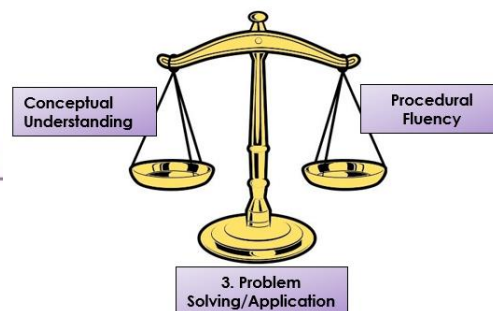


Balanced Math and the Mathematical Processes



Balanced Math

Has math instruction changed? To be clear, there is no “new math”. We now teach math in a way that is more accessible to more learners. Students need hands on math before they can get minds on math. They need opportunities to construct understanding and discover underlying relationships, models, strategies, and connections. This is part of the rationale of the C-R-A continuum. **Learners need to construct understanding of concepts.** But the mathematics is the same!

We teach math for understanding. We know that teaching through memorizing procedures creates a “house of cards”, a structure that collapses at the first challenge. Elementary and middle years teachers are tasked with the essential job of building a solid foundation of **conceptual understanding** on which we can build mathematical **proficiency**.

All things in moderation. Independent practice is still an important and effective form of learning, but when we overdo seat work and work sheets, it becomes “drill and kill”. Direct instruction also plays a role in teaching mathematics, as teachers need to introduce, make connections, explain, model procedures, and consolidate learning. While we know we can’t “tell” kids math, and that they need time to dialog and interact socially to learn past surface learning, there will always be a need for math teachers to explain clearly, model procedures, and lay out mathematics logically and systematically for learners.

The best math teachers provide a variety of experiences, including collaboration, exploration, guided math, game-based practice or activities, dialog, movement, and practice.

The answer to this argument? We need **BALANCED MATH**.

1. Conceptual Understanding is fostered by student exploration, meaning making, manipulatives, dialog, and collaborative experiences. This is supported by the concrete-representational-abstract (C-R-A) continuum. An example is working with fraction pieces to understand adding fractions by needing to swap pieces so that each group of pieces is the same size (Concrete), then drawing fractions and repartitioning them to create addends of the same size (Representational or Pictorial), then moving to the numbers, symbols, and procedures to compute added fractions by making a common denominator (Abstract).

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2. Procedural Fluency means recalling facts and understanding algorithms. Should students “memorize” math facts? They should know them! This means they can recall many facts from memory, but if they can't, they have a strategy to derive an answer. Students with poor fluency with facts have difficulty advancing to deeper thinking in math, because their brain's processing power is tied up with computation. We do a disservice to students when we don't take time to work on recall. Spaced practice helps learners store information as long term rather than short term memories. **So yes, we practice math facts!** But knowing facts alone, without the concepts that underly them, is hollow, surface learning. Multiplication facts are to mathematics what the typewriter is to a creative writer—just a tool for a much deeper construct. As in our example above, adding fractions, we can teach students a set of procedures to add fractions but they may never understand why the steps are necessary. When they forget, they make misconception errors, like simply adding denominators. Fluency is bolstered by flexible reasoning, composing and decomposing numbers and discussing strategies: Number talks!

Finally, **application** gives students opportunities to apply what they know to tasks. Problems solving is only problem solving when the task is novel—new to the student, and without set procedures. Anything else is just practice. But yes, we need to help students reason through “word” or “written” problems, to help translate written or oral problems to the language of mathematics. Students should be presented with a tool box of strategies (make a diagram, work backwards, make a list, act it out, make it simpler, use an equation, make a chart, guess and check, etc).

