Getting Down to FACTS

Redesigning Special Education: Leveraging Technology for Flexibility, Equity, and Inclusive Designs for Learning

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The accelerating development of educational technologies offers the promise of reshaping special education systems to be more responsive, flexible, and equitable (Rose et al., 2022; U.S. Department of Education, 2024). Historically, special education has grappled with reconciling the variability in student learning profiles by borrowing heavily from medical models that emphasized diagnosis, classification, treatment, and remediation (Annamma et al., 2022; Powell, 2021). Although these approaches were embedded in the original federal legislation mandating special education, their translation into educational contexts has been uneven and often constrained by limited capacity and inequitable access to resources (Education for All Handicapped Children Act of 1975; U.S. Department of Education, 2023).

Early implementation was marked by shortages of qualified personnel capable of conducting comprehensive assessments and delivering aligned services (McFarland et al., 2023; U.S. Government Accountability Office, 2022). Identification processes were further shaped by patterns of exclusion and inequitable opportunity to learn, contributing to persistent disproportionality across race, language, and disability (Fish, 2021; Sullivan & Bal, 2023). Within this system, categorical disability labels became organizing structures for placement and service delivery, reinforcing assumptions that diagnostic categories corresponded to distinct instructional approaches (Harry & Klingner, 2022; McLeskey et al., 2022).

In the 1970s and early 1980s, a series of research studies found that although systems for categorization and placement by disability label were in place, the instructional services delivered in classrooms did not differ substantially across categories; individualized education programs (IEPs) were developed, but instructional practices often remained largely uniform regardless of diagnostic classification (McLeskey et al., 2022; Powell, 2021). Moreover, evidence of consistent, substantial year-to-year academic progress for students with disabilities was limited, raising concerns about the effectiveness of services provided (Hanushek et al., 2021; McFarland et al., 2023). It was not until the U.S. Supreme Court clarified that students with disabilities must demonstrate meaningful educational progress in Endrew F. v. Douglas County School District RE-1 that families gained stronger legal footing to argue not only for access to schooling but for substantive educational benefit (Yell, Bateman, & Shriner, 2022).

Across many regions of the United States, persistent shortages of qualified personnel—including special educators, school psychologists, and related service providers—have constrained the ability of schools to fully implement federal mandates related to assessment, service delivery, and assistive supports (Bettini et al., 2022; U.S. Government Accountability Office, 2022). Early implementation of federal special education law was uneven, and systems for monitoring individualized student progress relied heavily on labor-intensive record keeping by educators and specialists. These structural challenges have persisted and continue to contribute to workforce instability and shortages (Bettini et al., 2022).

More broadly, governance and capacity challenges have characterized special education systems from their inception to the present. Extensive litigation in the 1970s and 1980s helped define the contours of a free appropriate public education, while subsequent reauthorizations of federal law have maintained these guarantees. However, federal funding has consistently fallen well below the originally envisioned 40 percent of excess costs, with recent contributions remaining closer to approximately 11–13 percent (U.S. Department of Education, 2023; Congressional Research Service, 2024).

Reconceptualizing Special Education

As the complexity of delivering diagnostic assessment and individualized planning became more apparent, researchers and system designers began to examine how education systems—distributed across diverse contexts with uneven access to specialized personnel—could function more effectively and equitably (McLeskey et al., 2022; U.S. Government Accountability Office, 2022).

Frameworks such as Multi-Tiered Systems of Support (MTSS) emerged to address these limitations by emphasizing prevention, early intervention, differentiated instruction, and continuous progress monitoring (California Department of Education, 2021; McIntosh & Goodman, 2021). However, recent scholarship highlights that MTSS can reproduce inequities when implemented through standardized, technocratic approaches that obscure structural disparities in opportunity to learn (Annamma et al., 2022; Ishimaru & Bang, 2022; Waitoller & King Thorius, 2023).

David Rose and colleagues advanced a series of foundational arguments suggesting that eligibility and program planning for students with disabilities should shift away from categorical diagnosis toward ensuring access and personalization of learning based on individual variability (Rose et al., 2022). Earlier work (Rose, 2001) introduced and elaborated the construct of Universal Design for Learning (UDL), drawing from principles in architecture and built environments to design educational systems that are accessible to all learners from the outset. This approach emphasized the use of flexible materials, assistive technologies, and multiple means of engagement, representation, and expression to address variability in sensory, motor, cognitive, and affective domains (CAST, 2024; Rose et al., 2022).

In addition, the rapid expansion of educational technologies—including learning analytics, adaptive systems, and artificial intelligence (AI)—has outpaced both educator preparation and system capacity (Edyburn, 2021; Ifenthaler & Schumacher, 2023; U.S. Department of Education, 2024). The COVID-19 pandemic exposed these gaps, revealing disparities in infrastructure, access, and instructional readiness (U.S. Department of Education, 2022; Ziedan et al., 2023). The convergence of shifting designs for learning along with technology advances creates a central tension: technology has the potential to support more responsive and individualized systems, yet without careful design, it may amplify existing inequities embedded in MTSS/RTI frameworks.

