design. The findings point to a gradual shift away from narrowly defined, skills-focused views of digital competence toward broader interpretations that situate technology use within pedagogy, professional practice, and institutional settings. At the same time, persistent constraints remain visible, particularly the heavy reliance on self-reported measures and the concentration of research within specific geographical regions. |

Rather than approaching digital readiness as a fixed outcome to be achieved, the study treats it as a condition that develops over time and is shaped by systemic arrangements, teaching practices, and local realities. By bringing together research that is otherwise scattered, the study clarifies prevailing directions in the field while also suggesting the need for more inclusive and methodologically varied future work.

## Introduction

From the beginning of 2020, when the COVID-19 outbreak began affecting the world, many sectors were forced to adopt digital platforms to maintain their normal lifestyles. Education sector was also one of them. This crisis acted more as a creator of new challenges and inventions. Digital tools were also used earlier in the teaching learning process, but the pandemic has grabbed a lot of attention and made them a bit popular. In simpler words, we mean that digitalisation in the field of education was happening through flipped classrooms, online workshops, and CDPs. But due to the pandemic, asynchronous form of learning has increased, advancement in content creation, lecture recordings, wearable devices, etc. have seen a rapid increase in growth. (Wang & He, 2022)

The urgent need for digital literacy and teacher readiness has reflected a long-embedded weakness within the teacher education institutions. As universities and schools were forced to migrate to online platforms for teaching with less preparation time, the gap between technological access and pedagogical preparedness became quite visible. Teachers who were thought to be digitally literate were found navigating unfamiliar platforms and struggling with assessment practices under intense pressure. This epidemic has changed the digital skills of teachers from a desirable attribute into a survival requirement of contemporary times.

The scope for research on digital literacy, readiness and competency of teachers has significantly increased due to the shift in academic disclosure. Yet, there is no common voice in this compiled literature; instead, it shows a field that includes inconsistent global representation, methodological fragmentation, and conceptual ambiguity. Digital literacy is described as a technical skill concerned with tool usage, cognitive ability, professional ability, ethical responsibility, and pedagogical practice. (Vásquez et al., 2021; Beták, 2024; Liu & Xu, 2025) Likewise, teacher preparedness is not regarded as a singular attribute but must be examined with multiple lenses, including the institutional standards, national policy frameworks, self-assessed competence, and classroom activities, which often result in

conflicting conclusions regarding the true meaning of being prepared for the digital classrooms. (Thahir et al., 2024; Vodneva et al., 2021; Nuangchalerm, 2020). As a result, the literature has become exceedingly rich yet conceptually dispersed in direction, offering substantial empirical findings while lacking theoretical coherence and clarity, a gap noted in the recent bibliometric and meta-analysis of teacher digital competence research. (Butar Butar et al., 2024; Chansanam et al., 2025; Liu & Xu, 2025).

Bibliometric analysis helps researchers to take a pause, distance themselves from the increasing literature and study the field as an interconnected whole rather than isolated studies to see a bigger picture. This approach allows patterns to merge across time, place, ideas, and methods, rather than studying the prominent voices or maximum cites papers and articles. It reveals which studies have shaped the conversation, what is repeated and reinforced, and how the preferred research design has become the norm. It also identifies the missing traces or overlooked gaps. These identified gaps are significant in the teacher education context as they have an impact on the concept, evaluation and application of digital literacy and preparedness. (Butar Butar et al., 2024; Chansanam et al., 2025; Liu & Xu, 2025)

This study engages in a bibliometric mapping of research on digital literacy and readiness within teacher education to understand how this field has gradually taken shape, identifying central academic themes and where persistent tensions continue to surface. Instead of offering another prescriptive model of digital competence, this study analyses and draws insights from 30 research papers and articles to examine how the idea of readiness has been prepared, negotiated, and revised across various educational contexts and crises. This study posits that readiness should not be perceived as technical proficiency solely, but as a continuous process formed by pedagogy, policy, emotion, and power. (Vásquez et al., 2021; Butar Butar et al., 2024; Liu & Xu, 2025). A deeper concern lies below these patterns in the educational landscape, where the change is constant and certain, what does it actually mean for teachers to be ready?

**Rationale and Significance of the Study**

The incorporation of emerging technologies and digital tools in education has significantly expanded research on teachers' preparedness and digital literacy, particularly during the pandemic (Bilal et al., 2022; Thahir et al., 2024). Various aspects of teacher education have been examined, such as digital competence and the integration of ICT in pedagogy. However, a substantial gap remains due to the fragmented nature of these studies in terms of conceptual clarity.

