

## **K-12 Digital Assessment Research and Practice: A Practitioner-Based Research Guide for Teacher Preparation**

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**Abstract:** Drawing from a broader practitioner-based research agenda, this paper synthesizes K–12 research on digital assessment and identifies five major themes: validity and reliability across modalities, assessment for instructional decision making, assessment for program evaluation, assessment of special populations, and standardized testing constraints in digital contexts. The paper argues that assessment practices developed for brick-and-mortar classrooms do not transfer cleanly to digital learning contexts. It outlines key shifts educator preparation should make to help teachers design, interpret, and use assessments more effectively across digital learning contexts.

### **Introduction**

Assessment in K–12 digital learning contexts has become a high-stakes design and measurement problem. The conditions under which evidence of learning is generated—and therefore interpreted—in digital contexts often differs from brick-and-mortar classrooms in ways that threaten validity, reliability, and usefulness of assessment data for decision making. In physical settings, teachers are trained to draw on frequent formative checks, in-the-moment observation, and spontaneous clarification to guide instruction and feedback. Digital instruction, by contrast, commonly distributes participation across time and space, reduces opportunities for live observation, and normalizes feedback through technology-mediated channels. As K–12 digital enrollment expands (Barbour et al. 2018), it is increasingly clear that assessment practices designed for in-person learning do not always transfer cleanly to digital environments. When the learning ecology is different, teacher preparation for assessment in that ecology must be different as well.

A broader practitioner-based research agenda (Short et al. accepted) synthesized current understandings about K–12 digital assessment and identified priority questions to guide future research and strengthen practice. The purpose of that agenda is to inform research, practice, and policy. The full agenda emphasizes these three aspects more heavily than these proceedings. The purpose of these proceedings is to capture a conversation about the place where current research, practice, and policy intersect—teacher education. Preparing teachers to implement effective pedagogies requires teacher educators to understand research-based best practices and how such practices operate within local and national policy. In the case of K–12 digital assessment, however, there is much that the research has yet to account for, so practice and policy either lag behind the research or move forward without a steady research-based foundation. This paper extracts implications for teacher preparation from the full K–12 digital assessment research agenda to ensure that teacher preparation not only overcomes lagging research but circuitously informs the very research, practice, and policy upon which it is built.

For the purposes of this report, assessment is treated as the process of gathering information for a specific purpose, most commonly to support instructional decisions and determine learning progress, which is why teacher preparation frequently frames assessment as a tool that informs instructional design and alignment (Davies & Short

2024). The central problem with this framing is that many preservice teachers learn assessment in ways that implicitly presumes teaching within a brick-and-mortar setting. These settings allow for regular observation, shared classroom routines, and consistent testing environments—characteristics that do not reliably transfer to K–12 digital contexts. Because the instructional design and delivery of K–12 digital learning differs from brick-and-mortar instruction in its modalities of time, interaction, pacing, and support, the assessment practices that gather information to provide interpretable evidence of learning and instructional effectiveness must also differ.

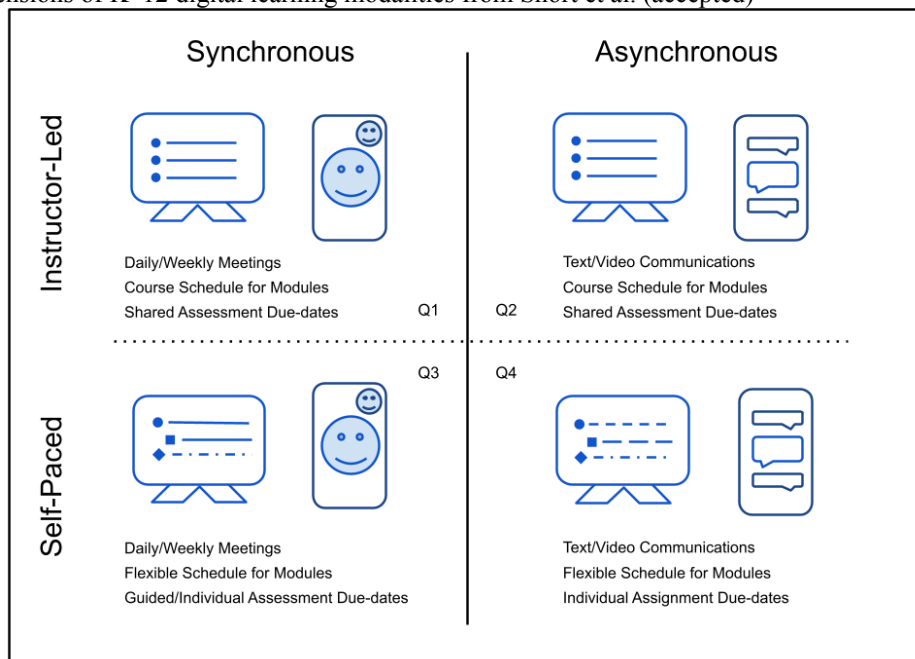
This paper provides teacher educators with an overview of the K–12 digital assessment research base and then illustrates how key research themes translate into specific teacher education design shifts to intentionally bridge the research-practice-policy gaps articulated within the original practitioner-based research agenda.