More personalization at each tier of assistance shifts responsibility for creating access, support, and feedback onto individual teachers and para-educators based on learning data from students and also increases the importance of troubleshooting specific access and output needs. Data systems that provide just-in-time information for educators to understand individual progress will be necessary in classrooms. Monitoring student progress will be crucial to delivering effective supports at the right time to support student learning and development. Implementation that is co-led by administrators, educators, families, students, and community partners and draws on shared inquiry across institutional boundaries, consistent with both transformative research on educational justice and California's MTSS framework. This is critical to advancing the opportunities created by harnessing AI agents to provide just-in-time data for use in classrooms to improve learning outcomes (California Department of Education, 2023; Ishimaru & Bang, 2022).

Critiques of MTSS/RTI and Risks of Technological Amplification

The shift from medicalized diagnosis models toward educational models grounded in access, design, and learning progress has been uneven and slow. At the same time, the rapid proliferation of educational technologies—including data systems for tracking and predicting student performance, artificial intelligence (AI), adaptive and assistive devices, and digital instructional platforms—has far outpaced both educator preparation and system-level capacity to implement these tools effectively and equitably (Edyburn, 2021; U.S. Department of Education, 2024; U.S. Government Accountability Office, 2022). This gap was made particularly visible during the COVID-19 pandemic, when disparities in broadband access, platform interoperability, and educator readiness exposed deep inequities in the infrastructure needed to support inclusive digital learning environments (U.S. Department of Education, 2022; Ziedan et al., 2023).

During the COVID crisis families and students became painfully aware of the disconnects between community infrastructures for online learning (community-wide bandwidth), local education agency (LEA) capacity to deliver online learning platforms that interfaced with family tools, and educators' knowledge and skills in using online learning platforms to deliver curriculum (Barron et al., 2026). Researchers have raised critical concerns about MTSS/RTI that are directly relevant to technology integration.

1. Deficit-based framing

MTSS/RTI frameworks, while designed to provide early and systematic support, can position students as problems to be remediated rather than as learners situated within inequitable systems of opportunity (Annamma et al., 2022; Sullivan & Bal, 2023). Such deficit-oriented framing risks being encoded into algorithmic systems trained on historically biased data, thereby reinforcing patterns of disproportionality in identification and intervention.

2. Tiered stratification

Although MTSS is often framed as an inclusive, prevention-oriented model, scholars note that its tiered structure can reproduce stratification by constructing general education as normative and intensified supports as separate or exceptional (Waitoller & King Thorius, 2023; McIntosh & Goodman, 2021). When digital platforms operationalize these tiers rigidly—through dashboards, risk scores, or automated grouping, they may further institutionalize separation rather than support fluid, inclusive instructional design.

3. Technocratic overreach

A growing body of research cautions against over-reliance on technical solutions that prioritize efficiency, standardization, and measurable outcomes over deeper engagement with cultural, relational, and contextual dimensions of learning (Ishimaru & Bang, 2022; Reich, 2020/2022). Within MTSS/RTI systems, this tendency can narrow instructional focus to what is easily quantified, potentially marginalizing culturally sustaining pedagogies and complex forms of student learning. AI-driven tools may intensify this dynamic by privileging predictive analytics over professional judgment and community knowledge.

4. Family and community marginalization

Despite MTSS's emphasis on collaboration, families and communities are often positioned peripherally in decision-making processes (Ishimaru, 2020/2022). Emerging research suggests that when families are meaningfully engaged as co-designers, particularly in technology-rich learning environments, more responsive and inclusive systems can emerge; however, without intentional design, digital systems may instead privilege professional and technical expertise, further distancing families from educational decision making (Handy et al., 2024; Ishimaru & Bang, 2022).

Taken together, these critiques underscore a central paradox: while emerging technologies hold significant potential to enhance responsiveness, personalization, and coordination within MTSS/RTI frameworks, they also risk amplifying existing inequities that reproduce deficit-based assumptions, rigid categorization, and technocratic decision-making logics embedded in current systems.

Assistive Technologies: From Possibility to Reality

In 2026, advances in technology offer a number of innovations for classroom learning designs including speech to text in real time, affording students with mobility impairments, dysgraphia, hearing impairments, and learning disabilities including autism the possibility of AI-powered dictation software for receiving information that can be a running record of what is being said or note-taking (Kooli & Chakraoui, 2025). Students with a variety of visual impairments can now access educational materials that offer seamless access to digital content, text-to-speech conversions and interactive learning functionalities such as frequent checks for understanding of vocabulary, main ideas, and links to additional content to hone understanding. Further, with access to an array of technologies, students along with their educators can sharpen their capacities to tailor technology for the needs of students. AI-generated tools can interpret complex layouts, maps, graphics, provide definitions for context-specific works, and summarize long passages. Voice assistants can support multi-turn interactions, reminders, scheduling, and instructional navigation. Sensory and motor assistants can help students navigate, anticipate barriers, and plan transfers from classroom to classroom or school to home routes. These aids are rapidly becoming more and more competent, promoting inclusivity and active engagement in the learning process.

Gesture recognition and voice command interfaces offer personally tailored solutions to increase accessibility, support student agency, and expand what can be learned within a lesson as well as deepen competencies over time. For students with motor, auditory processing, mobility, and speech impairments which delay or impede communication output and/or listener comprehension can benefit from AI-driven gesture recognition systems. Addressing individual needs transcends disability categories. A student, diagnosed with cerebral palsy, autism, cognitive disabilities, or language impairment, may benefit from using the same AI agent, that is capable of responding to the unique needs of individuals with a variety of communication pattens that relate to physical, sensory, cognitive, and/or social/emotional needs. Movements on the screen or towards the camera such as swiping, pinching, and head or hand gestures can enable autonomy over navigation through digital texts, slides, and multimedia presentations as well as small group discussion and teamwork. These opportunities emerge as AI tools learn to adapt to individual speech patterns and provide a variety of feedback to their users.

