A SUMMARY OF EVIDENCE FOR TECHNOLOGY IN EDUCATION

From Screentime to Screen Value

Updated 6/25/26

Introduction

There is considerable debate surrounding whether, and to what extent, technology should be used in education. School leaders are fielding urgent questions from parents, board members, and community stakeholders about the role of technology in classrooms. The questions are direct and important: *Is technology helping or harming students? Why are test scores not improving? Should schools return to paper and pencil?*

The concerns are not surprising, given our growing understanding of the risks associated with young people's use of social media and other consumer technologies not designed with their well-being in mind. While acknowledging these dangers is essential, the research summarized here shows that those issues are distinct from the effects of purpose-built, well-implemented educational technology used to support clear learning goals.

Research clearly shows that edtech is a great benefit to learning when it is well-designed, well-implemented, and aligned to clear learning goals. Quality matters far more than the quantity of tech in schools.

To build trust with parents, their questions deserve clear, thoughtful, evidence-based answers rather than anecdotal claims or speculation. This guide is organized into four sections, each aligned with a key factor relevant to the techlash debate: academic achievement, student well-being, supporting access, and impact on instruction. We draw on peer-reviewed studies, meta-analyses, and research syntheses from respected scholars and organizations.

While most widely applicable studies have focused on edtech solutions designed to support math and literacy instruction, many have broader relevance across subject areas, particularly in implementation, teacher practice, tool quality, and learning design. For each section, the guide presents a summary of the evidence, the underlying research, and responses to common questions that school leaders may receive.

Four findings that cut across the evidence.

Four themes consistently emerge across the evidence. These cross-cutting principles shape how we should think about technology in education as they carry direct implications for evaluating edtech tools, planning implementation, and communicating with teachers, students, and families.

01 | Quality matters more than quantity.

Educational technology products built in accordance with how people learn offer distinct advantages for academic learning (e.g., Feng, 2025; Hillmayr et al., 2020), while poorly built educational technology adds unnecessary cognitive load, thus inhibiting learning and academic performance (Støle et al., 2020). The quality of the product matters dramatically.

02 | Edtech is particularly impactful for underserved students.

Students with disabilities, multilingual learners, and students performing below grade proficiency often show disproportionately large gains from well-designed tools. For these students, technology is not simply a supplement to learning but an essential means of access, opportunity, and participation (Di Pietro & Castaño Muñoz, 2025; Lee et al., 2022; McKissick et al., 2018).

03 | Consumer technology and edtech are not the same.

Edtech, built by learning designers, operates from different incentives, learning strategies, and desired outcomes than commercial platforms engineered for intensive engagement. Research on social media or other consumer/entertainment tools does not necessarily apply to educational tools (American Academy of Pediatrics, 2025).

04 | Implementation significantly affects effectiveness.

Alongside product quality, implementation factors (e.g., Kohler et al., 2022) significantly affect how edtech influences student learning. Factors such as teacher preparation, curriculum alignment, and learning setting all affect how well any given product helps students learn (Bernard, 2018; Nordmark et al., 2024; Wu, 2024). As with any educational program or intervention, implementation must fit the local context.

Section 1 | Academic Achievement

The effectiveness of any curriculum or program, whether analog or digital, is affected by multiple factors. When technology is well designed and effectively implemented, it helps teachers teach, and students learn.

What the Evidence Says:

- **Quality matters more than quantity.** Historically, many "screentime" policies focused on the quantity of minutes, but evidence-based guidance, including that from the American Academy of Pediatrics (2025), has moved towards a focus on *quality* of technology product and implementation rather than amount of time used for determining best implementation practices (e.g., Juuti, Kervinen, & Loukomies, 2022; Petko, Cantieni, & Prasse, 2017). Educational technology products built in accordance with how people learn (Clark & Mayer, 2023) offer distinct advantages for learning (e.g., Hillmayr et al., 2020), whereas poorly built products add unnecessary cognitive load, thereby inhibiting academic performance (Støle et al., 2020).

- **Implementation quality drives outcomes.** How technology is deployed in schools — teacher preparation, curricular alignment, learner scaffolding — matters greatly for the effectiveness of edtech (Bernard et al., 2018; Cheung & Slavin, 2013). Dozens of contextual factors influence effectiveness (Kohler et al., 2022; Nordmark et al., 2024; O'Donnell, 2008). A meta-analysis of 60 studies found that the strategic use of technology yielded significantly different outcomes compared with 'fragmented' approaches and that appropriate instructional guidance enhanced effectiveness (Wu, 2024). Another meta-analysis (Chauhan, 2017) that considered 122 additional studies found that technology had a positive effect on the learning outcomes of elementary students. But that effect depended on which subject was being taught, what kind of technology was used, how long students used it, and the learning setting.

