

Math Think Aloud

Why Is This Strategy Useful?

Students with learning disabilities, emotional behavioral disabilities, and mild to moderate mental retardation who participate in grade-level mathematics instruction experience difficulty performing basic mathematical functions, difficulty paying attention, or difficulty giving self-directions. Mathematics Think-Aloud strategy has been proven to aid learning with these populations. Math Think-Aloud refers to thinking through the steps of a problem and helping students remember to follow each step. This strategy involves using explicit descriptions of the steps of problem solving through teacher modeling of the appropriate thought process. Moreover, having students use think-aloud strategies makes their tacit knowledge more explicit. This strategy is appropriate for elementary and middle school students. It is well suited for English language learners, students with learning disabilities, and those with emotional behavior disorders.

Description of Strategy

Math Think-Aloud involves learning a list of solution steps, often with a set of corresponding prompts that take the form of questions, such as “What does the problem say?” Students are taught to ask themselves the questions aloud and continue thinking aloud while answering them. Student can be encouraged to engage in a running monologue, describing the questions they are asking of themselves, possible solutions, and difficulties they may encounter. In the beginning, teachers model the use of the steps and apply the steps to a problem. Gradually, the teacher transfers responsibility for using the strategy to the student. Over time, the student internalizes the prompts and self-instructions so that he or she no longer verbalizes them aloud and the student independently uses the steps to solve problems. For example, students could be taught to solve problems using the following strategy. Consider this multiplication problem: $5n=50$.

Step 1: Identify the variable and the kind of problem. (Answer: n , multiplication)

Step 2: What operation do you use to solve the problem? (Answer: the opposite of multiplication, division)

Step 3: What number is used to solve the problem and why? (Answer: 5, because it is next to the variable)

Step 4: Perform the operation on both sides of the equation.

In this case, the teacher can model the strategy (i.e., thinking aloud when following the steps), use guided practice as he or she checked for comprehension and utility of the strategy, provide opportunities for independent practice (i.e., homework), assess students on mastery of the strategy and content, and provide feedback throughout. The teacher should often prompt students to go to the next step after completing the previous one. Positive reinforcement can be used throughout to motivate students.

Research Evidence

At least one case study supports the use of this strategy. In this study, teachers worked individually or in small groups with four ELLs identified with learning disabilities. Two teachers participated in this study with four students using mathematics think-aloud strategies. Pre-assessment baseline data were collected at the beginning of each study and post-assessment baseline data were collected at the end of the Math Think Aloud intervention. Assessment data included the students' state test results, IEP records, and content area test results. In addition to

frequent teacher observations and reports, three observations of each student were conducted by researchers using multiple checklists and assessment protocols. The progress of students was tracked on two measures, strategy mastery and content mastery. Findings indicated that the Math Think Aloud strategy led to increased academic performance in English language learners with disabilities. After the Math Think Aloud training, the students had more strategy and content mastery.

Sample Studies Supporting this Strategy

Barrera, M., Liu, K., Thurlow, M., Shyyan, V., Yan, M., & Chamberlain, S. (2006). *Math strategy instruction for students with disabilities who are learning English* (ELLs with Disabilities Report 16). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Available at: <http://education.umn.edu/NCEO/OnlinePubs/ELLsDis16/>

The question in this study was whether the Math Think Aloud strategy initiated through teacher instruction and subsequent use by ELLs with learning disabilities would improve academic performance in meeting standards-based mathematics objectives. The process used by both teachers, despite some differences in approach, yielded positive results for the students in this study. Our results also yielded important information on the second research question—to examine how teachers adjusted their instruction to match the specific needs of a student. This study involved six research participants: two teachers and four students identified with learning disabilities and limited literacy proficiency in English. To investigate the effects of the interventions, the research team used a baseline and intervention model for the strategy tested. Post intervention data were collected to examine maintenance of strategy effects. Students' standards-based test scores, pre- and post-curriculum-based measurement in basic skills for reading and mathematics, and ongoing performance outcomes were collected for the study. The process and results of this study served the dual purpose of examining the efficacy of an instructional approach to support the mathematics think-aloud process and to examine how teachers might implement such a strategy in specific ways to support the individualized needs of their students.

Additional Resources

Thinking Allowed. <http://www.netc.org/focus/examples/thinki.php>

Using "Think Alouds" to Evaluate Deep Understanding.
<http://www.uc.edu/cetl/documents/thinkalouds.pdf>