The possibilities are complicated by the rapidly changing landscape of AI. While seamless interaction is possible, AI agents remain challenged by accuracy of information synthesis, navigation difficulties created by the plethora of multimedia formats and internal programing. Algorithms may not be tailored for specific needs as well as the kinds of content encountered. The degree to which AI agents offer useful solutions to a student depends on AI features, accessibility and suitability for differing abilities. The readiness of the educational ecosystem into which they are introduced matters. Classrooms need to be outfitted with high quality audio environments, compatible devices, and stable internet access. Educators need to know how to design and adapt learning, optimizing the personalization that the AI agents afford. They need to be able to analyze the ways in which AI agents can interface effectively with the learners in any given learning context.

Data privacy and security remain serious concerns. Student progress data, communications between educators and students, and the use of data for larger analyses of student performance need appropriate safeguards at the individual, group, and population sampling levels.

The Promise of Technology in Special Education

The cognitive and administrative demands of differentiation have long constrained the effective implementation of Multi-Tiered Systems of Support (MTSS) and Response to Intervention (RTI). Teachers are expected to coordinate multiple tiers of intervention, conduct frequent progress monitoring, and design individualized instruction—requirements that are difficult to sustain in large, heterogeneous classrooms (McIntosh & Goodman, 2021; McLeskey et al., 2022).

Emerging educational technologies offer a pathway to reimagine special education as more flexible, responsive, and individualized. Advances in adaptive learning systems, embedded assessment, and collaborative data platforms make it increasingly feasible to align instruction with learner variability while reducing the administrative burden on educators (Edyburn, 2021; Ok et al., 2022; U.S. Department of Education, 2024). However, realizing this potential requires deliberate attention to equity, ethics, and system capacity. Without such attention, technological systems risk reinforcing existing inequities through biased data, uneven access, and technocratic decision-making (Ishimaru & Bang, 2022; Waitoller & King Thorius, 2023). Thus, researchers, practitioners, and policymakers must engage in coordinated inquiry to identify effective innovations, evaluate their impact, and design scalable systems that uphold inclusive and just educational practices. When thoughtfully implemented, technology can function not as a replacement for educators but as an enabling infrastructure that supports more equitable learning opportunities.

Several emerging technological affordances illustrate this potential.

Real-time progress monitoring: Digital platforms can integrate assessment within instruction, generating continuous data on student performance and enabling more timely and precise instructional adjustments (Edyburn, 2021).

Adaptive content delivery: AI-enabled systems can individualize pacing, scaffolding, and modality, supporting learner variability without requiring teachers to design multiple parallel lessons (Ok et al., 2022; Rose et al., 2022).

Collaboration and communication: Data systems and shared platforms can streamline documentation and support coordination among educators, specialists, and families, strengthening implementation fidelity and the social validity of interventions (U.S. Department of Education, 2024).

AI enabled tools: New modalities—including immersive environments and generative AI—offer the potential to create multisensory, customizable learning experiences and supports, though their educational validity and equity implications remain under active investigation (Holmes & Tuomi, 2022; U.S. Department of Education, 2024).

Together, these developments suggest that technology could help MTSS design move closer to its original goal of responsive, individualized support. At the same time, their effectiveness depends on whether systems are designed to center equity, family, student, and professional collaboration and judgment, and inclusive practice rather than increasing efficiency or standardization.

Equity-Centered Approaches to Technology Integration

To avoid reproducing inequities, technology integration within MTSS/RTI must be explicitly grounded in equity-centered frameworks, including Disability Critical Race Theory (DisCrit), which foregrounds the intersection of race and disability in shaping students' experiences of inclusion, exclusion, and opportunity (Annamma et al., 2022; Waitoller & King Thorius, 2023). Without such grounding, data-driven and AI-enabled systems risk encoding historical patterns of bias into identification, placement, and instructional decision making.

Designing technology-enhanced MTSS/RTI systems therefore requires attention to several interrelated dimensions:

Cultural responsiveness. Adaptive and AI-driven tools must account for diverse linguistic, cultural, and experiential repertoires rather than standardizing to dominant norms, which can misrepresent student competence and reinforce inequitable outcomes (Sullivan & Bal, 2023; Ok et al., 2022).

Social validity and Stakeholder alignment. Technologies must align with the values, goals, and lived experiences of students, families, and educators. Systems that privilege technical efficiency over stakeholders input risk low uptake and limited impact (McLeskey et al., 2022; Ishimaru & Bang, 2022).

Shared leadership. Effective implementation depends on distributed leadership across educators, families, and communities, supported by collaborative inquiry that spans institutional boundaries and centers local knowledge in system design (Ishimaru & Bang, 2022; Russell et al., 2021).

Workforce equity. Technology adoption must be coupled with efforts to recruit, retain, and support a diverse educator workforce. Without this, implementation risks reflecting dominant cultural assumptions embedded in both tools and institutional practices (Bettini et al., 2022; Waitoller & King Thorius, 2023).

