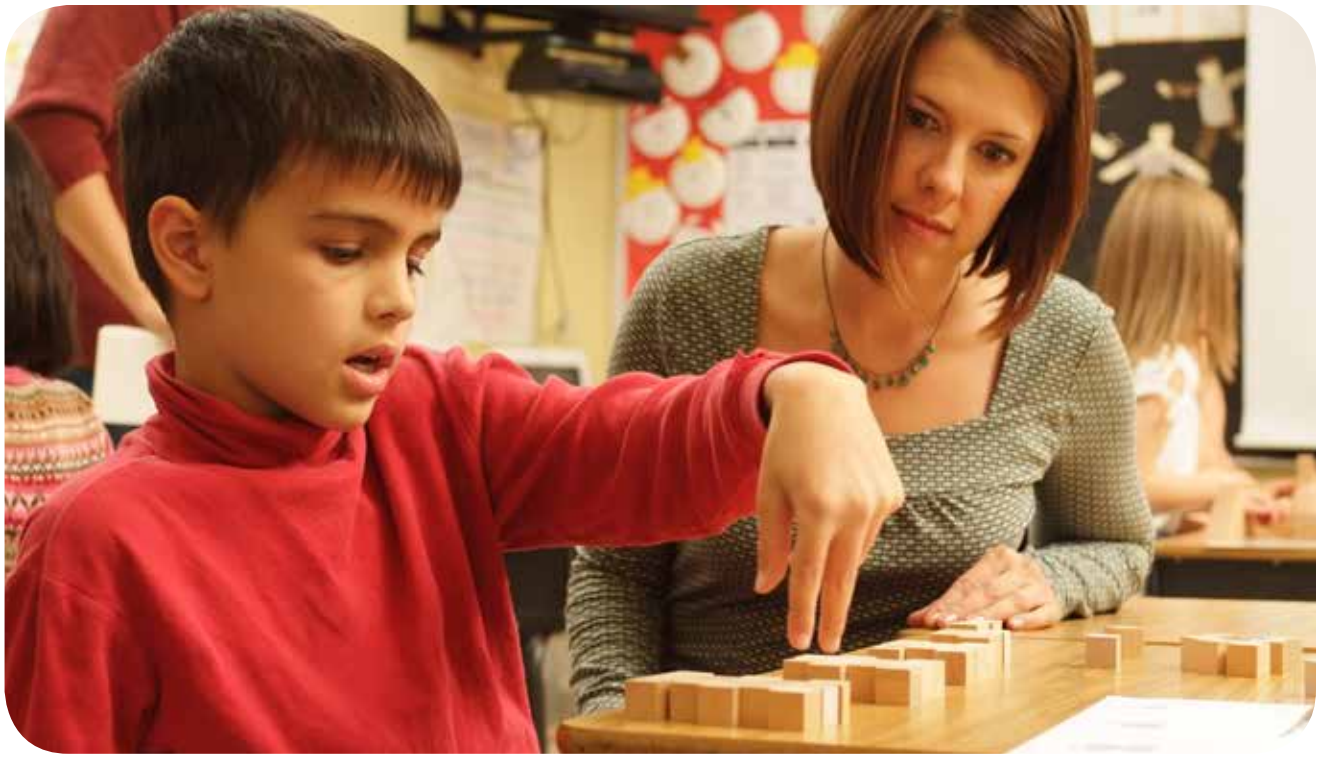


Teaching Students with Learning Disabilities:
7+ Instructional Practices

BRIDGES® IN MATHEMATICS

"Great teachers set high standards for all their students, not just the ones who are already achieving."

» Carol Dweck, Mindset

Math intervention has often taken a backseat in the world of education, with attention focusing on literacy. As new research points to specific instructional practices that make a difference for children who struggle with math, teaching can change to accommodate their needs. The seven instructional practices highlighted in this article are drawn from research analyzed by the Center on Instruction. Findings focus on effective instructional methods for these students, including those with learning disabilities and at-risk learners.

