



REL Appalachia Ask A REL Response

Educator Effectiveness, Math
March 2019

Question:

What middle school math interventions show a high level of effectiveness for students with disabilities, particularly interventions that involve coaching for teachers or those based on NCTM process standards?

Response:

Thank you for your request to our REL Reference Desk regarding evidence-based information about effective math interventions for middle school students with disabilities (SWD). Ask A REL is a collaborative reference desk service provided by the 10 Regional Educational Laboratories (RELs) that, by design, functions much in the same way as a technical reference library. Ask A REL provides references, referrals, and brief responses in the form of citations in response to questions about available education research.

Following an established REL Appalachia research protocol, we searched for peer-reviewed articles and other research reports on math interventions for middle school students with disabilities. We also focused on identifying resources that addressed coaching for teachers or the National Council of Teachers of Mathematics (NCTM) process standards. While we found literature that discussed NCTM-supported practices broadly, the articles did not specifically mention the NCTM process standards. We did not find literature that specifically discussed the impact of math coaching for teachers on students with disabilities. The sources included ERIC and other federally funded databases and organizations, research institutions, academic research databases, and general Internet search engines. For more details, please see the methods section at the end of this document.

The research team did not evaluate the quality of the resources provided in this response; we offer them only for your reference. Also, the search included the most commonly used research databases and search engines to produce the references presented here, but the references are not necessarily comprehensive, and other relevant references and resources may exist. References are listed in alphabetical order, not necessarily in order of relevance.

References

Hart Barnett, J. E., & Cleary, S. (2015). Review of evidence-based mathematics interventions for students with autism spectrum disorders. *Education and Training in Autism and Developmental Disabilities, 50*(2), 172–185. Abstract retrieved from <https://eric.ed.gov/?id=EJ1060599>; full text available at [http://daddcec.org/Portals/0/CEC/Autism_Disabilities/Research/Publications/Education_Training_Development_Disabilities/2015v50/ETADD_50\(2\)_June.pdf#page=50](http://daddcec.org/Portals/0/CEC/Autism_Disabilities/Research/Publications/Education_Training_Development_Disabilities/2015v50/ETADD_50(2)_June.pdf#page=50)

From the abstract: “Students with autism spectrum disorders (ASD) are being included more frequently in the general educational setting, and are therefore increasingly expected to access and master core curricular content, including mathematics. However, mathematics often presents challenges to students with ASD. Interventions to improve the mathematics skills of students with ASD have been recommended. This comprehensive literature review synthesized eleven studies of mathematics intervention strategies for students with ASD. Though studies related to instructional interventions in mathematics for students with ASD are limited, these students can benefit from mathematics interventions, which can help them strengthen their mathematics skills, increase independence when completing problems, and use acquired skills in community or other applied settings. Future implications include the need for additional, empirically-supported interventions in mathematics for students with ASD and the need to target more academically-oriented math interventions for this population, particularly in the context of problem solving, which will assist in determining the potential of students with ASD to achieve mathematic success.”

Hinton, V., Strozier, S. D., & Flores, M. M. (2014). Building mathematical fluency for students with disabilities or students at risk for mathematics failure. *International Journal of Education in Mathematics, Science and Technology, 2*(4), 257–265. Retrieved from <https://eric.ed.gov/?id=EJ1059041>

From the abstract: “It is incredibly important for students who are at-risk for mathematics failure or who have a disability which hinders mathematical performance to improve in their mathematical achievement. One way to improve mathematical achievement is through building fluency in mathematics. Fluency in mathematics is the ability to solve problems automatically and with accuracy. One method of building fluency for students who are at-risk or who have a disability includes the concrete-representational-abstract sequence of instruction that is paired with strategic instruction (CRA-SI). A brief overview is provided on CRA-SI instruction along with a review of the literature that shows CRA-SI instruction as effective instruction for students who are at-risk or who have a disability.”

Marita, S., & Hord, C. (2017). Review of mathematics interventions for secondary students with learning disabilities. *Learning Disability Quarterly, 40*(1), 29–40. Abstract retrieved from <https://eric.ed.gov/?id=EJ1129921>; full text available at <https://journals.sagepub.com/doi/pdf/10.1177/0731948716657495>

From the abstract: “Recent educational policy has raised the standards that all students, including students with disabilities, must meet in mathematics. To examine the strategies currently used to support students with learning disabilities, the authors reviewed literature from 2006 to 2014 on mathematics interventions for students with learning disabilities. The 12 articles reviewed contain various instructional focuses, including systematic instructions, problem-based instruction, and visual representation. This review includes discussion of the interventions used, including the success of interventions used for both students with disabilities and students without disabilities. Implications for practice and future research are also discussed, including the need for continued research on middle and high school interventions to address a variety of mathematical skills and concepts.”