  This reinforces the point that contextual factors shape outcomes. Survey data confirms this insight. When teachers have adequate support and preparation, they observe measurable improvements in student learning. A 2025 survey

(Gallup & Walton Family Foundation, 2025) examined how teachers use educational technology in practice. Among teachers who reported adequate support for using technology, 61% reported receiving better insights into student learning and achievement data.

- **Adaptive learning technology leads to significant positive effects.** Intelligent tutoring systems and adaptive software match instruction to each student's level — solving the differentiation challenge a single teacher cannot meet at scale. Across the literature on computer-adaptive instruction, well-designed and well-implemented adaptive tools show positive effects on learning (Hamilton & Hattie, 2021). Additionally, an analysis of more than 30 empirical studies found that learning methods and personalized learning software led to significant improvements in outcomes — reinforcing that *how* adaptive tools are used matters (Zheng et al., 2022).

- **Learning science matters, regardless of approach.** Aligning with learning science principles matters, regardless of the presence or absence of technology. Decades of cognitive research describe how the brain attends to, processes, and retains information — principles that apply whether instruction happens on paper or through technology (Clark & Mayer, 2023). The Universal Design for Learning framework draws on this evidence to show that learners benefit from learning in multiple ways, enabling more learners to access challenging content (Meyer et al., 2014). Another analysis found that using digital technology for collaborative learning has a greater effect on deep learning than independent learning without technology (Wu, 2024).

Answers to Common Questions

Q: Why did state assessment scores go down around the same time technology was brought into schools?

A: Many factors affect test scores, and we need to be careful not to confuse correlation with causation.

During the early 2010s, NAEP scores began to decline. This decline is ongoing and overlaps with a time of increasing access to technology in schools. However, there is no compelling evidence that the decline was *caused* by increased access to technology. Several factors likely had a greater impact on state assessment scores, including new state standards, new assessments for those standards (Wyckoff, 2026), and the enormous disruption caused by a global pandemic.

It's important to note that research shows that where edtech solutions were implemented effectively, they had a positive impact on test scores, including in math (Feng et al., 2025) and English language arts (Silverman et al., 2025). So while a variety of factors have led to decreasing state assessments, well-planned and executed edtech implementations demonstrate overall positive learning outcomes.

> When technology is built well, implemented in ways that fit local contexts, and used as intended, it can help students score higher on state assessments.

Q: Are there risks if technology is used in place of teachers?

A: Research shows that technology is most impactful when it *supports* teachers in doing their work.

Positive effects of edtech on learning largely depend on the technology's ability to support teachers rather than replace them, and teacher professional learning is among the strongest predictors of positive effects (Hillmayr et al., 2020). Research shows that simply putting technology in classrooms does not lead to learning gains for students (e.g., Juuti, 2022; Hamilton & Hattie, 2021).

Q: Are teachers adequately prepared to use technology effectively?

A. Generally no. This is an area where more support is needed.

Most teachers have not received sustained, pedagogically focused professional learning on how to use technology effectively, despite the fact that such training is a critical factor for implementation success (ISTE, 2022; Osorio Vanegas et al., 2025). Since COVID, schools have invested heavily in devices, platforms, and digital tools, but not always equally in the professional learning needed to use those tools well. Research consistently shows that effective technology integration requires ongoing support, coaching, and time for reflection. Access alone is not adequate. Schools must provide the time, professional learning, and support needed to realize the benefits of edtech for learning (Amemasor et al., 2025). A survey (Gallup & Walton Family Foundation, 2026) also found that 69% of U.S. teachers have received no formal guidance on using AI tools in the classroom.

Q: What is the right amount of education technology to improve learning?

A: It depends on the subject, grade level, and purpose.

What constitutes an ideal for one subject, grade level, or purpose may differ for other subjects, grade levels, or needs. The broader principle — that moderate, appropriate use tends to produce better outcomes than either excessive use or complete removal — is supported by research (OECD, 2024; Roschelle et al., 2016).

