



REL Appalachia Ask A REL Response
Math, Educator Effectiveness, Teacher Preparation
July 2019

Question:

What is the impact of preservice and inservice math training for special education elementary school teachers on student and teacher outcomes?

Response:

Thank you for your request to our REL Reference Desk regarding evidence-based information about the impacts of math training for special education teachers at the elementary school level. 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 training/professional development for special education elementary school teachers. We focused on identifying resources that specifically addressed the effects on student and teacher outcomes. 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

Browder, D. M., Jimenez, B. A., & Trela, K. (2012). Grade-aligned math instruction for secondary students with moderate intellectual disability. *Education and Training in Autism and Developmental Disabilities, 47*(3), 373–388. Abstract retrieved from <https://eric.ed.gov/?id=EJ986322>; full text available at

http://daddcec.org/portals/0/cec/autism_disabilities/research/publications/education_training_development_disabilities/2011v47_journals/etadd_47_3_373.pdf

From the abstract: “The purpose of this study was to examine the effects of grade-aligned math instruction on math skill acquisition of four middle schools with moderate intellectual disability. Teachers were trained to follow a task analysis to teach grade-aligned math to middle school students using adapted math problem stories and graphic organizers. The teacher implemented four math units representing four of the five National Council of Teachers of Mathematics recommended math standards (i.e., algebra, geometry, measurement, and data analysis/probability; NCTM, 2002). A multiple probe across unit design was used to examine the effects of the math instruction on the number of steps completed on each math standard task analysis. Results indicated a functional relationship between math instruction and student behavior with an overall increase in independent correct responses. Implications for practice and future research are discussed. Limitations and suggestions for future research and practice are discussed.”

Faulkner, V. N., & Cain, C. R. (2013). Improving the mathematical content knowledge of general and special educators: Evaluating a professional development module that focuses on number sense. *Teacher Education and Special Education, 36*(2), 115–131. Abstract retrieved from <https://eric.ed.gov/?id=EJ999923>; full text available at <http://jwilson.coe.uga.edu/EMAT7050/Students/Richards/Improving.pdf>

From the abstract: “Student performance in mathematics has been linked to the mathematical knowledge of the teacher. Based on this finding, a 5-day professional development module was created to improve teachers’ mathematical knowledge and their understanding of number sense. We found no difference prior to the professional development in mathematical content knowledge for teaching mathematics (CKTM) between special education teachers (at the K–12 level) and general education teachers (K–6). Results revealed that participating teachers made significant gains in mathematical CKTM. Implications and recommendations for professional development in mathematics are provided.”

Feng, L., & Sass, T. R. (2013). What makes special-education teachers special? Teacher training and achievement of students with disabilities. *Economics of Education Review, 36*, 122–134. Retrieved from https://www.researchgate.net/profile/Li_Feng7/publication/255947535_What_makes_special-education_teachers_special_Teacher_training_and_achievement_of_students_with_disabilities/links/5c015b1345851523d1560fa5/What-makes-special-education-teachers-special-Teacher-training-and-achievement-of-students-with-disabilities.pdf

From the abstract: “This paper contributes importantly to the growing literature on the training of special education teachers and how it translates into classroom practice and student achievement. The authors examine the impact of pre-service preparation and in-service formal and informal training on the ability of teachers to promote academic achievement among students with disabilities. Using student-level longitudinal data from

Florida over a five-year span the authors estimate 'value-added' models of student achievement. There is little support for the efficacy of in-service professional development courses focusing on special education. However, teachers with advanced degrees are more effective in boosting the math achievement of students with disabilities than are those with only a baccalaureate degree. Also pre-service preparation in special education has statistically significant and quantitatively substantial effects on the ability of teachers of special education courses to promote gains in achievement for students with disabilities, especially in reading. Certification in special education, an undergraduate major in special education, and the amount of special education coursework in college are all positively correlated with the performance of teachers in special education reading courses."