Together, these considerations suggest that technology is not inherently equity-enhancing; rather, its impact depends on whether systems are intentionally designed to disrupt, rather than reproduce, existing patterns of exclusion.

Legal Requirements for Assistive Technology

Recent federal guidance has reaffirmed that assistive technology (AT) is not optional but a required component of special education under the Individuals with Disabilities Education Act (IDEA). The U.S. Department of Education clarified in 2024 that Individualized Education Program (IEP) teams must consider whether each student requires AT devices and services and must provide them when necessary to ensure a free appropriate public education (FAPE) (U.S. Department of Education, 2024a). This requirement applies to all students with IEPs and includes both devices and the services needed to effectively implement them.

When IEP teams lack sufficient expertise to make informed decisions about AT, they are required to involve individuals with appropriate knowledge, including consultation with state AT programs when relevant (U.S. Department of Education, 2024a). Importantly, the provision of a device alone does not satisfy legal obligations. Teams must engage in functional assessment of student needs, determine the appropriateness of specific technologies, and ensure alignment with individualized learning goals and outcomes.

Federal guidance further emphasizes that AT services include training and technical assistance for educators, families, and students to support effective implementation and ongoing evaluation of use (U.S. Department of Education, 2024a; U.S. Department of Education, 2023). These responsibilities fall to local education agencies (LEAs), and all AT devices and services must be documented within the IEP. Critically, technologies that are universally available to all students do not automatically meet the individualized requirements of IDEA; AT must be selected and adapted based on each student's specific needs.

Despite these clear legal expectations, implementation remains uneven. Schools face persistent challenges related to cost, procurement, and the professional learning required to integrate AT into everyday instruction (Edyburn, 2021; Smith et al., 2022). These challenges are compounded by broader workforce capacity issues, including shortages of specialized personnel and limited access to sustained training (Bettini et al., 2022; U.S. Government Accountability Office, 2022). As a result, ensuring that educators can effectively select, implement, and evaluate AT remains a significant systems-level responsibility, not simply an individual teacher task.

Delivering the Mandate

Educators responsible for full classrooms face ongoing challenges in ensuring that assistive and instructional technologies are available, functional, and effectively integrated into instruction. Many schools operate with limited technical support—often a single technology specialist serving an entire site or district—requiring educators to navigate troubleshooting and implementation demands alongside their instructional responsibilities (U.S. Government Accountability Office, 2022; U.S. Department of Education, 2024). As a result, daily triage decisions are necessary to address immediate needs related to device functionality, software reliability, and access to technical assistance, diverting time and attention from instruction (Edyburn, 2021; Smith et al., 2022). These pressures reflect broader, persistent gaps in infrastructure, staffing, and professional learning needed to support effective technology use in schools (Bettini et al., 2022; GAO, 2022).

At the same time, educational and assistive technologies have expanded rapidly, including systems for shared digital information, learning analytics capable of tracking and predicting student performance, mobile adaptive devices, and accessibility tools such as speech-to-text and text-to-speech (Bouck et al., 2021; Ifenthaler & Schumacher, 2023; U.S. Department of Education, 2024; UNESCO, 2023). However, the capacity of schools to adopt and sustain these tools has not kept pace with their proliferation. Costs associated with procurement, maintenance, and interoperability—as well as the sustained professional learning required for effective classroom integration—remain unevenly distributed and frequently under-resourced (Chita-Tegmark et al., 2021; Edyburn, 2021; U.S. Government Accountability Office, 2022). Consequently, the promise of technology to support individualized and accessible learning is often constrained by systemic limitations rather than technical capability alone.

Policy Implications

Equity-oriented integration of technology within tiered levels of support for students with disabilities requires coordinated action across local, state, and federal systems. Without alignment across these levels, technology risks reinforcing fragmentation and inequity rather than improving access and outcomes (Ishimaru & Bang, 2022; U.S. Department of Education, 2024).

Local (LEA/SELPA level). Districts and SELPAs should pilot technology-enhanced MTSS/RTI models that are co-designed with educators, families, and students, ensuring that implementation reflects local contexts and priorities. Professional learning must extend beyond tool use to include critical inquiry into equity, bias, and inclusive instructional design (McLeskey et al., 2022; Smith et al., 2022).

State level. States play a central role in building system capacity by establishing sustained funding streams for inclusive technology integration, supporting regional technical assistance infrastructures, and monitoring implementation for disproportionate outcomes across race, language, and disability (Sullivan & Bal, 2023; U.S. Department of Education, 2023). State leadership is also essential for coordinating data systems and ensuring interoperability across districts and service providers.

Federal level. Federal policy should prioritize investment in research and development of inclusive and accessible technologies, while establishing clear standards for interoperability, accessibility, and data governance. Recent federal guidance highlights the importance of protecting student privacy and ensuring that data systems are used to support—not constrain—equitable educational opportunities (U.S. Department of Education, 2024; U.S. Government Accountability Office, 2022). Incentivizing rigorous, equity-focused evaluation of technology-enabled interventions is critical to avoid scaling tools that reproduce existing disparities.

The convergence of MTSS frameworks and emerging technologies presents both opportunity and risk. Technology can enhance responsiveness, reduce educator burden, and support more flexible systems of learning. However, these benefits are not guaranteed. Without intentional, equity-centered design, technologies may reinforce the same inequities they aim to address.

