Preparing Educators for K-12 Digital Learning: Gaps in Teacher Education, Leadership Preparation, and Professional Development

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Abstract: Despite decades of growth in K-12 digital learning, teacher education programs and educational leadership preparation remain inadequately equipped to prepare educators for digital instruction. This review examines existing initiatives across three domains: teacher education, leadership preparation, and professional development for practicing educators. While scattered efforts have emerged, including graduate certificates, field experience partnerships, and curriculum development projects, these initiatives remain fragmented and insufficient in scope. The COVID-19 pandemic revealed long-standing systemic failures in preparing educators for the flexible delivery models that contemporary schools demand. Moving forward requires coordinated research to develop validated standards and instruments, systemic integration of digital learning competencies throughout preparation programs, mandatory field experiences in digital environments, and policy mandates from accrediting bodies.

Introduction

K-12 digital learning has evolved from an educational niche into an essential component of modern school infrastructure. K-12 online and blended learning initiatives now serve millions of students across the United States and internationally (Johnson et al., 2023). Yet despite decades of growth and the accelerated adoption necessitated by the COVID-19 pandemic (Francom et al., 2021), the preparation of teachers and administrators for these digital environments remains fundamentally inadequate. This persistent gap between practice and preparation reflects systemic failures within teacher education programs and educational leadership preparation to address the specialized competencies required for effective digital instruction (Barbour & Hodges, 2024).

In this paper we examine the current state of K-12 digital learning preparation across three interconnected domains: teacher education initiatives, leadership preparation programs, and professional development for practicing educators. While scattered efforts have emerged, including graduate certificates, field experience partnerships, and curriculum development projects, these initiatives remain fragmented and insufficient in scope. The COVID-19 pandemic exposed rather than created this crisis, revealing what scholars had long predicted, that educational systems were unprepared for the flexible delivery models that contemporary schooling demands (Crompton et al.,

2022). Moving forward requires coordinated research, systemic policy reform, and sustained commitment to preparing educators for both traditional and digital instructional contexts.

Digital Teaching is Different than Traditional Teaching

The difference between teaching in a face-to-face classroom and a K-12 digital learning environment is frequently mischaracterized as a mere change in the delivery medium. While there are many overlaps, research indicates that effective digital instruction requires a fundamental shift in pedagogy, teacher roles, and instructional design (Kearsley & Blomeyer, 2004; Rice, 2020). In a traditional classroom, a single educator typically manages all aspects of the learning environment. In a K-12 digital learning environment, however, there is often a more specialized division of labor based on tasks and proximity (Davis et al., 2007), historically described as consisting of three distinct roles: the virtual school designer, the virtual schoolteacher, and the virtual school site facilitator or mentor.

The virtual school designer focuses on creating the entire learning environment to ensure the interface is accessible and the materials are pedagogically sound before the course begins and the first student ever logs in (Easton, 2003). The instructional environment must be intentionally designed for learners of varied abilities, usually without ever having met the students (Roblyer & McKenzie, 2000). This requires mastery of the ability to create high-quality instruction within digital tools rather than just digital access or the knowledge of how to use those tools (U.S. Department of Education, 2024). The geographic and temporal separation of teacher and student means that the virtual school teacher must focus on remote facilitation and assessment (Roblyer & McKenzie, 2000), with interactions deliberately planned and often asynchronous (Barbour & Adelstein, 2013). While face-to-face teachers can rely on physical presence, digital teachers must rely on the frequency and quality of their digital communication to ensure student success.

One of the most significant pedagogical differences is the necessity of the virtual school site facilitator, a local adult physically present with the student to serve as a bridge between the remote teacher and the student (Borup & Stimson, 2019). Research has shown that students often struggle with self-regulation and pacing in digital settings (Greene et al., 2005), and effective programs include a site facilitator to provide day-to-day guidance and support (Barbour & Adelstein, 2013). These roles signal a transition from solo teaching to a specialized, diffused model driven by intentional instructional design and mediated interaction.

Existing Teacher Education Initiatives

Teacher education for K-12 digital learning has evolved significantly over the past three decades, yet remains characterized by a persistent gap between the rapid growth of student enrollment and the readiness of the teaching workforce (Johnson et al., 2023). This lack of preparation became painfully evident during the COVID-19 pandemic. The existing and former teacher education initiatives can be categorized into three areas: graduate certificates and degrees, field experiences, and curriculum development projects.