Across existing studies, teacher readiness is not treated as a single, uniform construct. Instead, it is examined through a range of perspectives, including teachers' own perceptions, institutional arrangements, leadership roles, and what actually unfolds in classroom practice. Digital literacy, however, is more often described in comparatively narrower terms, with attention directed toward the use of tools, cognitive skills, professional competence, ethical awareness, and instructional capability (Vásquez et al., 2021; Nuangchalerm, 2020; Beták, 2024). At the same time, bibliometric and systematic reviews suggest that much of this discussion is shaped by a small set of influential conceptual frameworks, most notably TPACK. While such frameworks provide an organising lens for research, they can also limit how the field engages with persistent methodological weaknesses and the wide contextual differences that continue to shape teachers' digital experiences but remain insufficiently explored (Butar Butar et al., 2024; Chansanam et al., 2025; Liu & Xu, 2025)

This study is concerned with mapping current research trends in teacher education, identifying recurring thematic patterns, and highlighting issues that remain insufficiently resolved. The bibliometric analysis gathers data from 30 peer reviewed to present a comprehensive review which promotes conceptual consolidation and guides future policy makers, research scholars, and teacher educators related to the changing digital landscape.

**Objectives of the Study**

The study aims to:

1.  Analyse the evolution of research on digital literacy and readiness in teacher education over time.

2.  Identify dominant themes and conceptual frameworks shaping this body of literature.

3.  Highlight the key research gaps to inform future studies.

**Research Questions**

1.  How has research on digital literacy and readiness in teacher education evolved?

2.  What major themes and frameworks dominate the literature?

3.  What gaps remain in existing research?

**Description of the Data Corpus**

A set of thirty peer-reviewed research articles covering teacher preparedness, digital literacy, and technological proficiency within the teacher education context has been selected as the basis of bibliometric analysis. The selected papers encompasses of wise range of geographical areas, such as Asia, Latin America, Europe, and other developing institutions and illustrate both practice and policy-driven perspectives on the changing landscape of digital education. Pre-service teachers, in-service teachers, teacher educators, and administrators in a digital setting are all included in the data set. The data set comprises empirical studies, systematic reviews, and bibliometric analysis.

Taken together, the literature engages with a range of conceptual frameworks, with particular attention given to digital competence models and the TPACK framework. Beyond these, the studies also address related concerns such as professional development, digital leadership, online and blended learning environments, and broader processes of educational transformation. Methodologically, the research draws on quantitative, qualitative, mixed-methods, and bibliometric approaches, offering diverse perspectives on how digital readiness in teacher education has been examined and understood over time.

**Thematic Bibliometric Analysis and Findings**

The findings of the bibliometric analysis are organised in accordance with the three research questions guiding this study. This structure allows for a focused examination of the evolution of the field, the dominant thematic and conceptual orientations, and the gaps that remain within research on digital literacy and readiness in teacher education.

**RQ1: How has research on digital literacy and readiness in teacher education evolved over time?**

The analysis indicates a clear temporal progression in research focus and volume. Earlier studies primarily conceptualised digital literacy in terms of basic ICT skills and technological familiarity, often positioning technology as a supplementary component of teacher preparation (Polat, 2021; Nuangchalerm, 2020). Over time, particularly after 2018, research began to adopt broader perspectives that integrated pedagogy, professional practice, and institutional contexts into discussions of digital readiness (Vásquez et al., 2021; Beták, 2024).

A noticeable rise in publication activity can be seen during and in the period following the COVID-19 pandemic, pointing to increased scholarly concern with teachers' preparedness for online and blended forms of teaching (Bilal et al., 2022; Thahir et al., 2024). During this time, the literature moves beyond

early, exploratory accounts and begins to offer more reflective analyses that engage with issues of systemic readiness, professional pressures, and the long-term viability of digital teaching practices. Bibliometric and review-based studies suggest that this moment represented a turning point in the field, broadening the conversation from short-term emergency measures to more sustained questions about digital transformation in teacher education (Butar Butar et al., 2024; Liu & Xu, 2025).

**RQ2: What major themes and conceptual frameworks dominate the literature?**

A dominant theme across the literature is the conceptualisation of digital literacy and digital competence as multidimensional constructs. Studies increasingly emphasise pedagogical integration, critical information use, and ethical responsibility alongside technical skills (Vásquez et al., 2021; Hafizhah et al., 2024). However, bibliometric evidence shows that this conceptual expansion remains uneven, with variations in how digital literacy is defined and operationalised across studies (Butar Butar et al., 2024; Liu & Xu, 2025).