Harris, P. P., Pollingue, A. B., Herrington, D., & Holmes, A. (2014). Effects of training on pre-service special educators' abilities to co-teach math vocabulary in preparation for inclusion settings. *Journal of the International Association of Special Education*, 15(2), 94–99. Abstract retrieved from <https://eric.ed.gov/?id=EJ1058234>; full text available at <http://www.iasse.org/Publications/2014%20JIASE%20TOPICAL%20EDITION%20FINAL.pdf#page=96>

From the abstract: "New special education teachers often struggle to teach children the mathematics vocabulary necessary to understand and effectively solve math word problems. The authors designed and implemented a pilot program to prepare pre-service teachers majoring in special education to implement the Camelot Learning Math Intervention Program (CLMIP). We met with participants an hour a day, twice a week, for five weeks over the summer to study the impact of learning to implement CLMIP on participants' comfort levels with teaching mathematics vocabulary. The pre-service teachers taught the CLMIP program in co-teaching pairs to prepare them for later co-teaching in inclusive settings. Over the course of three summers, 30 participants completed the program. A one-group pretest-posttest design was implemented using a Wilcoxon Signed-rank test and follow-up interviews to measure change in participants' vocabulary teaching comfort levels. Findings indicated that the program resulted in significant improvement of comfort levels, $z = 6.357$, $p < 0.0005$, with a large effect size, $r = 0.82$. The results suggest that teacher education programs and school districts desiring to improve the skills of their teachers practicing in regular and inclusion classroom settings may benefit from implementing a similar program."

Tournaki, N., & Lyublinskaya, I. (2014). Preparing special education teachers for teaching mathematics and science with technology by integrating TPACK framework into the curriculum: A study of teachers' perceptions. *Journal of Technology and Teacher Education*, 22(2), 243–259. Abstract retrieved from <https://eric.ed.gov/?id=EJ1025144>; full text available at <https://www.researchgate.net/publication/261725239> [Preparing Special Education Teachers for Teaching Mathematics and Science with Technology by Integrating the TPACK Framework into the Curriculum A Study of Teachers' Perceptions](https://www.researchgate.net/publication/261725239)

From the abstract: “This study examined the development of Technological Pedagogical And Content Knowledge (TPACK) in mathematics and science of pre-service special education teachers via one course. The course focused on the three domains of knowledge related specifically to integrating instructional technology into mathematics and science teaching and learning namely, Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and TPACK. The Survey of Pre-service Teachers’ Knowledge of Teaching and Technology developed by Schmidt et al. (2009) was used to measure pre-service teachers’ perceptions of knowledge. A paired *t*-test revealed that upon completion of the course requirements, students perceived themselves to have had significant gains in each of the domains of teacher knowledge addressed in the course—effect sizes were large (between 0.69 and 1.10). Further, significant gains were also found in the area of Pedagogical Content Knowledge (PCK) but with moderate effect size.”

Additional Ask A REL Responses to Consult

Ask A REL Appalachia at SRI International. (2018). *What are the effects of sustained teacher professional development in elementary mathematics on teacher confidence and mathematics content knowledge?* Retrieved from <https://ies.ed.gov/ncee/edlabs/regions/appalachia/askarel/aar39.asp>

Additional Organizations to Consult

Association of Mathematics Teacher Educators (AMTE): <http://amte.net>

From the website: “AMTE is the largest professional organization devoted to the improvement of mathematics teacher education—it includes over 1,000 members supporting the preservice education and professional development of preK–16 teachers of mathematics. Members include professors, researchers, teacher-leaders, school mathematics coordinators, policy experts, graduate students, and others.”

National Association of Special Education Teachers: <http://naset.org>

From the website: “The National Association of Special Education Teachers (NASSET) is a national membership organization dedicated to rendering all possible support and assistance to those preparing for or teaching in the field of special education. NASSET was founded to promote the profession of special education teachers and to provide a national forum for their ideas.”

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

From the website: “Founded in 1920, the National Council of Teachers of Mathematics (NCTM) is the world’s largest mathematics education organization, with 60,000 members and more than 230 Affiliates throughout the United States and CanadaThe National Council of Teachers of Mathematics advocates for high-quality mathematics teaching and learning for each and every student.”

Methods

Keywords and Search Strings

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

- “special education” AND math AND (“in-service” OR inservice OR “pre-service” OR preservice) AND (training OR “professional development”) AND (outcome* or achievement)

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 July 5, 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.