The most common approach to preparing teachers for K-12 digital learning has been through graduate-level coursework and specialized credentials for in-service teachers. Several universities introduced graduate certificates in online teaching around 2010 (Barbour, 2012), with each offering a course in online teaching methodology and most also including a course in online course design. An example of a research-based certificate was the Graduate Certificate in K-12 Online Teaching offered by Boise State University, which began in 2006 as a single methods course and evolved into a twelve-credit certificate program (Rice & Yang, 2012). This certificate eventually formed the basis for Idaho's state-approved K-12 Online Teaching Endorsement in 2011 (Yang & Rice, 2015). It should be noted that some programs have since closed due to low enrollment.

Despite the prevalence of K-12 digital learning, providing pre-service teachers with practical field experiences in these environments is well documented as rare. Early research by Smith et al. (2005) indicated that only 15% of K-12 teachers had undergone any training for online instruction. Kennedy and Archambault (2012) found that a negligible 1.3% of programs provided clinical field experiences in K-12 online environments, a figure that saw only a minor increase to 4.1% a few years later (Archambault et al., 2016). A recent replication by Woo et al. (2025) found that availability had risen to only 14%. A few notable initiatives have existed. Florida universities have been at the forefront through partnerships with the Florida Virtual School. The University of Central Florida pioneered virtual internships pairing pre-service teachers with experienced online mentors for a seven-week period (Kennedy, 2010). These experiences led the FLVS to formally create the Florida Virtual School University Partnership program in 2011-12 (Wagner et al., 2012).

Curriculum development initiatives have also aimed at embedding K-12 digital learning competencies into existing programs. Iowa State University provided the most extensive development, beginning with the Good Practice to Inform Iowa Learning Online case studies (Davis et al., 2007) and the Teacher Education Goes Into Virtual Schooling (TEGIVS) project, which systematically integrated virtual instruction competencies into pre-service training by defining the distinct roles of virtual school teacher, course designer, and site facilitator. Wayne State University established itself as an early leader through comprehensive initiatives spanning all three areas, including a five-year, eight-cycle action research project refining its K-12 digital learning coursework (Siko & Barbour, 2026). These efforts transitioned the curriculum from a general focus on internet-based instruction to a more nuanced exploration of K-12 digital pedagogy.

Preparing Teachers for K-12 Digital Learning

Only a select few teacher education programs chose to focus on K-12 digital learning in any meaningful way. The pandemic underscored the paradigm shift from digital learning as a niche alternative to a vital component of educational resilience (U.S. Department of Education, 2010). The COVID-19 pandemic did not create the need for K-12 digital learning; rather, it exposed a decades-long failure within teacher education programs to prepare educators for a reality scholars had long predicted (Crompton et al., 2022; Lahr & Welch, 2023). To move beyond the emergency remote teaching that characterized the early 2020s toward high-quality, sustainable instruction (Hodges et al., 2020), Hodges and his colleagues have called for structural transformation resting upon two overarching goals (Barbour & Hodges, 2025; Hodges et al., 2022).

First, scholars need funded efforts to develop promising practices and frameworks that teacher education programs can use and be evaluated against. This requires two specific objectives: validated, research-based standards must be developed, and metrics and instruments must be created or refined to assess pre-service teachers' knowledge, skills, and attitudes for K-12 digital teaching. Teacher education programs must have access to reliable, research-based frameworks, standards, and instruments which have been lacking in the field to date (Barbour, 2020). Without financial support, this development remains fragmented, impeding the ability of teacher education programs to define what a 'quality' digital teacher looks like (Mancenido, 2024).

Second, teacher education programs need to provide teachers with the appropriate knowledge, skills, and attitudes to design, deliver, and facilitate instruction in digital settings. Four specific objectives must be achieved: experiences as digital learners themselves, sufficient coursework related to K-12 digital learning, field experiences in digital environments, and requirements from accrediting bodies and state agencies. A recurring theme in research is the principle that teachers teach the way they were taught (Lortie, 1975), so teacher education programs must ensure candidates complete a portion of their professional learning in a digital environment (Luo et al., 2017). The stand-alone technology integration course has long been criticized as insufficient (Wang & Chen, 2006), which is why digital content and pedagogy must be woven throughout the curriculum.

The final needed elements are field experiences and policy mandates. Future teachers must complete field experiences in digital settings to make the transition from theory to practice (Ma et al., 2021). And, finally, is the

stick of policy and accreditation: accrediting bodies and state agencies must provide mandates to drive the pace of institutional change (Bond et al., 2019).