The Technological Pedagogical Content Knowledge framework emerges as the most influential conceptual model shaping research on teacher digital readiness. Multiple studies employ TPACK to analyse teacher preparation, instructional design, and technology integration, particularly in pre-service teacher education contexts (Nuangchalerm, 2020; Chansanam et al., 2025). While widely adopted, findings frequently indicate imbalances among TPACK components, with technological integration remaining less developed than pedagogical and content knowledge.

A recurring observation across the literature is that teacher readiness is rarely framed as the outcome of individual effort alone. Instead, it is shaped by wider institutional and systemic conditions. Several studies draw attention to the role played by teacher education institutions, leadership practices, and policy environments in influencing how digital competence develops over time (Vodneva et al., 2021; Alshidi & Rashid, 2024). Work that examines digital leadership and broader processes of educational change further suggests that teachers' engagement with digital technologies is strongly affected by the presence of a clear institutional direction and access to meaningful, ongoing professional development opportunities (Thahir et al., 2024).

Methodologically, the literature is characterised by a strong reliance on quantitative and self-report approaches, particularly surveys measuring perceived digital competence and readiness (Polat, 2021; Beták, 2024). Bibliometric reviews identify this methodological concentration as a defining feature of the field (Butar Butar et al., 2024; Liu & Xu, 2025).

**RQ3: What gaps remain in existing research on digital literacy and readiness in teacher education?**

Even with the steady expansion of research in this area, several gaps continue to shape the field. One of the most visible limitations lies in the strong dependence on self-reported data. While such measures offer useful insights into perceptions and attitudes, they provide only a partial view of how digital competence is enacted in classrooms and translated into pedagogical practice (Polat, 2021; Beták, 2024). Studies that follow teachers over time or examine digital practices as they unfold in real teaching contexts remain relatively rare, which constrains understanding of how digital readiness is developed, negotiated, and sustained across different stages of professional life (Butar Butar et al., 2024; Liu & Xu, 2025).

Another gap that emerges from the literature concerns the uneven geographical and contextual spread of existing research. A large proportion of studies are situated in European and Asian contexts, where supportive policy environments and digital infrastructure are relatively well developed. By contrast, research from developing education systems tends to foreground ongoing difficulties related to access, infrastructure, and educational equity, issues that are only partially addressed by prevailing models of digital readiness (Judijanto, 2025; Bilal et al., 2022). This imbalance raises questions about the extent to which widely used frameworks can be meaningfully applied across diverse educational settings.

Finally, the analysis points to a noticeable lack of sustained engagement with the emotional and professional dimensions of teacher readiness. Although recent research has begun to acknowledge issues such as increased workload, stress, and professional uncertainty in digitally transforming environments, these experiences are still marginal when compared with the emphasis placed on technical skills and pedagogical competence (Vodneva et al., 2021; Thahir et al., 2024). This imbalance suggests the need for a broader understanding of readiness that accounts not only for what teachers can do, but also for how they experience and navigate digital change.

**Discussion of Findings**

The bibliometric evidence suggests that scholarship on digital literacy and readiness in teacher education has gradually moved beyond a narrow, skills-based orientation toward more layered understandings of professional competence. Earlier work, which tended to focus on basic ICT familiarity, has increasingly given way to perspectives that bring together pedagogy, everyday teaching practice, and institutional context, signalling a gradual maturation of the field (Polat, 2021; Vásquez et al., 2021; Beták, 2024). This

transition reflects a growing awareness within the literature that digital readiness involves far more than technical ability alone.

The strong presence of frameworks such as Technological Pedagogical Content Knowledge indicates an effort within the field to theorise the relationship between technology and teaching practice. However, recurring findings of imbalances across TPACK components suggest persistent challenges in translating conceptual knowledge into pedagogically meaningful digital practice, particularly in teacher preparation programmes (Nuangchalerm, 2020; Chansanam et al., 2025). This indicates that while frameworks provide coherence, they do not fully resolve tensions between theory and classroom enactment.

The findings also underscore that teacher readiness is increasingly framed as a systemic rather than individual concern. Studies consistently highlight the influence of institutional leadership, professional development structures, and policy environments on teachers' digital engagement (Vodneva et al., 2021; Alshidi & Rashid, 2024; Thahir et al., 2024). This challenges deficit-oriented narratives that place responsibility solely on teachers and instead positions readiness within organisational and structural conditions.

Methodologically, the concentration of survey-based and self-report studies limits a deeper understanding of how digital readiness is enacted and sustained over time. Bibliometric and review studies repeatedly identify the need for more diverse methodological approaches, particularly those capturing practice-based and longitudinal dimensions of teacher development (Butar Butar et al., 2024; Liu & Xu, 2025). Additionally, the geographical concentration of research highlights the risk of universalising models of digital readiness that may not adequately reflect varied educational realities (Bilal et al., 2022; Judijanto, 2025).

