

6. Build procedural fluency from conceptual understanding.

Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Research Says:

- Effective mathematics teaching focuses on the development of both conceptual understanding and procedural fluency.
- Both NCTM and CCSS-M emphasize that procedural fluency follows and builds on a foundation of conceptual understanding, strategic reasoning, and problem solving.
- Students who use math effectively do much more than carry out procedures. Such students must also know:
 - Which procedure is appropriate and most productive for a given situation,
 - What a given procedure accomplishes, and
 - What kind of results to expect
- “Mechanical execution of procedures without understanding their conceptual basis often leads to bizarre results” (Martin, (2009), p.165)

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Teacher and student actions

What are teachers doing?

Providing students with opportunities to use their own reasoning strategies and methods for solving problems.

Asking students to discuss and explain why the procedures that they are using work to solve particular problems.

Connecting student-generated strategies and methods to more efficient procedures as appropriate.

Using visual models to support students' understanding of general methods.

Providing students with opportunities for distributed practice of procedures.

What are students doing?

Making sure that they understand and can explain the mathematical basis for the procedures that they are using.

Demonstrating flexible use of strategies and methods while reflecting on which procedures seem to work best for specific types of problems.

Determining whether specific approaches generalize to a broad class of problems.

Striving to use procedures appropriately and efficiently.