Advancing the field requires moving beyond questions of efficacy to consider how systems shape opportunity, participation, and outcomes. For policymakers, this means aligning governance, funding, and accountability structures with inclusive goals. For researchers, it requires sustained attention to equity, validity, and context. For practitioners, it demands tools and supports that enhance—not replace—professional expertise.

Ultimately, the goal is not simply more efficient special education, but more just, inclusive, and responsive systems. Technology, thoughtfully integrated, can serve as a catalyst for this transformation.

The California Conundrum: Persistent Barriers and Emerging Opportunities

California continues to wrestle with serving students with disabilities due to a number of factors distilled here into three major barriers: Cost, infrastructure, and educator training. California served 9% of its school-aged population through special education services in 1984-85. It now serves about 15%, based on figures from the 2024-25 school year. The federal government, in spite of a 50 year old promise to fund about 40% of special education costs has never appropriated more than about 11% of special education services across the country. Thus, the burden of special education costs falls on local education agencies (LEAs). The persistent exodus of special educators reflects structural working conditions—particularly excessive workloads, administrative burdens, and limited administrative support—that are consistently associated with burnout, reduced job satisfaction, and increased attrition (EdResearch for Action, 2024; NCTQ, 2025; U.S. Commission on Civil Rights, 2025). These issues have been reported since the 1990s and have led to several national critiques of special education services.

Turnover

As a result of persistent turnover among qualified special educators, California school districts and SELPAs increasingly rely on underprepared educators, including those working under emergency permits and waivers. Over a recent five-year period, California issued approximately 24,548 waivers and emergency permits for special education positions compared to 17,726 new credentials, indicating that underprepared hires now outpace fully credentialed entrants into the field (CA Legislative Analyst's Office (CLAO, 2025). These staffing challenges are not evenly distributed: schools serving higher proportions of low-income students and multilingual learners are significantly more likely to employ teachers on waivers or emergency credentials (CLAO, 2025).

Nationally representative data indicate that 21% of schools report at least one special education vacancy and 55% report difficulty filling positions, with special education consistently identified as one of the hardest-to-staff areas (Gilmour et al, 2023). Shortages are not evenly distributed: schools serving higher proportions of students from low-income backgrounds and racially minoritized communities experience significantly higher vacancy rates and greater reliance on underprepared teachers (Gilmour et al., 2023)

In California, districts report pervasive staffing strain, with nearly 90% of schools experiencing difficulty filling teaching positions and roughly 70% reporting overall understaffing (Proxmity Learning, 2025). As a result, districts increasingly adopt hybrid staffing approaches, including contracting with private providers, teletherapy services, and regionalized SELPA supports to meet IDEA service obligations.

Shortages extend beyond teachers to related service providers. Demand for speech-language pathologists, occupational therapists, and physical therapists continues to grow, while supply has not kept pace, contributing to service delays and reduced access to required supports (Gilmour et al., 2023). Labor market conditions further exacerbate these shortages, as professionals in these fields can access higher-paying and less administratively complex positions in medical and private-sector settings.

Similarly, workforce constraints reshape the role of school psychologists, who frequently report spending the majority of their time on compliance-driven eligibility determination rather than delivering preventive or mental health services. Across roles, persistent shortages contribute to high workload, burnout, and attrition. National estimates suggest that approximately 15% of special educators leave their positions annually, further destabilizing staffing pipelines (Gilmour et al., 2023). In response, some special educators transition into general education roles, where responsibilities for assessment, progress monitoring, and instructional planning are more distributed, reducing role strain. Within California's SELPA structure, these dynamics collectively underscore a system in which staffing instability, inequitable distribution of qualified personnel, and increasing service demands intersect to constrain the delivery of individualized, legally mandated supports.

Framing Special Education Delivery System through tiered support systems

The rapid expansion of new technologies presents a transformative opportunity for the field of special education, particularly within tiered support system frameworks. Special education has long struggled to reconcile the wide variability in student learning profiles with the limited structural flexibility of schools. Each student arrives with distinct cognitive, social, and emotional strengths and challenges, and even within a single student, these abilities can fluctuate over time and across contexts. Traditional instructional approaches, even when carefully designed, have difficulty adapting to these dynamics at scale. MTSS frameworks were explicitly created to address such variation by integrating systematic screening, progress monitoring, and tiered intervention. Yet in practice, implementation has often fallen short due to systemic rigidity, resource constraints, and the immense cognitive burden placed on educators tasked with individualizing instruction for large, diverse groups of learners. Educators and related service personnel roles and responsibilities have not substantially transformed in spite of the shifts in what and where their expertise and practice responsibilities lie within education systems.

Recent technological advances, particularly in data analytics, adaptive learning platforms, and artificial intelligence (AI), offer powerful tools to support educators in achieving the core promise of MTSS/RTI. These innovations can reduce educators’ cognitive load of identifying and planning for individual differentiation, enabling schools to become more flexible, responsive, and equitable in their approach to special education. For researchers and policymakers, the task now is to identify leverage points where technology can yield the greatest benefits, assess the readiness of existing and emerging tools, and design processes for responsible selection and large-scale implementation.

Leverage Points for Technology Integration

One of the most significant leverage points for technology lies in real-time progress monitoring. MTSS relies on frequent assessments to track student growth and inform instructional adjustments. However, administering and analyzing these assessments has often been labor-intensive and slow. Emerging technologies such as AI enable continuous data capture through embedded digital assessments, natural language processing, and behavioral tracking, thereby providing teachers with immediate insights into student performance. Automating progress monitoring allows educators to intervene earlier and with greater precision.

