



Designing a National Inclusive Mathematics and MTSS Framework for Diverse Learners, Including English Language Learners and Deaf/Hard-of-Hearing Students

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Abstract

Despite sustained federal investment in standards-based reform and accountability, mathematics achievement gaps persist for English Language Learners (ELLs), students with disabilities, and Deaf/Hard-of-Hearing (D/HoH) learners across the United States. National data indicate that these populations continue to demonstrate significantly lower mathematics proficiency rates compared to their peers, particularly in secondary education and high-poverty school districts¹. While Multi-Tiered Systems of Supports (MTSS) have been widely adopted as a framework for addressing academic and behavioral challenges, their implementation in mathematics instruction remains fragmented, inconsistently aligned with accessibility requirements, and insufficiently integrated with language development and special education systems.

Building on that instructional and systems-design foundation, this article advances the discourse by focusing on the educator workforce and leadership infrastructure necessary to operationalize and sustain inclusive MTSS frameworks at scale. Rather than reiterating instructional design, this companion paper examines teacher capacity development, micro-credentialing, instructional coaching, and leadership pipelines as critical mechanisms for implementation. Together, the two articles form a complementary, systems-level contribution to national discussions on educational equity, demonstrating both *what* inclusive mathematics and MTSS frameworks should entail and *how* education systems can build the professional capacity required to implement them effectively and sustainably.

Keywords

Inclusive mathematics, MTSS, English Language Learners, Deaf and Hard-of-Hearing students, Universal Design for Learning, special education policy, instructional equity



I. Introduction

Mathematics proficiency is a critical predictor of academic persistence, postsecondary access, and long-term economic participation. Proficiency in mathematics correlates strongly with graduation rates, college readiness, and workforce competitiveness in science, technology, engineering, and mathematics (STEM) fields². Yet for millions of students in the United States—particularly English Language Learners (ELLs), students receiving special education services, and Deaf/Hard-of-Hearing (D/HoH) learners equitable access to high-quality mathematics instruction remains elusive.

Despite decades of reform efforts, achievement gaps in mathematics have proven stubbornly persistent. National Assessment of Educational Progress (NAEP) data reveal that ELLs and students with disabilities consistently score below national averages at both the fourth- and eighth-grade levels³. These disparities widen as students progress into secondary education, where mathematics content becomes increasingly abstract and language-dependent. For D/HoH learners, instructional barriers are compounded by inconsistent access to qualified personnel, limited availability of visual-gestural mathematics resources, and insufficient alignment between general education curricula and accessibility standards⁴.

Federal education policy has increasingly emphasized inclusive practices, evidence-based intervention, and accountability for subgroup outcomes. The Individuals with Disabilities Education Act (IDEA) mandates access to the general education curriculum, while the Every Student Succeeds Act (ESSA) requires states to address achievement gaps through evidence-based strategies⁵. Additionally, the U.S. Department of Education promotes Multi-Tiered Systems of Supports (MTSS) as a comprehensive framework for academic and behavioral intervention. However, in practice, mathematics instruction for diverse learners often remains siloed from MTSS processes, language development services, and Deaf education methodologies.

This article argues that meaningful progress requires a coherent, national framework that integrates inclusive mathematics instruction with MTSS implementation, accessibility mandates, and teacher capacity development. The proposed National Inclusive Mathematics and MTSS Framework seeks to address this need by offering a scalable, evidence-based model aligned with federal priorities and grounded in instructional research.

II. Literature Review

A. Mathematics Achievement and Educational Equity

Research consistently demonstrates that mathematics achievement disparities are closely linked to broader inequities in educational access and instructional quality. Students from linguistically diverse backgrounds and those with disabilities are more likely to encounter reduced instructional rigor, lowered expectations, and limited access to advanced



coursework⁶. These inequities are particularly pronounced in mathematics, where instruction often relies heavily on linguistic complexity, abstract reasoning, and culturally specific problem contexts.

ELLs face unique challenges in mathematics classrooms. Although mathematics is sometimes perceived as language-neutral, research shows that mathematical reasoning is deeply embedded in language, including vocabulary, syntax, and discourse practices⁷. Without intentional language scaffolding, ELLs may struggle to access mathematical concepts even when they possess the underlying cognitive skills.

For D/HoH learners, access barriers extend beyond language proficiency to include modality of instruction. Studies indicate that visual-gestural representations, explicit conceptual modeling, and accessible assessments are essential for equitable mathematics instruction for Deaf students⁸. However, such practices are inconsistently implemented across educational settings.

B. MTSS and Inclusive Instruction

MTSS has emerged as a dominant framework for organizing academic and behavioral supports in U.S. schools. Rooted in Response to Intervention (RTI) models, MTSS emphasizes tiered instruction, progress monitoring, and data-driven decision-making⁹. When implemented with fidelity, MTSS has been shown to improve early identification of learning needs and reduce inappropriate special education referrals.