Section 2 | Student Wellbeing

High-quality edtech products are built by learning designers motivated by meaningful learning outcomes. Consumer tech (e.g., social media, games) is engineered for very high engagement and even addiction; educational products are designed for learning and growth.

What the Evidence Says

- **The quality of tech use matters more than its quantity.** The American Academy of Pediatrics has moved away from rigid hour limits toward quality and context-based guidance for tech use (American Academy of Pediatrics, 2025). They emphasize that adults should attend carefully to the kinds of activities the technology enables and to how well it supports human relationship-building and development.

- **Active engagement improves outcomes compared to passive consumption.** Passive consumption or unstructured use of edtech shows minimal benefits. In contrast, active use of technology is associated with improved academic and social outcomes (Kolb, 2017; Liao & Tian, 2025). In fact, active, intentional learning works in both technology-rich and technology-free settings, whereas passive learning does not (Chi & Wylie, 2014; Kolb, 2017).

- **Adult modeling and explicit instruction.** Children need both explicit instruction and adult modeling to develop healthy technology habits. (American Academy of Pediatrics, 2025, 2016; American Psychological Association, 2019). Leaving children alone with technology is not advisable. Modeling and teaching self-discipline in technology use is recommended.

Answers to Common Questions

Q: Is edtech harming our students?

A: There is no evidence to suggest that edtech has a negative impact on students' well-being.

High-quality edtech is designed differently from consumer tech and entertainment platforms, including social media products. The goals of edtech and consumer tech differ significantly, and families should carefully consider how they handle both types of platforms (American Academy of Pediatrics, 2025). To help evaluate tools that are nominally educational but may vary widely in quality, schools can use frameworks like SAMR, the Technology Integration Matrix (TIM), the ISTE Seal Framework, and the 4-Shifts Protocol (McLeod & Graber, 2019) to assess whether a given tool actually supports learning. In addition, third-party edtech validations are available on EdTechIndex.org. Research clearly suggests that the quality of edtech use affects the educational experience, with higher-quality experiences motivating better learning outcomes (Juuti et al., 2022; Petko et al., 2017).

Note that *how* technology is used matters more than *how much* it is used: students who actively and purposefully engage with well-designed tools experience very different outcomes from those who passively consume media (Kolb, 2017; Liao & Tian, 2025). The American Academy of Pediatrics (2025) documents specific harms associated with social media platforms: addictive design, erosion of truth, and negative self-perception.

Q: Will students need to know how to navigate technology in the future?

A: Yes. Demand for technical and digital skills is a clear requirement for future jobs.

Employer surveys (e.g., World Economic Forum, 2025) and other research (Asa et al., 2025) clearly indicate a global need for students to enter the job market with technological skills. Digital skills are not discrete but intersect with other human skills, such as creativity and critical thinking. Decreasing or eliminating opportunities to learn such skills in K-12 environments is a policy that is misaligned with workforce needs.

Section 3 | Supporting Access

Access to learning opportunities is especially challenging for students who need the most support. Educational technology clearly and consistently improves access for students with disabilities and multilingual learners.

What the Evidence Says

- **Technology decreases barriers for multilingual learners.** When multilingual learners cannot understand content due to language barriers, their self-confidence plummets. Evidence shows that digital tools can remove that barrier, allowing students to engage with grade-level content while building English proficiency (Lee et al., 2022; Zhang, 2022).

- **Access to high-quality instructional materials**. Educational technology helps expand access for rural students and especially supports Special Education students by providing high-quality, standards-aligned instruction tailored to students whose academic knowledge varies widely from age-level norms (McKissick et al., 2017, 2018).

- **Assistive technology enables communication and literacy.** Assistive technologies have consistently positive effects on literacy skills among students with disabilities, including those with Augmentative and Alternative

Communication (AAC) needs (Fernandez-Batanero et al., 2022; Pang & Datu, 2025; Stanger et al., 2016). As with other studies anchored in general classrooms, studies from Special Education report that effects are stronger when teachers actively assist learners with technology and are well-trained (Grynszpan et al., 2014).

- **Text-to-speech removes barriers to reading**. By converting printed words to spoken language, text-to-speech software allows students with reading difficulties to engage with grade-level content rather than being limited by decoding skills (Keelor et al., 2020).

Answers to Common Questions

Q: Does banning edtech harm students with disabilities or multilingual learners?

A: Yes. Evidence shows that we can harm these students when technology is <u>not</u> used.