Another leverage point is adaptive content delivery. Digital learning platforms can adjust the difficulty, modality, and pacing of material in real time, tailoring instruction to individual learners without requiring educators to manually redesign lesson plans for each student. When integrated into MTSS/RTI tiers of intervention and support, adaptive platforms can extend high-quality core instruction to all students while reserving specialized interventions for those who need them most.

Finally, technologies that support communication and collaboration are critical. Special education is inherently interdisciplinary, requiring coordination among general educators, specialists, families, and students themselves. Digital platforms that streamline documentation, intervention planning, and stakeholder communication reduce fragmentation and ensure that interventions are coherent and consistently applied.

Current and Emerging Tools

Several tools already demonstrate promise in supporting differentiated instruction. Learning management systems with integrated analytics, adaptive literacy and numeracy platforms, and speech-to-text and text-to-speech tools are increasingly commonplace. AI-powered systems are expanding these capacities, offering personalized feedback, automated grading, and predictive analytics that flag students at risk before difficulties become entrenched. Beyond academics, wearable devices and emotion-recognition software may help track social-emotional states, enabling more holistic support for students with disabilities.

Emerging technologies such as generative AI open additional possibilities, from automatically producing customized instructional materials to serving as real-time assistants for teachers managing complex classrooms. Virtual and augmented reality tools, though less widely implemented, may enhance engagement for students with diverse learning needs by offering immersive and multisensory environments.

Challenges and Processes for Implementation

Despite these opportunities, integrating technology into special education poses significant challenges.

Chief among them are equity and access. Students with disabilities are often concentrated in under-resourced schools, which may lack the infrastructure to implement advanced tools. Without intentional policy design, new technologies risk widening existing disparities. Data privacy and ethical considerations also loom large: sensitive information about students with disabilities must be protected, and algorithms must be carefully monitored for bias that could reinforce disproportionality in special education identification and placement.

Implementing technology at scale requires robust processes. Policymakers should establish evidence-based vetting systems that evaluate the effectiveness, accessibility, and equity impacts of emerging tools. Researchers must design longitudinal studies to assess not only academic outcomes but also broader impacts on student well-being, teacher workload, and systemic flexibility. Professional development is critical: educators need training to effectively integrate tools into MTSS/RTI, not as replacements for their professional judgment but as amplifiers of their expertise.

Policy Implications

Persistent gaps in special education capacity—particularly in California's decentralized SELPA system—underscore that technology integration within MTSS/RTI is not primarily a technical challenge but a governance and systems-design problem. Without coordinated policy, new technologies risk layering additional complexity onto already strained systems rather than improving responsiveness or equity (Bettini et al., 2022; U.S. Government Accountability Office, 2022). Effective integration therefore requires alignment across local, state, and federal levels, with explicit attention to equity, workforce capacity, and system coherence.

Local (LEA/SELPA level). At the point of implementation, districts and SELPAs must move beyond policy adoption toward co-designed, context-sensitive implementation models. Evidence from improvement science and inclusive education research suggests that technology is most effective when developed through iterative collaboration with educators, families, and students, rather than imposed as external solutions (Ishimaru & Bang, 2022; Russell et al., 2021). Professional learning must similarly shift from tool training to inquiry-based models that integrate data use, instructional design, and equity-focused reflection, particularly given persistent workforce instability and uneven preparation in special education and technology integration (Bettini et al., 2022; Smith et al., 2022).

State (California context). States play a critical intermediary role in addressing fragmentation across districts. In California, this includes aligning SELPA governance, funding, and accountability structures with MTSS and inclusive technology goals. State policy should prioritize sustained funding for infrastructure and professional learning, expand regional technical assistance networks, and monitor implementation for disproportionate outcomes across race, language, and disability (California Department of Education, 2021; Sullivan & Bal, 2023). From a learning sciences perspective, state systems must also support interoperability and data coherence, enabling educators to use information across platforms without increasing administrative burden (Ifenthaler & Schumacher, 2023).

Federal level. Federal policy is essential for setting baseline expectations and reducing interstate inequities. Recent federal guidance emphasizes accessibility, interoperability, and data privacy as core requirements for educational technology systems (U.S. Department of Education, 2024). Beyond standards, federal investment should prioritize research and development focused on inclusive, bias-aware technologies and fund longitudinal evaluations that examine not only academic outcomes but also impacts on identification, placement, and opportunity to learn (Holmes & Tuomi, 2022; U.S. Department of Education, 2023). Addressing the longstanding gap between IDEA's funding commitments and actual appropriations remains critical to ensuring that LEAs can implement these innovations without exacerbating resource inequities.

Across all levels, the central policy challenge is coherence: aligning technology, workforce capacity, and governance structures to support inclusive practice. Absent this alignment, technology will likely amplify existing inequities in access, identification, and service delivery rather than transform them.

At the local level, school districts can pilot technology-enhanced MTSS/RTI models, leveraging partnerships with research institutions to iteratively refine implementation. States can incentivize adoption by aligning funding streams with evidence-based technology integration and by establishing technical assistance centers to support districts. At the federal level, investments in research and development are essential, as is the creation of national standards for accessibility, privacy, and equity in educational technologies. Federal policy can also promote interoperability, ensuring that tools adopted across different jurisdictions can communicate seamlessly within existing student information systems.