## The Research Base

Research on assessment in K–12 digital learning remains comparatively underdeveloped despite the continued growth of virtual, blended, and other technology-mediated learning environments. Much of the broader online learning literature has centered on higher education, leaving important questions about assessment in K–12 digital contexts underexamined (Martin et al. 2020; Martin et al. 2025). This gap is especially concerning because assessment in educational environments does more than measure student performance. It also shapes instructional choices, identifies learning needs, informs eligibility and support decisions, provides evidence for funding frameworks and sources, and contributes to evaluations about school and program effectiveness (Davies & Short 2024; U.S. Department of Education October 2018). In K–12 digital contexts, where students differ widely in academic readiness, self-regulation, access to support and legally guaranteed services, assessment presents challenges that are not fully addressed by research.

The research agenda established by Short et al. (accepted) responds to this problem by organizing current research around a set of recurring themes that emerged from analysis of practitioner-oriented research questions (Barbour et al. 2025). Rather than treating digital learning as a singular instructional modality different from in-person learning environments, the agenda found that practitioners frame modality as a multidimensional learning ecology in which synchronicity, pacing, autonomy, and support structures shape what counts as evidence of learning and how such evidence should be interpreted (Figure 1). Across the research questions, five themes emerged as specific focuses for future scholarship: (a) validity and reliability across modalities, (b) assessment for instructional decision making, (c) assessment for program evaluation, (d) assessment of special populations and access to special services, and (e) standardized testing, participation, and systemic constraints for students in digital learning contexts.

**Figure 1.** dimensions of K–12 digital learning modalities from Short et al. (accepted)



The first major theme in the literature concerns the validity and reliability of assessment across digital modalities. In K–12 digital learning, modality is no longer limited to whether instruction occurs online or in person. It also includes whether the learning is synchronous or asynchronous, instructor-paced or self-paced, resulting in learning that exists on a continuum between being highly structured or more autonomous. Prior studies suggest that these differences influence not only engagement and learning outcomes, but also the quality and interpretability of assessment data. Lindfors and Pettersson (2021), for example, found that synchronous remote teaching strengthened social presence, teacher support, and peer cooperation, while also reducing opportunities for learner autonomy. Similarly, DiPietro et al. (2008) described how online courses organized through instructor-paced, self-paced, and flexible models prompted teachers to rely on different forms of assessment and alternative evidence of learning. Johnson et al. (2023) further emphasized that the timing of instruction and degree of learner autonomy impact both engagement and learning outcomes in K–12 virtual contexts. Taken together, this line of research suggests that assessment performance in digital settings is partly shaped by the design of the learning environment itself. Assessment results—including test scores, participation patterns, and alternative demonstrations of learning—may therefore reflect not only what students know, but also how instructional decisions about interaction, pacing, and support can impact student learning.

The second theme centers assessment as a tool for instructional decision making. In both physical and digital classrooms, educators rely on assessment to guide instruction, provide feedback, or otherwise support student growth. The literature suggests that these processes function differently in digital settings because opportunities for observation are more limited and feedback is more frequently mediated by technology. Digital environments may offer new flexibility in assessment design, including individualized performance tasks, varied formats for student response, and expanded opportunities for multimodal feedback. At the same time, such environments may reduce the spontaneity of formative assessment that teachers often rely on in brick-and-mortar settings. Johnson et al. (2023) and Pollard and Armatas (2025) suggest that frequent assessment and feedback can improve outcomes even in asynchronous settings, while Maier and Klotz (2022) point to the importance of understanding how feedback functions when it extends beyond written text into audio, video, or automated systems. Frequent assessment and feedback is also closely connected to learner engagement. The Academic Communities of Engagement framework (Borup et al. 2020) highlights the importance of independent engagement, course support, and personal support in shaping digital learners' success. The implication for assessment is significant: assessment quality in digital settings depends not only on the design of the task itself, but also on the extent to which the learning environment—and the methods facilitated by that environment—supports students in demonstrating what they know.

