NCTM and CEC Position Statement on Teaching Mathematics to Students with Disabilities

POSITION

The National Council of Teachers of Mathematics (NCTM) and the Council for Exceptional Children (CEC) jointly recognize the important role of educators in ensuring students with disabilities have access to and success with grade/course-level standards, receive high-quality instruction and are supported by systems that believe in their abilities.

INTRODUCTION

Students who are identified as having a disability, according to the Individuals with Disabilities Education Act (IDEA), are guaranteed a Free Appropriate Public Education (FAPE) that provides them access to the general curriculum (IDEA Regulations, 34 C.F.R. § 300.39 [a][3]liil). NCTM and CEC believe that for students with disabilities, mathematical learning is a shared responsibility between mathematics educators, special educators, administrators, related service providers, families, and other interested partners who must work within the limits of their professional knowledge and skills. This means educators need to know when to collaborate to support the educational needs of their students in specific content areas. It is critical to align what mathematics students learn, how they will learn it, and how they will be assessed. Teaching mathematics to students with disabilities is a complex undertaking and should involve the shared knowledge and expertise of professionals working together as a cohesive team.

Within the multiple frameworks and evidence based on mathematics teaching and learning, NCTM and CEC find compelling and shared points of convergence:

- Students with disabilities have a right to access, and be provided with appropriate supports to be successful with Grade/Course-Level Content
- Students with disabilities have a right to high-quality instruction aligning with content and intervention designed to facilitate success with grade-level content
- Students with disabilities have a right to be supported by educators who believe in their abilities.

Declarations

Students with disabilities have a right to access, and be provided with appropriate supports to be successful with Grade/Course-Level Content

As students with disabilities move through the grade levels, their access to grade/course-level content often diminishes. Yet, by law, all students, regardless of disability status or prior experience, have a legal right to access, be involved in, and make progress in the same grade level or course standards as their non-disabled peers [IDEA Regulations, 34 C.F.R. § 300.320 et seq.]. To do so, students with disabilities need consistent, high-quality, research-based instruction on their grade-level content standards that develop both conceptual and procedural knowledge and skills (National Research Council, 2001). Limiting students to below-grade-level content will not improve outcomes toward mathematics proficiency. Core or Tier 1 instruction should reflect the principles of Universal Design for Learning (UDL) (Pusateri, 2022) by proactively considering barriers to engagement, representation, and expression to facilitate student access to grade level or course content. Intervention on specific, targeted, and prioritized skills as part of MTSS is usually part of Tier 2 and Tier 3 instruction and does not replace Tier 1 instruction aligned with grade-level/content standards.

Students with disabilities should be instructed by teachers with strong content and pedagogical content knowledge (CEC, 2021a; AMTE, 2020). Yet, because different teachers participate in different coursework in their preparation programs, general and special educators often enter the field with differences in their knowledge of mathematics education or special education (AMTE, 2020). Collaboration and co-teaching are important responses to address these different teacher knowledge bases (Council for Exceptional Children 2021b; Friend & Barron, 2021; AMTE, 2020; NCTM, 2020). We see collaboration and co-teaching as an effective vehicle for ensuring meaningful access to and success with grade level and course content.

Students with disabilities have a right to high-quality instruction aligning with content and intervention designed to facilitate success with grade-level content

Teacher content knowledge and pedagogical content knowledge are important to facilitate successful learning. CEC and NCTM have a long-standing commitment to high-quality instructional outcomes for all students, including those with disabilities (CEC, 2021a; NCTM, 2020). Content and pedagogical content knowledge can support teachers in the complexity of instructional decision-making, specifically in responding to student thinking, facilitating appropriate challenges, and providing students with support (NCTM, 2014). Teachers equipped with such knowledge and skills create opportunities for all students to build clear relationships between concepts and view mathematics as a coherent and connected discipline (Fosnot & Jacob, 2010; Ma, 2010).

Student learning is improved when general and special education teachers engage in collaboration and co-planning that draws from, coordinates, and extends teachers' areas of expertise. To prepare for core instruction, teachers intentionally plan or co-plan lessons using UDL and individually tailored adaptations and modifications to meet the needs of all learners

(i.e., Specially Designed Instruction). Given their distinct areas of professional expertise, it is important for general education and special education teachers to collaboratively plan instruction focusing on the most important concepts, frontloading critical background knowledge, and providing appropriate scaffolds to ensure student success. Instruction concurrently teaches both critical concepts and procedures with meaningful connections between them using research-supported practices (Fuchs et al., 2021).

