



Using Technology to Teach Math

What is the evidence base?

- This is an evidence-based practice for **students with disabilities** based on three methodologically sound group experimental studies with random assignment across 115 students with disabilities and three methodologically sound single-subject students across 15 students with disabilities.
- This is an evidence-based practice for **students with learning disabilities** based on three methodologically sound group experimental studies with random assignment across 115 students with learning disabilities and one methodologically sound single-subject study across one student with a learning disability.

Where is the best place to find out how to do this practice?

The best place to find out how to implement using technology to teach math is through the following research to practice lesson plan starters:

Due to the program and software specificity of the included articles, no research to practice lesson plan starters could be developed for this practice

With who was it implemented?

- Students with:
 - **Learning Disabilities (n=116, 4 studies)**
 - Intellectual Disability (n=7, 2 studies)
 - Autism Spectrum Disorder (n=6, 2 studies)
 - Other Health Impairment (n=1, 1 study)
- Ages ranged from 13-21
- Males (n=76), females (n=48), Not reported (n=6)
- Ethnicity
 - African American (n=50)
 - Caucasian (n=31)
 - Hispanic (n=1)
 - Other (n=2)
 - None reported (n=46)

What is the practice?

Technology can be defined in many ways:

Computer-based instruction (CBI) is when computers or associated technology are used to improve students' skills, knowledge, or academic performance (Okolo et al., 1993)

Computer-assisted instruction (CAI) includes software designed to provide instruction and practice for meeting specific learning objectives or goals with drill- and-practice or tutorial instruction (Kulik & Kulik, 1987; Posgrow, 1990)

Computer-enriched instruction (CEI) is the utilization of computer technology to augment instruction and includes usage of the computer as a calculating tool, a programming tool, and to conduct simulations (Kulik & Kulik, 1987)

Computer-managed instruction (CMI), also referred to as integrated learning system (ILS), is used to describe the application of computer technology and extensive software programs designed to present sequential instruction to students over extended periods of time while maintaining records of student progress (Kulik, 2003)

In the studies used to establish the evidence base for using technology to teach math included:

- Using (a) videodisc program to teach addition, subtract, multiplication and division of fractions called Mastering Fractions Interactive Videodisc Program; (b) an 8 minute contextualized problem video called Bart's Pet Project to teach problem-solving skills, and (c) word problems in a contextualized video format to teach solving one step and multiple step word problems that require addition and subtraction of fractions and a combination of money and measurement problems (Bottge & Hasselbring, 1993).
- Using videodisc software (Systems Impact, Inc., 1986) to provide instruction using an instructional design fraction curriculum to teach students how to solve fraction problems (Kelly, Gerston, & Carnine, 1990).
- Using computer read aloud questions and computer read aloud with a video representation of the problem situation to assist students in solving complex math problems on assessments (Calhoon, Fuchs, & Hamlett, 2000).
- Using video prompting in conjunction with systematic instruction (e.g., least intrusive prompting) with error correction and feedback to solve video simulation real-world math problems by finger counting (Saunders, Spooner, & Davis, 2017).
- Using point-of-view video modeling to teach mathematics problem solving with word problems involving subtracting mixed fractions with uncommon denominators (Yakubova, Hughes, & Hornberger, 2015).
- Using a video prompting intervention to teach multi-step math skills including calculating a tip, calculating item unit prices, and adjusting a recipe for more or fewer people (Kellems et al., 2016).

Where has it been implemented?

- Computer Lab (1 study)
- General Education classroom (2 studies)
- Special Education classroom (2 studies)
- 18-21 Transition program classroom (1 study)

How does this practice relate to Common Core Standards?

- Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. [CCSS.MATH.CONTENT.7.NS.A.1](#)
- Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. [CCSS.MATH.CONTENT.7.NS.A.2](#)
- Solve real-world and mathematical problems involving the four operations with rational numbers [CCSS.MATH.CONTENT.7.NS.A.3](#)
- Use proportional relationships to solve multistep ratio and percent problems [CCSS.MATH.CONTENT.7.RP.A.3](#)
- Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate. [CCSS.MATH.CONTENT.7.RP.A.2B](#)
- Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. [CCSS.MATH.CONTENT.6.RP.A.3D](#)

References used to establish this evidence base:

- Bottge, B. A., & Hasselbring, T. S. (1993). A comparison of two approaches for teaching complex, authentic, mathematics problems to adolescents in remedial math classes. *Exceptional Children, 59*, 556-566.
- Calhoon, M. B., Fuchs, L. S., & Hamlett, C. L. (2000). Effects of computer-based test accommodations on mathematics performance assessments for secondary students with learning disabilities. *Learning Disability Quarterly, 23*, 271-282
- Kellems, R. O., Frandsen, K., Hansen, B., Gabrielsen, T., Clarke, B., Simons, K., & Clements, K. (2016) Teaching multi-step math skills to adults with disabilities via video prompting. *Research in Developmental Disabilities, 58*, 31-44.

Kelly, B., Gersten, R., & Carnine, D. (1990). Student error patterns as a function of curriculum design: teaching fractions to remedial high school students and high school students with learning disabilities. *Journal of Learning Disabilities, 23*, 23- 29.

Saunders, A. F., Spooner, F., & Davis, L. L. (2017). Using video prompting to teach mathematical problem solving of real-world video-simulation problems. *Remedial and Special Education, Advance online publication*. doi:10.1177/0741832517717042

Yakubova, G., Hughes, E. M., & Hornberger, E. (2015). Video-based intervention in teaching fraction problem-solving to students with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*, 2865-2875.

This Practice Description was developed by The National Technical Assistance Center on Transition (NTACT), Charlotte, NC, funded by Cooperative Agreement Number H326E140004 with the U.S. Department of Education, Office of Special Education and Rehabilitative Services (OSERS). This document has been reviewed and approved by the OSERS. Opinions expressed herein do not necessarily reflect the position or policy of the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Department of Education. OSEP Project Officer: Dr. Selete Avoke. RSA Project Officer: Kristen Rhinehart-Fernandez. This product is public domain. Authorization to reproduce it in whole or in part is granted. While permission to reprint this publication is not necessary, the citation should be:
National Technical Assistance Center on Transition (2017). *Using technology to teach math*.