Despite its promise, MTSS implementation in mathematics instruction remains uneven. Research suggests that many schools adopt MTSS as a compliance mechanism rather than a fully integrated instructional system¹⁰. Mathematics interventions are frequently disconnected from core instruction, language support, and IEP goal alignment. As a result, students with complex learning profiles may receive fragmented or redundant services that fail to produce sustained academic gains.

C. Universal Design for Learning and Accessibility

Universal Design for Learning (UDL) provides a theoretical and practical framework for designing instruction that accommodates learner variability from the outset. UDL emphasizes multiple means of representation, engagement, and expression¹¹. In mathematics instruction, UDL-aligned practices include visual models, manipulatives, multiple problem-solving pathways, and flexible assessment formats.

While UDL is widely endorsed in policy and research, its application in mathematics classrooms serving ELL and D/HoH learners is inconsistent. Teachers often lack the training and resources necessary to operationalize UDL principles effectively, particularly in secondary mathematics contexts¹².



III. Policy and Legal Framework

A. Federal Statutory Alignment

The proposed National Inclusive Mathematics and MTSS Framework is grounded in existing federal statutes and guidance. IDEA requires that students with disabilities have access to the general education curriculum and that instructional decisions be informed by measurable progress toward individualized goals¹³. ESSA reinforces this mandate by requiring states to implement evidence-based interventions and monitor subgroup performance.

Title VI of the Civil Rights Act and subsequent Office for Civil Rights (OCR) guidance impose language access obligations on public schools, including meaningful access for ELLs¹⁴. For D/HoH students, additional protections arise under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act (ADA).

B. Alignment with Federal Guidance on MTSS

The U.S. Department of Education has repeatedly emphasized MTSS as a vehicle for improving academic outcomes and ensuring equitable access to instruction¹⁵. However, federal guidance also cautions that MTSS must not be implemented in ways that delay or deny appropriate services. The proposed framework responds to this guidance by integrating MTSS with inclusive mathematics instruction and accessibility requirements rather than treating them as separate initiatives.

IV. Methodological Framework for Inclusive Mathematics and MTSS

A. Framework Design Rationale

The National Inclusive Mathematics and MTSS Framework is designed as a **systems-level intervention** rather than a standalone curriculum. Its purpose is to align instructional practice, professional development, and accountability structures across educational contexts. The framework emphasizes scalability, recognizing the diversity of state and district capacities.

B. Core Components

The framework consists of five interrelated components:

1. **Inclusive Mathematics Instruction** grounded in UDL and evidence-based pedagogy
2. **MTSS Integration** across Tier 1, Tier 2, and Tier 3 supports
3. **Language and Accessibility Alignment** for ELL and D/HoH learners
4. **Teacher Capacity Building** through structured professional development
5. **Data-Driven Evaluation and Accountability**



Each component is designed to reinforce the others, creating a coherent instructional ecosystem rather than a collection of discrete interventions.

Part II – Implementation Models and System Design

V. National Implementation Architecture

A. Rationale for a Multi-Level Implementation Model

Effective national reform in mathematics education requires a balance between **federal coherence and local flexibility**. Research on large-scale instructional reform demonstrates that initiatives fail when they rely solely on top-down mandates or isolated pilot programs¹⁶. Accordingly, the proposed National Inclusive Mathematics and MTSS Framework is structured as a multi-level implementation architecture encompassing classroom, school, district, and state systems.

This architecture recognizes that inclusive mathematics instruction is not merely a pedagogical issue but a systems-design challenge involving curriculum alignment, professional learning, compliance structures, and accountability mechanisms.

B. Tiered Implementation Levels

1. Classroom-Level Implementation

At the classroom level, the framework operationalizes inclusive mathematics through:

- UDL-aligned lesson design
- Visual, linguistic, and representational scaffolds
- Co-teaching and collaborative instructional models
- Embedded formative assessment

Teachers implement Tier 1 inclusive mathematics instruction accessible to the widest range of learners, thereby reducing reliance on pull-out or segregated services. Tier 2 and Tier 3 supports are layered without removing students from rigorous mathematical discourse.

Research indicates that when inclusive Tier 1 instruction is robust, referrals to intensive intervention decrease while overall achievement increases¹⁷.

2. School-Level Implementation

At the school level, the framework integrates inclusive mathematics into **MTSS infrastructure**, including:

- Universal screening protocols



- Data team structures
- Intervention scheduling and resource allocation
- Fidelity monitoring tools

Schools establish interdisciplinary MTSS teams that include general educators, special educators, ELL specialists, and Deaf/HoH service providers. Mathematics data are analyzed alongside language proficiency and IEP goal progress to ensure coherent decision-making.

3. District-Level Implementation

Districts function as the **primary scaling agents** for the framework. Responsibilities include:

- Curriculum adoption aligned with inclusive mathematics principles
- District-wide professional development systems
- Data governance and reporting
- Compliance alignment with IDEA, ESSA, and civil rights obligations

District leadership ensures consistency across schools while allowing contextual adaptation. Research on district-led reform shows that sustained instructional improvement depends on coherent leadership, not isolated school initiatives¹⁸.

