

Research background for hands-on mathematics

The hands-on approach to mathematics instruction is grounded in a long and extensive research history. This information sheet provides a brief annotated bibliography of key research reports and documents that provide the foundation for ETA hand2mind® work.

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J.R., & Witzel, B. (2009).

Assisting students struggling with mathematics: Response to intervention (RtI) for elementary and middle schools (NCEE 2009 - 4060).

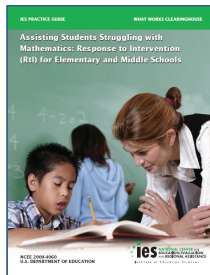
Washington, DC: National Center for Education Evaluation and Regional Assistance,

Institute of Education Sciences, US Department of Education.

Retrieved from <http://ies.ed.gov/ncee/wwc/publications/practiceguides/>.

“...research shows that the systematic use of visual representations and manipulatives may lead to statistically significant or substantively important positive gains in math achievement.” (Pages 30–31)

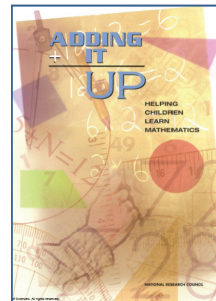
This is one of several research-based practice guides from the What Works Clearinghouse. This publication recommends visual models (including manipulatives) as recommendation five. Appendix D summarizes research supporting this recommendation and includes a good discussion of the research supporting the Concrete–Representational–Abstract (CRA) approach noted at right. Another practice guide in the series, focusing on fractions instruction K–8, also includes recommendations for using manipulative materials and the supporting research.



National Research Council (2001).

Adding it up: Helping children learn mathematics. J. Kilpatrick, J. Swafford, and B. Findell (Eds.).

Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education, Washington, DC: National Academy Press.

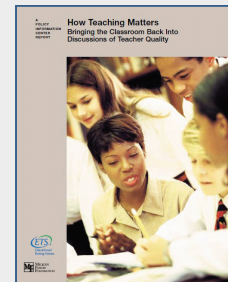


“The evidence indicates, in short, that manipulatives can provide valuable support for student learning when teachers interact over time with the students to help them build links between the object, the symbol, and the mathematical idea both represent.” (Page 354)

ETA hand2mind uses and recommends a Concrete–Representational–Abstract (CRA) cycle of instruction to help students build connections between manipulatives and mathematical ideas.

Additional research support for this approach to instruction is found in the National Council of Supervisors of Mathematics Position Statement *Improving Student Achievement in Mathematics by Using Manipulatives with Classroom Instruction.*

Wenglinsky, H. (2000).



How teaching matters: Bringing the classroom back into discussions of teacher quality. Princeton, NJ: Educational Testing Service.

...when students are exposed to hands-on learning on a weekly rather than a monthly basis, they prove to be 72% of a grade level ahead in mathematics.”

While the reports cited earlier in this document suggest improved student achievement from manipulative-based instruction, this analysis of student performance on NAEP provides quantitative suggestions of the extent of improvement. Students whose teachers use manipulatives on a weekly basis perform almost three-quarters of a grade level ahead of their age-mates whose teachers use this approach on a monthly basis. ETA hand2mind materials are designed to support teachers as they use manipulatives as routine classroom instructional tools.

If you have questions or would like to talk more about hands-on mathematics, please contact **Sara Delano Moore, Ph.D., Director of Mathematics & Science, ETA hand2mind, smoore@hand2mind.com or 330.619.0119.**