Preparing Leaders for K-12 Digital Learning

The expansion of K-12 digital learning has also impacted how leaders should be prepared. Most educational leadership programs and state certification requirements are deeply rooted in the brick-and-mortar context (Quilici & Joki, 2011). The COVID-19 pandemic exposed that the majority of educational leaders were "unprepared for working and delivering instruction in virtual environments" (Azukas, 2022, p. 327). The recommendations for addressing this issue overlap substantially with those for teacher preparation.

There is a need for additional research related to the unique knowledge, skills, and abilities needed to be a K-12 digital leader (Azukas, 2022; Quilici & Joki, 2011). Once standards have been developed, instruments must be created to assess and support growth of K-12 digital learning leaders. Leadership candidates should have experiences as digital teachers. Virtual school principals who had previously served as virtual teachers were better equipped to support their staff (Gustafson & Haque, 2020), while Azukas (2022) highlighted the negative consequences when leaders lacked this background.

Educational leadership programs should integrate K-12 digital learning into their curricula, as the act of leading is distinctly different when geographic or temporal distance exists between the leader and those they are leading (Abrego & Pankake, 2010). Programs must also include field experiences in K-12 digital learning environments, though LaFrance and Beck (2014) found that only 14 of 159 educational leadership programs (9%) offered some type of field experience in a K-12 virtual school setting. Finally, accreditation bodies should consider specific licensure endorsements for K-12 digital learning administrators, as Richardson et al. (2015) explicitly listed policy reform as a necessary systemic response.

K-12 Digital Teaching and Professional Development

Like teacher education, professional development opportunities specifically designed for digital teaching contexts remain insufficient. Professional development refers to the process of remaining current in one's professional area of expertise, including functioning as a member of a professional community (Hodges, 2015). Digital teaching environments demand specialized pedagogical competencies distinct from those in traditional settings. Kearsley and Blomeyer (2004) articulated these requirements two decades ago, including proficiency with digital course elements, understanding of distance learner characteristics, knowledge of effective digital teaching techniques, and awareness of ethical and legal issues.

Practitioners report persistent challenges accessing research-informed professional development (Leary et al., 2020). Current initiatives frequently overlook the demands of synchronous versus asynchronous instruction while failing to provide strategies for building social presence in virtual spaces. National survey data revealed that only 12% of new online teachers received college or university training for digital instruction, with 94% relying on professional development from their employing organizations (Dawley et al., 2010). Rice and Dawley (2007) found that 62% of online teachers received no training prior to teaching online. Furthermore, Leary et al. (2020) observed that "consistency in both the design and delivery" (p. 254) of professional development for digital educators is lacking. Most programs tend to be one-size-fits-all and often lack individual relevance (Leary et al., 2020), with historical patterns showing emphasis on technology tool usage rather than pedagogical approaches (Bond et al., 2019), leaving many educators insufficiently prepared to design and facilitate effective digital learning experiences.

Avenues for Future Research

Across the three domains examined, consistent patterns can be observed: inadequate pre-service preparation forcing reliance on fragmented in-service training, the absence of validated standards and assessment instruments, and minimal field experiences in digital environments. Despite overlapping needs between teacher and leader preparation, both remain largely grounded in brick-and-mortar contexts with few programs systematically integrating digital competencies.

Moving forward, the field requires a coordinated research agenda addressing several interconnected priorities. Researchers must develop and empirically test research-based standards for both digital teachers and leaders, drawing on competency framework techniques from fields such as healthcare, engineering, and human resources (Batt et al., 2021). Longitudinal research is needed to evaluate the effectiveness of different preparation models, from the comprehensive initiatives at Wayne State University to the partnership approaches pioneered by Florida institutions. Scholars must investigate scalable professional development models that move beyond inconsistent, one-size-fits-all approaches currently predominating. Finally, policy research is essential to understand how accreditation requirements and state mandates can serve as the necessary enticement to drive institutional change. Without such comprehensive inquiry, teacher education programs will continue their historical pattern of short memory and inadequate response to educational disruptions.

The need to prepare teachers and leaders for the digital environment is not simply about growth in K-12 digital learning. As world events continue to challenge the traditional brick-and-mortar model of schools, the need for a teaching workforce prepared for digital pedagogy is a fundamental requirement for maintaining the continuity of instruction. Beyond crisis management, digital learning remains a vital tool for expanding access in rural jurisdictions and accommodating diverse student needs. By preparing teachers for multiple modes of instructional delivery, the education system can ensure that every student has access to quality instruction, regardless of the physical or societal circumstances that may arise in the future.

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