4. State-Level and Inter-State Alignment

At the state level, the framework aligns with:

- State standards and accountability systems
- Teacher licensure and endorsement requirements
- State MTSS guidance documents

States may also collaborate regionally to develop shared professional learning resources, reducing duplication and cost while increasing consistency.

VI. Teacher Capacity Building and Workforce Development

A. National Shortage of Inclusive Mathematics Expertise

A persistent barrier to inclusive mathematics reform is educators' limited preparation to serve linguistically and modality-diverse learners. National studies indicate that most teacher preparation programs provide minimal coursework in inclusive mathematics, MTSS integration, or Deaf education strategies¹⁹.

The proposed framework addresses this gap through a **tiered professional learning model**.



B. Professional Learning Structure

1. Foundational Micro-Credentials

Educator's complete micro-credentials in:

- Inclusive mathematics pedagogy
- MTSS fidelity in mathematics
- Language scaffolding for ELLs
- Visual-gestural strategies for D/HoH learners

Micro-credentials are aligned with ESSA evidence tiers and stack toward advanced endorsements.

2. Instructional Coaching and Communities of Practice

Professional learning is reinforced through:

- Embedded instructional coaching
- Lesson study and peer observation
- Data-informed reflection cycles

Research demonstrates that coaching combined with collaborative inquiry yields stronger instructional change than workshop-based training alone²⁰.

3. Leadership Development

School and district leaders receive targeted training in:

- Inclusive instructional leadership
- Compliance-informed decision-making
- Resource allocation for MTSS sustainability

Leadership capacity is essential for maintaining fidelity and scaling impact²¹.

Part III – Case Applications and Practice Scenarios

VII. Illustrative Case Applications

To demonstrate practical feasibility, this section presents **representative application scenarios** reflecting common U.S. educational contexts.



A. Urban Secondary School with High ELL Enrollment

In a large urban high school with significant ELL enrollment, mathematics failure rates exceeded state averages. Implementation of the framework resulted in:

- Redesigned Tier 1 math instruction with language scaffolds
- Integration of math and English language development objectives
- Reduced reliance on remedial pull-out programs

Within two academic years, math proficiency increased, and course failure rates declined. Similar outcomes have been documented in districts that have adopted integrated language-and-content models²².

B. Suburban District Serving Deaf and Hard-of-Hearing Students

A suburban district with a regional Deaf education program adopted the framework to align math instruction with accessibility standards. Key outcomes included:

- Increased use of visual modeling and conceptual mapping
- Improved assessment accessibility
- Enhanced collaboration between math teachers and interpreters

Research supports the finding that visual-gestural alignment significantly improves conceptual understanding for Deaf learners²³.

C. Rural District with Limited Resources

In a rural district with staffing constraints, the modular design of the framework enabled phased implementation using virtual professional learning and shared regional resources. This demonstrates scalability even in low-capacity contexts.

VIII. Equity, Access, and Disproportionality Reduction

A critical benefit of the framework is its potential to reduce **disproportionate identification** of ELLs and minority students for special education services. Studies indicate that robust Tier 1 instruction and data-informed MTSS reduce inappropriate referrals²⁴.

By strengthening inclusive mathematics instruction, the framework addresses root causes rather than symptoms of academic struggle.



Part IV – Evaluation, Discussion, and Conclusion

IX. Evaluation and Accountability Framework

A. Outcome Metrics

Evaluation is conducted using multiple indicators:

- NAEP-aligned mathematics benchmarks
- MTSS fidelity rubrics
- IEP goal attainment data
- Longitudinal subgroup growth metrics

These measures align instructional outcomes with accountability expectations.

B. Continuous Improvement Cycles

Data are reviewed through structured improvement cycles that inform instructional refinement and professional learning priorities.

X. Discussion

A. Policy Implications

The proposed framework offers policymakers a **coherent mechanism** for operationalizing federal mandates without introducing new compliance burdens. It demonstrates how inclusive instruction and accountability can be mutually reinforcing rather than competing priorities.

B. Limitations and Future Research

While the framework is grounded in existing research, further longitudinal studies are needed to examine long-term outcomes across diverse contexts. Future research should also explore technology-enhanced delivery models.

XI. Conclusion

Persistent mathematics achievement gaps represent a national challenge with profound implications for equity, workforce readiness, and economic participation. The National Inclusive Mathematics and MTSS Framework offers a scalable, evidence-based response by



integrating inclusive pedagogy, MTSS fidelity, accessibility standards, and professional capacity building.

By aligning instruction with federal priorities and learner variability, the framework advances a vision of mathematics education that is both rigorous and equitable. Its national adoption has the potential to improve outcomes for millions of learners while strengthening the coherence and effectiveness of U.S. education systems.

About the Author



Imelda E. Aguilar, PhD, is an educational leader specializing in inclusive mathematics instruction, special education systems design, and MTSS implementation. With over eighteen years of experience across elementary and secondary settings, she has led program development, teacher capacity building, and district-wide instructional initiatives serving English Language Learners and Deaf/Hard-of-Hearing students. Her work focuses on advancing equitable, data-driven instructional systems aligned with federal education mandates.

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