Montague, M., Enders, C., & Dietz, S. (2011). Effects of cognitive strategy instruction on math problem solving of middle school students with learning disabilities. *Learning Disability Quarterly*, 34(4), 262–272. Abstract retrieved from <https://eric.ed.gov/?id=EJ964289>; full text available at https://www.researchgate.net/publication/258166768_Effects_of_Cognitive_Strategy_Instruction_on_Math_Problem_Solving_of_Middle_School_Students_With_Learning_Disabilities

From the abstract: “The purpose of the study was to improve mathematical problem solving for middle school students with learning disabilities by implementing a research-based instructional program in inclusive general education math classes. A total of 40 middle schools in a large urban district were matched on state assessment performance level (low, medium, and high performing) and socioeconomic status. One school from each pair was randomly assigned to the intervention condition, and one eighth grade math teacher participated at each school ($n = 40$). Because of attrition at the outset, 24 schools completed the study (8 intervention, 16 comparison). The intervention, *Solve It!*, a research-based cognitive strategy instructional program, was implemented for 7 months, and periodic progress monitoring was conducted. A cluster-randomized design was used, and the data were consistent with a three-level model in which repeated measures were nested within students and students were nested within schools. The results indicated that students who received the intervention ($n = 319$) showed significantly greater growth in math problem solving over the school year than students in the comparison group ($n = 460$) who received typical classroom instruction. Moreover, the intervention effects did not differ for students with learning disabilities, low-achieving students, and average-achieving students. Thus, the findings were positive and support the efficacy of the intervention when implemented by general education math teachers in inclusive classrooms.”

Sayeski, K. L., & Paulsen, K. J. (2010). Mathematics reform curricula and special education: Identifying intersections and implications for practice. *Intervention in School and Clinic*, 46, 13–21. Abstract retrieved from <https://eric.ed.gov/?id=EJ897127>; full text available at https://www.researchgate.net/publication/254108173_Mathematics_Reform_Curricula_and_Special_Education_Identifying_Intersections_and_Implications_for_Practice

From the abstract: “In many general education classrooms today, teachers are using ‘reform’ mathematics curricula. These curricula emphasize the application of mathematics

in real-life contexts and include such practices as collaborative, group problem solving and student-generated algorithms. Students with learning disabilities in the area of mathematics can experience challenges with these curricula due to lack of content knowledge and requisite skills along with processing and strategy deficits. The purpose of this article is to present information on strategies that can be used to complement math reform curricula to meet the needs of students with math learning disabilities.”

Spooner, F., Root, J. R., Saunders, A. F., & Browder, D. M. (2018). An updated evidence-based practice review on teaching mathematics to students with moderate and severe developmental disabilities. *Remedial and Special Education*. Retrieved from https://www.researchgate.net/publication/323476711_An_Updated_Evidence-Based_Practice_Review_on_Teaching_Mathematics_to_Students_with_Moderate_and_Severe_Developmental_Disability

From the abstract: “The purpose of this review was to examine the body of research on teaching mathematics to students with moderate and severe developmental disability that has been published since 2005, reflecting changes in both the academic expectations for this population and research and design standards in the evidence-based practice (EBP) era. We examined research on teaching mathematical skills for students with moderate and severe developmental disability from 2005–2016 and found 36 studies (33 single-case and three group-experimental studies), updating the Browder, Spooner, Ahlgrim-Delzell, Harris, and Wakeman analysis. Of the 36 studies included in the review, 22 single-case and three group-design studies received a rating of high or adequate quality using the National Technical Assistance Center on Transition (NTACT) indicator criteria. In addition to systematic instruction, instructional procedures of technology-aided instruction, graphic organizers, manipulatives, and explicit instruction were found to be EBPs in teaching mathematics to this population.”

Additional Ask A REL Responses to Consult

Ask A REL Mid-Atlantic at Mathematica Policy Research. (2017). *What instructional strategies in mathematics will help meet the needs of struggling learners and English language learners?* Retrieved from https://ies.ed.gov/ncee/edlabs/regions/midatlantic/askarel_2.asp

Ask A REL Mid-Atlantic at Mathematica Policy Research. (2017). *What does the research say about the effectiveness of the following math programs/interventions: Reflex Math, DreamBox, Do the Math, Origo Stepping Stones, Istation Math?* Retrieved from https://ies.ed.gov/ncee/edlabs/regions/midatlantic/askarel_5.asp

Additional Organizations to Consult

National Council of Teachers of Mathematics: <http://www.nctm.org/>

From the website: “As the leading professional organization for teachers of mathematics in grades Pre-K–12, the National Council of Teachers of Mathematics (NCTM) provides broad national leadership in matters related to mathematics education.