Implementation-Year Cost

A planning estimate for a high-quality professional learning (PL) initiative that builds special education teachers' capacity to use artificial intelligence (AI) for progress monitoring, goal calibration, work-sample analysis, and sequenced intervention design is approximately $4,500–$6,500 per teacher in the implementation year. This estimate aligns with cost studies of professional development (PD) that distinguish workshop-based learning from coaching-intensive models, with the latter consistently demonstrating stronger effects on teacher practice (Kraft et al., 2018; Raudenbush et al., 2017). Per-contact-hour estimates for PD and coaching (approximately $138–$169) further support the cost structure of multi-day institutes paired with job-embedded coaching cycles (Knight, 2018; Goldhaber et al., 2020). Additional costs for release time are grounded in prevailing district substitute rates, while near-term access to AI tools may be partially offset by free educator licenses; however, sustained implementation typically requires district-supported data systems, governance structures, and workflow integration. Importantly, the cost profile reflects evidence that practice-based, coached, and data-anchored PL—rather than one-time workshops—is necessary to produce measurable changes in instruction and student outcomes (Darling-Hammond et al., 2017).

Table 1

Estimated Year 1 Cost of High-Quality Professional Learning for AI-Supported Special Education Practice

Cost Component	Description	Cost per Teacher (USD)
Foundational Institute (18 hours)	AI literacy, ethics, IEP-aligned goal tracking, progress monitoring, work-sample analysis, intervention sequencing	$2,500–$2,850
Job-Embedded Coaching (8–10 hours)	Coaching cycles, case consultation, MTSS/IEP alignment, feedback on implementation	$1,350–$1,700
Release Time / Substitute Coverage	3 days for training, planning, and data inquiry cycles	$750–$1,060
AI Tools and Infrastructure	AI access, data systems integration, compliance supports	$0–$900
Total Estimated Cost (Year 1)		$4,600–$6,510

Note. Estimates synthesized from PD cost studies and current district expenditure patterns (Darling-Hammond et al., 2017; Goldhaber et al., 2020; Kraft et al., 2018).

Sustained Implementation and Impact (Years 2–3)

In Years 2 and 3, costs shift from initial capacity building to sustained implementation, instructional refinement, and outcome monitoring, with estimated annual expenditures of $1,200–$2,800 per teacher. At this stage, the focus moves to examining teacher practice within classrooms, using AI-supported analytics to evaluate both instructional delivery and student response to intervention within a Universal Design for Learning (UDL) framework (CAST, 2018). Teachers engage in structured inquiry cycles in which AI tools support the analysis of student work samples, rate alignment between instructional strategies and IEP goals, and generate adaptive intervention sequences. Concurrently, learning metrics for teacher practice—such as fidelity of UDL implementation, responsiveness to student data, and differentiation quality—are paired with student-level indicators including rate of progress toward goals, generalization of skills, and reduction in intensive supports. Research on sustained PD and coaching indicates that continued, lower-intensity support is critical for maintaining gains and embedding new practices into routine instruction (Kraft et al., 2018; Darling-Hammond et al., 2017). Thus, ongoing investment supports not only technical tool use but also the integration of AI into instructional decision-making systems, which is necessary for realizing improvements in student outcomes.

Table 2

Estimated Annual Cost for Sustained AI-Enabled Instructional Improvement (Years 2–3)

Cost Component	Description	Annual Cost per Teacher (USD)
Refresh Professional Learning	Advanced AI applications, updates to tools, onboarding new staff	$200–$600
Coaching and Data Inquiry Cycles	Classroom observation, feedback, collaborative data review (4–6 hours/year)	$400–$1,200
AI Tools and Data Systems	Continued platform access, analytics dashboards, compliance supports	$300–$1,000
Collaborative Planning Time	Structured team-based review of student data and intervention design	$300–$800
Total Estimated Annual Cost (Years 2–3)		$1,200–$2,800

Note. Sustained implementation costs reflect reduced intensity relative to Year 1 and emphasize embedding practices into instructional routines (Kraft et al., 2018).

Implementation-Year Cost

Within California's special education finance structure, a high-quality professional learning (PL) initiative to build special education teachers' capacity to use AI for progress monitoring, goal calibration, work-sample analysis, and sequenced intervention planning can be conceptualized as a regionalized SELPA investment layered onto AB 602 base funding and IDEA Part B set-asides. A defensible estimate remains approximately $4,500–$6,500 per teacher in the implementation year, but the cost distribution shifts across governance levels. SELPAs are well-positioned to underwrite core training and coaching through regionalized economies of scale, while local education agencies (LEAs) absorb personnel release time and site-based implementation costs. Federal IDEA Part B funds (particularly proportionate share and Coordinated Early Intervening Services where applicable) can support aspects of professional learning tied to improved service delivery, while state AB 602 base grants and local contributions provide the primary fiscal base (California Department of Education [CDE], 2023). This structure reflects the statutory role of SELPAs in coordinating services, pooling resources, and ensuring program quality across member LEAs. Consistent with the professional learning literature, the largest cost drivers remain coaching and job-embedded implementation, rather than technology itself, underscoring that system improvement depends on changes in instructional practice rather than tool adoption alone (Darling-Hammond et al., 2017; Kraft et al., 2018).