Using multiple representations is essential for making sense of mathematics across all domains (NCTM, 2014, Root et al., 2021; Scheuermann et al., 2009). For example, including Concrete-Semiconcrete-Abstract (CSA) simultaneously focuses instruction on the fluent movement among concrete representations/models (e.g., manipulative materials) and semi-concrete (e.g., drawings, sketches, graphs), and abstract incorporating symbols, numerals, equations, mentally solving problems, or using stories with mathematical ideas. Instruction can focus on building conceptual understanding of the relationship among concrete, semi-concrete, and abstract representations and providing opportunities to practice using representations with feedback.

True collaboration for effective intervention in a preventative model (e.g. Response to Intervention, Multi-Tiered System of Supports) requires advanced planning between the special and mathematics educators. Before a new lesson, the two experts come together to determine the foundational knowledge needed to effectively access the more sophisticated ideas ahead. They plan ways to proactively use the intervention time to establish those understandings that allow students to access the upcoming new grade-level content. Then, interventions use the exact language, representations, and problem-solving strategies that provide these preliminary components rather than repeating Tier 1 lessons. In this way, students enter the new lesson with refreshed knowledge and the mathematics teacher can start with that knowledge as a launching point to provide opportunities for the students emerging from the intervention to actively engage.

Students with disabilities have a right to be supported by educators who believe in their abilities.

Students with disabilities benefit from asset-based learning environments where they are recognized and positioned as capable and competent mathematics learners (Cooper & Farkas, 2022; Steele & Honey, 2024). Educators' beliefs and expectations about students influence their instructional decisions (NCTM, 2014) and student learning outcomes (Busaad, 2020; Cameron & Cook, 2013; Hattie 2023). Simultaneously, students attend closely to the messages received about them and their peers (Bandura, 1997; Usher & Pajares, 2009). Basing mathematics instruction on what students *do* know, rather than a perception of their disability, leverages student strengths and is foundational to promoting learning (Cameron & Cook, 2013; Raley et al., 2021).

Viewing students' thinking as viable and valuable impacts their self-efficacy and motivation in mathematics learning (Hattie & Timperley, 2007; Mullis et al., 2015) and increases academic achievement (Usher & Pajares, 2009). Asset-based environments must leverage the knowledge students bring from family and community spaces. Students must have a sense of belonging with adults, peers, and parents (National Association of State Directors of Special Education, 2007). Students with disabilities benefit from opportunities to develop a positive math identity

that connects to their perspectives and experiences (NCTM, 2024). Mathematics learning is mediated through students' opportunities to participate in, perform, and use mathematics in meaningful ways (Aguirre et al., 2013; Andersson & Wagner, 2019). Identities of students with disabilities are built in discourses that take up or reject their perspectives and experiences (Heyd-Metzuyanim, 2013). Classroom environments can support positive identities by using pedagogies that empower students' ways of thinking and content that incorporates multiple representations so that students can see and position themselves as learners of mathematics (Andersson & Wagner, 2019, Martin, 2000).

Actionable Recommendations

Teacher Educators and State Education Departments

- Require special education majors to take a minimum of one mathematics methods course with field-based learning opportunities and mathematics content courses directed specifically to PK-12 mathematics.
- Require general education majors to have field-based learning opportunities to teach mathematics to students with disabilities beyond the introduction to disabilities course.
- Provide co-teaching learning opportunities and field based experiences in which mathematics educators and special educators collaborate.
- Identify and systematically blend into practice empirically-supported instructional strategies that integrate the expertise of general education and special education of mathematics in ways that meet the needs of educators.

General Education and Special Education Teachers of Mathematics

- Incorporate Universal Design for Learning Framework in unit and lesson planning
- Use appropriate and accurate multiple representations, such as simultaneously presenting Concrete-Semiconcrete-Abstract (CSA).
- Plan proactively using a preventative model for instruction.
- Position students with disabilities as valuable owners of and contributors to the mathematics being learned.
- Provide paired time for students to share and rehearse their thinking and ideas in multi-modal ways before moving to a whole group discussion.
- Provide a variety of interactive learning experiences.
- Use flexible grouping structures to cultivate a community of learning.
- Build meaningful connections between concepts and procedures.