1 Teach with explicit instruction.

It's no secret that all students benefit from modeling. But when it comes to students with learning disabilities, modeling becomes even more crucial. When teaching a new concept, teachers will want to articulate their thoughts—really, to think aloud—as they solve the problem, considering:

- the steps involved in problem solving
- how to arrive at a solution
- alternate ways to look at the problem

When teachers model the thinking that goes into a problem, students have a window into what mathematically proficient thinkers do. This "thinking aloud" should also include reference to symbols and their meanings. To represent work, use number lines, arrays, ratio tables, and sketches as well. Highlight important verbs in the context of word problems. Label steps and units. Use rounding to estimate a reasonable answer.

During explicit instruction, teachers can provide immediate feedback, exploring misconceptions and preventing mistakes. Although every teaching session won't contain this degree of explicit instruction, regular use of this technique will help students access mathematical thinking skills.

2 Teach with multiple examples.

When students see a variety of instructional examples, they develop tools to help transfer knowledge to new situations. For example, when working with multi-digit multiplication, a student might begin with the concrete, building an array with tiles or base ten pieces; followed by sketching an array using grid paper as a representational model; then using quick sketches, like open arrays; and finally looking at the abstract in a number expression. Problem strings might focus on different models for multiplicative thinking, using arrays, number lines, or ratio tables. Sometimes at-risk students choose models that don't work for them; make sure that they know how to use models correctly.

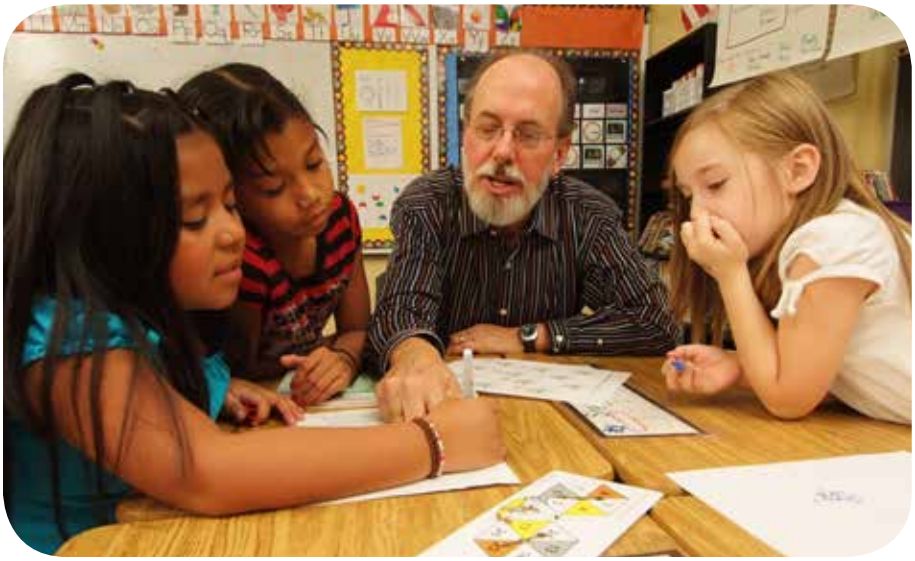
Instructional examples, when carefully chosen, also serve as scaffolds for student learning. A problem string starts out with a simple expression, with subsequent problems building on the previous understanding; by the end of the string students have used the scaffolding to solve complex problems. Anchor charts and journals provide a tour of the experience, a road map to get there again.

3 Ask students to describe their strategies, steps, and solutions aloud.

When they do so, students gain focus that stems behavioral and mathematical impulsivity and leads to better self-regulation. They might verbalize each step of the problem, or they might explain in detail the strategy they used and how they arrived at the solution.

For example, in a multi-digit multiplication problem, they might describe how they set up the the problem with a model:

"The problem is 12 x 13. I'll use the edge pieces to show 12 and 13 on each side. Then I'll build the array with base ten pieces. The 100 piece goes in the corner because there is a 10 on each side…"



Alternately, they might ask questions aloud:

"How should I begin? First, I'll… What would the next step be?"

The think-ink-pair-share strategy lends itself to this recommendation. Students could be asked to think about the specific steps that they've taken, write a record of their thinking, pair up to share those steps with a partner, and then share them with a larger group. Alternately, students might tell another student how to solve the problem while that student records the steps on paper.

4 Ask students to show their work with visual representation.

CCSS Math Practice 5 suggests that all students need to "consider the available tools when solving a mathematical problem." This is especially true for children who struggle. In the classroom, this might begin with the teacher using explicit instruction (recommendation #1) to explore a strategy, while representing the problem with visual models that might include concrete manipulatives, sketches, or some sort of graphic representation. In addition to the concrete manipulatives, apps can show number lines, number frames, geoboards, base ten pieces, pattern pieces, and more.