The third theme in the research base concerns assessment for program evaluation. In K–12 digital learning, assessment data are frequently used not only by teachers but also by administrators, policymakers, and other stakeholders to judge school quality and determine whether programs are effective. Yet the literature repeatedly shows that virtual schools often perform worse than their brick-and-mortar counterparts on conventional accountability measures, even though the reasons for these differences are not always clear. Gulosino and Miron (2017) found that few virtual schools met acceptable performance benchmarks and that independently operated or district-operated virtual schools appeared to outperform for-profit and charter virtual schools on several indicators. More recent work has continued to document lower course completion, higher withdrawal rates, and lower academic achievement in virtual settings (Johnson et al. 2023; Molnar et al. 2023). At the same time, this research also warns against simple comparisons. Students enroll in digital programs for many reasons, including credit recovery, scheduling flexibility, health needs, and dissatisfaction with traditional schools. These enrollment patterns complicate direct comparisons between digital and brick-and-mortar outcomes. Current research therefore points to an unresolved problem: digital programs are often evaluated using assessment systems developed for traditional schooling, even when the design features, student populations, and goals of those programs differ substantially. This bias raises important questions about which indicators should count as evidence of program quality in digital settings and how those indicators should be interpreted.

The fourth theme involves special populations and access needs. Research consistently suggests that students with disabilities, English learners, credit-recovery students, and students in rural or under-resourced communities experience digital learning differently, and that assessment systems do not always account for these differences. Although digital learning is often described as flexible or personalized, prior work indicates that these benefits do not automatically translate into equitable assessment conditions for students who need targeted supports (Rice & Dykman 2018). Studies have highlighted barriers related to teacher preparation, curriculum design, implementation time, collaboration with families, and the difficulty of providing accommodations or individualized monitoring in virtual environments (Şanal 2023; Wade et al. 2022). These challenges are compounded when students have not been identified for legally mandated special education services. In traditional schools, repeated in-person contact often allows teachers to notice behavioral or academic patterns that suggest a need for special education

evaluation. In digital settings, such observations may be harder to make, especially when synchronous interaction is limited. As a result, digital schools may need alternative observation protocols and stronger partnerships with caregivers to recognize and respond to specialized student needs. This body of research underscores that fairness in digital assessment is not only a matter of giving students access to equitable learning opportunities, but of ensuring that assessment systems can validly identify, support, and monitor diverse learners under different conditions of participation and visibility.

The fifth theme concerns standardized testing, participation in standardized testing, and systemic constraints for digital learners who must complete standardized assessments. The research agenda highlights this theme because digital schools are often judged by accountability systems that presume brick-and-mortar routines. For example, many states require students enrolled in full-time digital programs to complete standardized assessments in person, even when their instruction has been fully online. This creates a mismatch between the environment in which students learn and the environment in which they are evaluated. Kingsbury et al. (2024) found evidence that online students performed better on standardized exams when tested at home than when tested in person, suggesting that changes in testing location and administration may affect performance. Other studies have documented lower test scores and graduation rates for online students (Barbour et al. 2018; Molnar et al. 2023), but such findings are difficult to interpret when the testing conditions themselves may introduce construct-irrelevant barriers. The agenda also raises concerns about whether the design and language of state-mandated assessments assume brick-and-mortar experiences that virtual learners may not share. In this sense, standardized testing in digital settings is not merely a technical administration issue. It is a question of fairness, participation, and of bias. The extent to which standardized assessment systems accurately reflect what students in digital contexts have learned rather than how closely their schooling resembles traditional in-person education needs to be more deeply evaluated.

Taken together, this research base suggests that K–12 digital assessment should be understood as a problem of educational design, as well as a problem of digital contextualization. Across themes, current research suggests that assessment practices become less interpretable when they are transferred from traditional classrooms to digital settings without attention to modality, pacing, interaction, accessibility, and systemic constraints unique to digital contexts. Research, practice, and policy therefore need stronger conceptual and practical tools for preparing educators to design assessments that generate meaningful evidence under these altered, digital, conditions. For teacher education, this matters because preservice teachers are often introduced to assessment through frameworks developed primarily for in-person instruction. If educators are to fully reap the benefits of effective assessment in digital contexts, educator preparation programs must help them understand not only the technical features of digital assessment tools, but the broader research showing how the digital context changes what assessment may capture, how feedback may operate, and what constitutes alternative methods for collecting valid evidence of learning.