Technology-integrated instruction demonstrates significant, positive effects for multilingual learners (Lee et al., 2022). For students who rely on text-to-speech to access grade-level text (Keelor et al., 2020), or Augmentative and Alternative Communication tools for communication and literacy (Stanger et al., 2016), or rely on digital language supports to engage with grade-level content (Zhang, 2022), technology is not supplemental to instruction. Its absence prevents their access to learning itself, fundamentally limiting learning potential.

Q: Does technology help students at risk?

A: Yes. Research shows consistent positive effects when using technology to support at-risk students.

The evidence is strongest for three groups of students who face barriers to learning. English learners demonstrate significant, positive effects from technology-integrated instruction (Lee et al., 2022; Zhang, 2022). Students with disabilities, including those with reading difficulties and significant communication needs, gain access to grade-level content through text-to-speech and Augmentative and Alternative Communication tools (Keelor et al., 2020; Stanger et al., 2016). Technology can also extend special education support, particularly in rural districts (McKissick et al., 2017, 2018). Students performing below grade-level expectations show disproportionately large gains in well-implemented platforms (Murphy et al., 2020; Roschelle et al., 2016). When students can access content and experience success, self-efficacy rises — enabling the productive academic struggle and sustained engagement that drive learning gains (Zhang, 2022).

Section 4 | Impact on Instruction

The quality of learning materials and approaches affects how well students learn. When materials (print or digital) are built and implemented in ways that align with learning science, they are more effective.

What the Evidence Says

- **The science of learning guides quality.** Products built in accordance with learning science principles help students learn better, regardless of whether they are in print, digital, or blended formats. These principles can make or break product quality (Clark & Mayer, 2023).

- **The impact of tech depends on the task and context.** Factors like product quality, implementation features, and student characteristics all affect impact. For example, edtech effectiveness depends on the subject area and task. Technology offers distinct advantages in math and science – such as personalization and dynamic visualizations – that support improved learning (Hillmayr et al., 2020). However, in literacy (both reading and writing), the picture is more complex: factors such as literacy level of the student, type of text (informational vs. narrative), complexity of text, and nature of the assignment all influence the relative advantages of digital vs. paper-based activities (Delgado et al., 2018; Furenes et al., 2021; Goodwin, 2020).

- **Digital tools work best alongside teacher instruction.** Edtech that replaces teacher-led instruction yields smaller learning gains than when it is used to support teacher-led instruction (e.g., Furenes et al., 2021; Grynszpan et al., 2014). However, because effective use depends on how well teachers use edtech in their instruction, teacher professional learning is a significant predictor of whether those gains appear (e.g., Hillmayr et al., 2020).

- **Digital assessment provides faster, more efficient feedback**. Digital assessment platforms enable immediate feedback to students, automatic disaggregation by subgroup, and selective grading, in which a teacher grades a portion of submitted work. These features align with what is known about the power of feedback to support student learning (Hattie & Timperley, 2007; Wisniewski et al., 2020) and effectively support practices such as screening and benchmarking, which contributed to profound academic gains in places like Mississippi, which employs a variety of digital assessments. Poorly designed assessments can impair student performance by taxing working memory (e.g., Støle et al., 2020), so it's very important that assessment platforms are built with an excellent user experience in mind (e.g., Clark & Mayer, 2023).

Answers to Common Questions

Q: Is there value in using more paper-based activities in school?

A: It depends. The format should match the learning activity.

Research suggests that matching the format of learning materials to instructional goals is ideal. Different pedagogical goals may be better suited to paper-based activities, such as early literacy and handwriting (James & Engelhardt, 2012), working with complex informational texts (Delgado et al., 2018), or "showing your work" in math (Graham, et al., 2020). In contrast, well-built technology usually offers distinct advantages that paper-based learning can never provide, such as interactive visualizations, dynamic simulations, and even simple push notifications when assignments are due (e.g., Hillmayr et al., 2020).

Q: Should digital tools replace teacher-led instruction?

A: No. Digital tools work best alongside teacher instruction.

Evidence shows that edtech produces larger learning gains when used alongside teacher-led instruction than when used as a substitute for it (e.g., Furenes et al., 2021; Grynszpan et al., 2014). Because effective use depends on how teachers integrate tools with curriculum and instruction, teacher professional learning is a significant predictor of whether those gains appear (e.g., Hillmayr et al., 2020).

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