After teacher representation, students should have ample time to use the visual model on a specific type of problem. For example, students might explore multiplicative thinking using tiles. As they become more comfortable with the model, they extend the knowledge to a drawing on graph paper. Students benefit most when they, as well as the teacher, use visual models.

"Low-achieving students who struggle to master more and more procedures, without using numbers flexibly or compressing concepts, are working with the wrong model of mathematics. These students need to work with someone who will change their worldview of mathematics and show them how to use numbers flexibly and how to think about mathematical concepts."

» Jo Boaler,
What's Math Got to Do with It?

5 Teach students some general strategies for problem solving.

Heuristics are general problem-solving strategies that might be warranted when a specific algorithm or explicit strategy isn't used. Take estimation, for example. On a trip to the grocery store, shoppers estimate to ensure they have enough to cover the bill; they are unlikely to take the time to add every item in the cart to the penny. Estimation is a general strategy that lends itself to endless situations.

A heuristic strategy could also be useful for a word problem. Steps might include:

1. What is the problem asking?
2. What information do I need to solve the problem?
3. What would a reasonable estimate be?
4. When I check the answer against the estimate, does it make sense?

6 Use formative assessment data to make instructional decisions.

Specific data helps teachers prepare. Formative assessments guide them as they consider what to teach, when to move on, and how to select students who might need more focused review or reteaching.

Within the Bridges curriculum, the Support & Intervention materials include a progress monitoring tool that can be used every five sessions to target instruction to meet students' needs, inform decisions about future sessions, and determine whether the interventions are working. Likewise, Bridges and Number Corner sessions include checkpoints that offer a window into individual students' progress.

"Proficient problem solvers frequently use representations to solve problems and communicate results."

» Jo Boaler, What's Math Got to Do with It?

Teachers also strive to inform their teaching through informal observation, whether through one-on-one conversation, class-wide discussion, Work Place games, or responses noted on daily work, homework, or journal entries. When instructors notice a specific issue, they can set explicit goals, asking questions like, "How might I target this skill over the next two weeks?" Refer to the Work Place Guides for specific support ideas, including suggestions for game modification. As you analyze student work, look beyond just the correct answer and consider whether the chosen strategy was efficient. Could development of a more efficient strategy help students to become more fluent?

7 Provide opportunities for struggling students to work with peers.

Studies have shown that children with learning disabilities benefit from working with a capable peer or older student. A situation in which an older student provides explicit, one-on-one tutoring can be particularly helpful to students with learning disabilities. If students do not have a true LD but are low-achieving, peer tutoring is a viable alternative.

And finally…

+ Refer to the Standards for Mathematical Practice.

The eight Math Practice standards describe things that mathematically proficient students DO. When used as a guide, the practice standards help educators frame the content standards with verbs that drive student work: *explain, communicate, analyze, persevere, reason, critique, model, attend,* etc. True focus, coherence, and rigor will develop only as students integrate the behavior of mathematicians.

REFERENCES

» Jayanthi, M. Gersten, R., Baker, S. (2008). Mathematics instruction for students with learning disabilities or difficulty learning mathematics: A guide for teachers. Portsmouth, NH: RMC Research Corporation, Center on Instruction.

http://www.centeroninstruction.org/files/Mathematics%20Instruction%20LD%20Guide%20for%20Teachers.pdf

» Standards for Mathematical Practice

http://www.corestandards.org/Math/Practice/

» Math Recovery Series:

Early Numeracy: Assessment for Teaching and Intervention, 2nd edition, Robert J. Wright, Jim Martland and Ann K. Stafford, 2006

Teaching Number: Advancing Children's Skills and Strategies, 2nd edition, Robert J. Wright, Jim Martland, Ann K. Stafford, and Garry Stanger, 2006

Teaching Number in the Classroom with 4-8 year olds, 2nd edition, Robert J. Wright, Garry Stanger, Ann K. Stafford and Jim Martland, 2014

Developing Number Knowledge: Assessment, Teaching and Intervention with 7-11-year-olds, Robert J. Wright, David Ellemor-Collins and Pamela D. Tabor, 2012.