School and District-Level Leadership

- Ensure the delivery of ongoing professional learning on evidence-based mathematics practices, including practical, hands-on experiences.
- Build supports for regular collaboration (e.g., dedicated time) between general education and special education teachers of mathematics regardless of service delivery models

- Ensure funding and resources for high-quality instructional materials, including assistive technology.

Funding Agencies

- Create intentional mechanisms (e.g., cross-disciplinary research initiatives, co-funding within and across agencies and organizations) that bring together cross-disciplinary researchers (e.g., mathematics education, special education, cognition, educational psychology, learning sciences).
- Encourage collaborative research with specific cross-disciplinary language in requests for proposals.
- Encourage the U.S. Department of Education to fund a technical assistance center on mathematics instruction and students with disabilities.

Researchers

- Engage in cross-disciplinary research (e.g., build relationships with cross disciplinary colleagues, read literature across fields).
- Identify specific areas of interest and share with program officers and others at funding agencies
- Consider the topic of multiple representations for example, as a natural starting place for collaborative research.

Professional Organizations

- Guide the program selection and themes for annual or regional conferences to include collaborative work from the general education and special education teachers of mathematics communities.
- Design and implement a conference for mathematics education and special education researchers to identify an agenda for action for future collaborative research.
- Support the publication in professional journals of co-authored articles through active recruitment of cross-disciplinary teams.
- Create cross-disciplinary teams to design and deliver webinars and other professional learning experiences.
- Build the resources for classroom teachers to support this cross-disciplinary work.
- Identify shared language to support better communication and an understanding of significant dimensions of teaching, learning, and research in both mathematics education and special education.

References

+Association of Mathematics Teacher Educators Writing Team. (2020). *Standards for preparing teachers of mathematics*. Charlotte, NC: Information Age Publishing

+Aguirre, J. M., Turner, E. E., Bartell, T. G., Kalinec-Craig, C., Foote, M. Q., Roth McDuffie, A., & Drake, C. (2013). Making Connections in Practice: How Prospective Elementary Teachers Connect to Children's

Mathematical Thinking and Community Funds of Knowledge in Mathematics Instruction. *Journal of Teacher Education*, *64*(2), 178-192. https://doi-org.spot.lib.auburn.edu/10.1177/0022487112466900

+Andersson, A., & Wagner, D. (2019). Identities available in intertwined discourses: Mathematics student interaction. *ZDM*, *51*(3), 529-540.https://doi.org/10.1007/s11858-019-01036-w

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

+Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

+Busaad, Y. A. (2020). Explore the dynamic interplay between teachers' expectations and the academic performance of students with disabilities. *Psychology and Education, 57*(8), 1429-1437.

+Cameron, D. L., & Cook, B. G. (2013). General education teachers' goals and expectations for their included students with mild and severe disabilities. *Education and Training in Autism and Developmental Disabilities, 48*(1), 18–30. https://www.jstor.org/stable/23879883

+Cooper, M., & Farkas, G. (2022). High school math and motivation for autistic students. *Journal of Autism and Developmental Disorders, 53*(7), 2717-2727. https://doi.org/10.1007/s10803-022-05522-1

+Council for Exceptional Children (2021a). *Position statement. Strengthening the workforce to support all children and youth with Exceptionalities*. Author.

+Council for Exceptional Children (2021b). *Position statement. Multiple-tiers systems of supports: The integral role of special education and special educators*. Author

+Fosnot, C. T., & Jacob, B. (2010). *Young mathematicians at work: Constructing algebra.* NCTM/Heinemann.

+Friend, M. & Barron, T.L. (2021). Collaboration with colleagues to increase student success. In J. McLeskey, M.D. Barringer, B. Billingsley, M. Brownell, M. Kennedy, T. Lewis, L. Maheady, J. Rodriguez, M.C. Scheeler, J. Winn, J., & D. Ziegler (Eds.), *High-leverage practices in special education* (2nd ed. pp. 3-14), Council for Exceptional Children & CEEDAR Center.