Table 3

SELPA-Aligned Distribution of Year 1 Costs for AI-Supported Professional Learning

Cost Component	Description	Funding Responsibility (Typical)	Cost per Teacher (USD)
Foundational Institute (Regionalized)	AI literacy, compliance, IEP alignment, data use, intervention design	SELPA (pooled AB 602 + local contributions)	$2,500–$2,850
Job-Embedded Coaching	Cross-LEA coaching, specialist support, MTSS alignment	SELPA + LEA shared (IDEA Part B allowable)	$1,350–$1,700
Release Time / Substitute Coverage	Teacher participation in training and data cycles	LEA (site-based expenditure)	$750–$1,060
AI Tools & Data Infrastructure	Platforms, dashboards, compliance safeguards	LEA primary; SELPA optional coordination	$0–$900
Total Estimated Cost (Year 1)			$4,600–$6,510

Note. SELPAs function as intermediaries that can reduce per-teacher costs through shared contracts, regional coaching models, and coordinated implementation.

Sustained Implementation (Years 2–3, SELPAs)

In Years 2 and 3, SELPA-aligned investment shifts toward continuous improvement systems, with annual costs of approximately $1,200–$2,800 per teacher distributed across SELPA and LEA responsibilities. At this stage, SELPAs play a central role in facilitating cross-district data inquiry cycles, maintaining shared AI-enabled analytic tools, and supporting calibration of instructional practices across sites. Teachers engage in iterative cycles of analyzing student work, monitoring IEP goal progress, and refining instruction using AI-generated supports aligned with Universal Design for Learning (UDL) principles (CAST, 2018). Importantly, this phase introduces dual-layer metrics: (a) teacher practice indicators (e.g., fidelity of UDL implementation, responsiveness to progress data, alignment between instruction and goals), and (b) student outcome indicators (e.g., rate of progress toward IEP goals, generalization of skills, reduced need for intensive services). IDEA Part B funds may support ongoing professional learning tied to improved outcomes, while AB 602 base funding sustains personnel and system infrastructure. Research on sustained professional learning emphasizes that ongoing, lower-intensity coaching and collaborative inquiry are necessary to institutionalize new practices and prevent regression to prior instructional routines (Kraft et al., 2018; Darling-Hammond et al., 2017). Thus, SELPA-coordinated systems are critical for maintaining coherence, equity, and scale across diverse LEAs.

Table 4
SELPA-Aligned Annual Costs and Continuous Improvement Functions (Years 2–3)

Cost Component	Description	Funding Responsibility (Typical)	Annual Cost per Teacher (USD)
Advanced / Refresh Professional Learning	Updates to AI tools, onboarding, advanced applications	SELPA-led (regionalized)	\$200–\$600
Coaching & Data Inquiry Cycles	Classroom observation, feedback, cross-site calibration	SELPA + LEA shared	\$400–\$1,200
AI Tools & Data Systems	Ongoing platform access, analytics, compliance	LEA primary; SELPA coordination	\$300–\$1,000
Collaborative Planning Time	Team-based review of student data and intervention design	LEA	\$300–\$800
Total Estimated Annual Cost (Years 2–3)			\$1,200–\$2,800

Summary

Within California's SELPA-based governance structure, investments in AI-enabled professional learning can be efficiently distributed across regional and local funding streams, leveraging economies of scale while maintaining site-level instructional responsiveness. This approach aligns fiscal responsibility with functional roles: SELPAs coordinate expertise and infrastructure, while LEAs operationalize instructional change.

Conclusion

The convergence of new technologies with MTSS/RTI frameworks offers both promise and peril. Technologies can reduce educator burden, enhance responsiveness, and create more flexible systems of support. Yet, as critiques from Artiles (2015), Kozleski (2020), Waitoller and Thorius (2016), and others remind us, MTSS/RTI frameworks are not neutral; they are embedded in inequitable systems. Without intentional, equity-centered integration, new technologies may reproduce exclusionary patterns under the guise of efficiency.

For researchers, this means expanding inquiry beyond efficacy to include questions of cultural responsiveness, disproportionality, and social validity. For policymakers, it means creating structures that ensure technologies are accessible, ethical, and equity-enhancing. It also requires a commitment to ensuring that the workforce has the tools, the knowledge, and the support needed to effectively and equitably support infant, toddler, and student learning. Ultimately, the goal is not only to make special education more efficient but also to make it more just, inclusive, and responsive to the lived experiences of students with disabilities and their families. Technologies, critically leveraged, can become catalysts for realizing this vision.

The convergence of MTSS frameworks and emerging technologies presents both opportunity and risk. Technology can enhance responsiveness, reduce educator burden, and support more flexible systems of learning. However, these benefits are not guaranteed. Without intentional, equity-centered design, technologies may reinforce the same inequities they aim to address.

Advancing the field requires moving beyond questions of efficacy to consider how systems shape opportunity, participation, and outcomes. For policymakers, this means aligning governance, funding, and accountability structures with inclusive goals. For researchers, it requires sustained attention to equity, validity, and context. For practitioners, it demands tools and supports that develop and enhance —not replace—professional expertise.

The goal is efficient, effective, caring special education constructed on and through just, inclusive, and responsive systems. Technology, thoughtfully integrated, can serve as a catalyst for this transformation.

Getting Down to FACTS

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