“NCTM initiated the development of standards for school mathematics that address content, teaching, and assessment. These standards are guidelines for teachers, schools, districts, states, and provinces to use in planning, implementing, and evaluating high-quality mathematics programs for prekindergarten through grade 12.”

National Math and Science Initiative: <https://www.nms.org/>

From the website: “Today, more than ever, a quality education is the foundation of opportunity. By 2020, almost two-thirds of all jobs will require post-secondary education or training. Nearly as many will require basic literacy in science, technology, engineering and math...NMSI works to expand access to challenging coursework and improve student achievement through proven programs that consistently produce measurable and lasting results. We partner with schools and districts nationwide to provide extraordinary training and support for teachers and to give students the resources they need to develop and demonstrate knowledge and skills that will propel them throughout their lives.”

- National Math and Science Initiative Research: <https://www.nms.org/Our-Impact/Research.aspx>

Evidence for ESSA: <https://www.evidenceforessa.org/>

From the website: “To maximize the impact on practice, educational leaders must have a simple, straightforward way to identify programs and practices that meet the ESSA [Every Student Succeeds Act] evidence standards. This website was created to help identify these programs. It provides a free, authoritative, user-centered database to help anyone—school, district, or state leaders, teachers, parents, or concerned citizens—easily find programs and practices that align to the ESSA evidence standards and meet their local needs.”

What Works Clearinghouse: <https://ies.ed.gov/ncee/wwc/>

From the website: “The What Works Clearinghouse (WWC) reviews the existing research on different programs, products, practices, and policies in education. Our goal is to provide educators with the information they need to make evidence-based decisions. We focus on the results from high-quality research to answer the question ‘What works in education?’”

Methods

Keywords and Search Strings

The following keywords and search strings were used to search the reference databases and other sources:

- math* AND (“middle school” OR “middle grade*”) AND (“students with disabilities” OR SWD OR disabilit*) AND (intervention OR strateg* outcome* OR achievement OR improvement)

- math* AND (coach* OR mentor*) AND (“students with disabilities” OR SWD OR disabilit*) AND (intervention OR strateg* OR outcome* OR achievement OR improvement)
- math* AND “NCTM process* standards” AND (“students with disabilities” OR SWD OR disabilit*) AND (intervention OR strateg* OR outcome* OR achievement OR improvement)

Databases and Resources

We searched ERIC, a free online library of more than 1.6 million citations of education research sponsored by the Institute of Education Sciences (IES), for relevant resources. Additionally, we searched the academic database ProQuest, Google Scholar, and the commercial search engine Google.

Reference Search and Selection Criteria

In reviewing resources, Reference Desk researchers consider—among other things—these four factors:

- Date of the publication: Searches cover information available within the last ten years, except in the case of nationally known seminal resources.
- Reference sources: IES, nationally funded, and certain other vetted sources known for strict attention to research protocols receive highest priority. Applicable resources must be publicly available online and in English.
- Methodology: The following methodological priorities/considerations guide the review and selection of the references: (a) study types—randomized controlled trials, quasi experiments, surveys, descriptive data analyses, literature reviews, policy briefs, etc., generally in this order; (b) target population, samples (representativeness of the target population, sample size, volunteered or randomly selected), study duration, etc.; (c) limitations, generalizability of the findings and conclusions, etc.
- Existing knowledge base: Vetted resources (e.g., peer-reviewed research journals) are the primary focus, but the research base is occasionally slim or nonexistent. In those cases, the best resources available may include, for example, reports, white papers, guides, reviews in non-peer-reviewed journals, newspaper articles, interviews with content specialists, and organization websites.

Resources included in this document were last accessed on March 4, 2019. URLs, descriptions, and content included here were current at that time.

This memorandum is one in a series of quick-turnaround responses to specific questions posed by education stakeholders in the Appalachia region (Kentucky, Tennessee, Virginia, and West Virginia), which is served by the Regional Educational Laboratory Appalachia (REL AP) at SRI International. This Ask A REL response was developed by REL AP under Contract ED-IES-17-C-0004 from the U.S. Department of Education, Institute of Education Sciences, administered by SRI International. The content does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. government.