**Implications of the Study**

The findings emerging from this bibliometric analysis suggest important directions for teacher education, research, and policy. Within teacher education programmes, the evidence indicates that treating ICT training as a separate or add-on component is increasingly inadequate. What appears necessary, instead, is a more deliberate integration of digital literacy into subject-specific pedagogy, supported by opportunities for reflection on teaching practice. This shift implies moving away from short, skills-oriented interventions toward forms of professional learning that are continuous, cumulative, and embedded in everyday teaching contexts (Beták, 2024; Nuangchalerm, 2020).

At both institutional and policy levels, the findings draw attention to the importance of leadership, organisational support, and clearly articulated digital strategies in shaping teachers' preparedness for digital change. The evidence indicates that although investment in technological infrastructure is essential, it rarely leads to meaningful improvements in readiness on its own unless it is supported by sustained professional development and a positive institutional culture (Vodneva et al., 2021; Alshidi & Rashid, 2024). For this reason, policies directed at digital transformation in education need to move away from placing responsibility solely on individual teachers and instead acknowledge readiness as a collective, system-level concern.

About future research, the analysis highlights the need to broaden methodological approaches in this field. Greater emphasis on longitudinal, qualitative, and practice-oriented studies would allow researchers to capture better how digital readiness develops, fluctuates, and is sustained over time. In addition, extending research to underrepresented contexts remains essential if existing frameworks and models of readiness are to reflect diverse educational realities and promote greater equity (Bilal et al., 2022; Judijanto, 2025; Liu & Xu, 2025).

Collectively, these findings indicate that digital literacy and preparedness in teacher education should not be regarded as conclusive accomplishments that educators merely acquire and maintain. Instead, they manifest as dynamic professional states that evolve, transform, and are perpetually redefined through daily pedagogical decisions, institutional demands, and the broader social and educational environments in which educator's function.

**Limitations of the Study**

While this study provides a systematic bibliometric mapping of research on digital literacy and readiness in teacher education, it is important to acknowledge certain limitations. To begin with, the analysis is based on a set of thirty peer-reviewed journal articles. Although this corpus is adequate for identifying broad themes and publication trends, it cannot fully represent the entire scope of scholarship in a field that continues to expand rapidly (Butar Butar et al., 2024; Liu & Xu, 2025). In addition, the decision to focus exclusively on journal articles means that conference papers, policy documents, and other forms of grey literature were not included, even though such sources may offer valuable insights into emerging practices and context-specific developments (Bilal et al., 2022).

From a methodological standpoint, the findings are also shaped by the dominant research approaches within the existing literature. The strong reliance on survey-based instruments and self-reported measures

limits the extent to which the analysis can capture actual classroom practices or trace the longer-term development of digital readiness among teachers (Polat, 2021; Beták, 2024). Furthermore, the concentration of studies in particular geographical regions restricts the applicability of the findings across more diverse educational contexts, where access, policy environments, and institutional conditions may differ considerably (Judijanto, 2025; Vásquez et al., 2021).

These limitations do not weaken the value of the study. Instead, they provide a clearer frame for interpreting the findings and highlight the importance of future research that extends across a wider range of contexts, adopts more diverse methodological approaches, and gives greater attention to settings that have so far received limited scholarly focus.

**Conclusion**

This bibliometric study examined research on digital literacy and readiness in teacher education with the aim of tracing how the field has developed over time, identifying its main thematic concerns, and highlighting areas that remain underexplored. An analysis of thirty peer-reviewed studies points to a clear movement away from a limited emphasis on ICT skills toward broader understandings of digital competence that bring together pedagogy, professional practice, and institutional context (Polat, 2021; Vásquez et al., 2021; Beták, 2024). This shift suggests a growing awareness in the literature that teacher readiness cannot be adequately understood in purely technical terms.

At the same time, the findings reveal uneven conceptual and practical integration. While frameworks such as Technological Pedagogical Content Knowledge provide theoretical direction, recurring evidence points to challenges in translating these models into effective classroom practice (Nuangchalerm, 2020; Chansanam et al., 2025). The literature also emphasises that digital readiness is shaped by institutional leadership, professional development, and policy support, rather than individual capacity alone (Vodneva et al., 2021; Alshidi & Rashid, 2024).

The study further highlights methodological and contextual gaps, including reliance on self-report methods and limited representation of diverse educational settings (Butar Butar et al., 2024; Liu & Xu, 2025; Bilal et al., 2022). Overall, the findings position digital literacy and readiness as dynamic and context-dependent professional conditions, underscoring the need for more integrated and sustainable approaches to teacher education in the digital era.

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