+Fuchs, L. S., Bucka, N., Clarke, B., Dougherty, B., Jordan, N. C., Karp, K. S., ... & Morgan, S. (2021). *Assisting students struggling with mathematics: Intervention in the elementary grades. Educator's Practice Guide*. *What Works Clearinghouse*. U.S. Department of Education Institute of Sciences.

+Hattie, J. (2023). Visible learning: The sequel: A synthesis of over 2,100 meta-analyses relating to achievement. Routledge.

+Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*, 81–112. https://doi.org/10.3102/003465430298487

+Heyd-Metzuyanim, E. (2013). The co-construction of learning difficulties in mathematics-teacher-student interactions and their role in the development of a disabled mathematical identity. *Educational Studies in Mathematics, 83*, 341-368. https://doi.org/10.1007/s10649-012-9457-z

+Individuals with Disabilities Education Act (IDEA) https://sites.ed.gov/idea/2022-individuals-with-disabilities-education-act-annual-report-to-congress/

+Individuals with Disabilities Act Regulations, 34 C.F.R. § 300.39 (a)(3)(iii). Available at https://www.ecfr.gov/current/title-34/subtitle-B/chapter-III/part-300/subpart-A/subject-group-ECFR0ec59c730ac278e/section-300.39 and 34 C.F.R. § 300.320 et seq. Avaliable at https://www.ecfr.gov/current/title-34/subtitle-B/chapter-III/part-300/subpart-D/subject-group-ECFR28b07e67452ed7a/section-300.320

Langer-Osuna, J. M., & Nasir, N. I. S. (2016). Rehumanizing the "Other": Race, culture, and identity in education research. *Review of Research in Education*, *40*(1), 723-743.

+Ma, L. (2010). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States*. Routledge.

+Martin, D. B. (2000). *Mathematics success and failure among African-American youth: The roles of sociohistorical context, community forces, school influence, and individual agency*. Routledge.

+Mullis, I. V., Martin, M. O., Foy, P., & Hooper, M. (2015). *TIMSS 2015 International results in mathematics.* https://timssandpirls.bc.edu/timss2015/international-results/wp-content/uploads/filebase/full%20pdfs/T15-International-Results-in-Mathematics.pdf

National Association of State Directors of Special Education (NASDSE); National Disability Rights Network (NDRN). (2007). *Tools for promoting education success and reducing delinquency*. Retrieved from https://search.issuelab.org/resource/tools-for-promoting-educational-success-and-reducing-delinquency.html

+NCTM (2024). *The impact of identity in K-12 mathematics: Rethinking equity-based practices*. Author.

NCTM. (2020). Catalyzing change in middle school mathematics: Initiating critical conversations. Author.

+NCTM, (2014). *Principles to actions: Ensuring mathematical success for all*. Author.

+National Research Council. (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: The National Academies Press. https://doi.org/10.17226/9822

+Pusateri, J.L. (2022). *Transform your teaching with universal design for learning*. CAST, Inc.

+Raley, S. K., Shogren, K. A., & Cole, B. P. (2021). Positive psychology and education of students with disabilities: The way forward for assessment and intervention. *Advances in Neurodevelopmental Disorders, 5*, 11-20. https://doi.org/10.1007/s41252-020-00181-8

+Root, J., Saunders, A., Jimenez, B., & Gilley, D. (2021). Essential components for math instruction: Considerations for students with extensive support needs. *TEACHING Exceptional Children, 56*(1), 34-43. https://doi.org/10.1177/00400599221120882

+Scheuermann, A. M., Deschler, D. D., & Schumacher, J. B. (2009). The effects of the explicit inquiry routine on the performance of students with learning disabilities on one-variable equations. *Learning Disability Quarterly, 32*(2), 103-120. 10.2307/27740360

+Steele, M.D., & Honey, J (2024). *Transform Your Math Class Using Asset-Based Perspectives for Grades 6-12.* Corwin.

+Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary educational psychology*, *34*(1), 89-101. doi:10.1016/j.cedpsych.2008.09.002

Williams, J. (2010). Constructing a new professional identity: Career change into teaching. *Teaching and Teacher Education*, *26*(3), 639-647