## **Educator Preparation Shifts**

The major themes in the K–12 digital assessment research agenda point to specific design shifts that educator preparation programs should make if they hope to prepare teachers for assessment in digital environments. Traditional educator preparation courses focus on formative and summative assessments as seen in the in-person environment, with many assumptions about the students' interactions with the teacher and within the learning environment itself. To prepare teachers for digital environments, we need to explore and challenge the assumptions underlying traditional assessment conditions. Conditions in the in-person environment enable regular, real-time observation of student thinking. Teachers are trained to use these observations for formative assessment opportunities leading to differentiation and specialized student support. The in-person environment also naturally creates a stable environment with shared vocabulary and routines. Students have common, shared experiences that allow teachers to design assessments with those experiences in mind. Additionally, the teacher can control the summative assessment environment by removing distractions, ensuring students are adequately prepared for assessment routines, and providing appropriate guidance and redirection during the assessment process.

These assumptions are all complicated within the digital learning environment. In a traditional classroom, real-time observation of student understanding and development happens organically as teachers monitor students' learning, listen to their conversations, and evaluate their body language. However, those opportunities are reduced and complicated when filtered through a screen. Teachers may see less real-time student activity and hear less impromptu student conversations. There are, however, digital tools that add opportunities for intentionally designed formative checks such as polls, chats and emoticon-based gestures during synchronous learning and discussion boards, exit tickets, and individual teacher check-ins during asynchronous learning. Preservice teachers need

opportunities to see digital formative assessment in action during their educator preparation program, and then create valid, reliable, and effective digital formative assessments. This can include modeling in their own courses and opportunities to observe experienced digital teachers within their certification area but should also include creative opportunities for designing digital assessments based on digital learning opportunities.

The assumption of a common, stable environment is also altered when students are learning in a digital environment. In person environments naturally allow for synchronized (often teacher-led) pacing, common learning progression routines, and shared language for objectives and assessments. Students learning in a digital space may inhabit a variety of different physical environments. Some students may complete courses at home, while others are working on their online courses within brick-and-mortar buildings. This difference likely creates varying degrees of distraction, support, and supervision, especially for digital learning opportunities that fluctuate across modalities. Teachers need to be prepared for explicitly teaching digital learners the vocabulary needed to follow assessment directions in written and verbal forms, and to plan around the wide range of variability within digital learning environments and the support for learners within such environments. One such support would include guardian support from home. Teachers need to understand how to collaborate with the adults who do have frequent interactions with learners to guide instruction, assessment, and selection for legally mandated services.

Course pacing also needs to be considered in assessment design and development. In a traditional environment, pacing is largely unified. Classes work through content together and the pacing is adjusted based on individual and group needs. In asynchronous courses, students can often work ahead or on an alternative flexible schedule. It is possible for each student in a digital course to be in a different place within the curriculum. This variability requires teachers to understand each student's progression and be prepared to support student learning across all aspects of the course and its curriculum. Teachers must be able to embrace personalized learning strategies with an understanding of how PAL data—performance, activity, and learner profile data—inform instruction and assessment, and how learning can be guided by the learner, the educator, or by educational technologies and systems (Short 2022). Teachers must be able to develop such wide-angled views of learning to prepare students in digital contexts for course assessments without limiting the pace of their learning.

## **Conclusion**

Teacher education programs can address the challenges of preparing teachers for assessment in digital contexts by intentionally giving preservice (and inservice) teachers opportunities to examine the differences between teaching modalities and to analyze how those differences directly impact assessment validity, bias, and design. Rather than treating digital learning as an add-on environment, preparation programs must position modality and environment as a core instructional variable. Teachers and teacher candidates should be guided to compare how monitoring student learning varies based on physical setting and instructional modality. Teacher educators also need to provide opportunities for their learners to practice designing and scoring assessments across both synchronous and asynchronous modalities. This preparation could be accomplished through a combination of clinical practices, simulations, and case study evaluations. Additionally, teachers need to be prepared to analyze the wealth of data produced in digital learning environments. Analytics from learning management systems, course progression, learning artifacts, quiz attempts and other digital tools combine with learner profiles to provide a robust picture of learners' performance, activity, and learning profile. Without proper training, this data can be misinterpreted, invalidated, or ignored entirely. If teacher education programs embed competencies for digital learning and assessment into their programs, teachers will be better equipped to assess student learning within unique, digital learning contexts.

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