



5b. Origin of EL Education's Math Pedagogy

Although the best methods and practices for teaching mathematics (*i.e.* pedagogy) have long been researched and reported, the truth of how that pedagogy is implemented into schools inevitably leads to what the education researcher Suzanne Wilson has dubbed “education reform’s double bind.” EL Education has focused on the *what* of teaching practices through the updated its [Core Practices \(CP15\)](#) to lay out the ideal mathematics pedagogy (see table 5.1).

Table 5.1: The core components of EL Education's Core Practice 15:

- A. Planning for Math Instruction
- B. Teaching for Conceptual Understanding
- C. Teaching Foundational Math Facts
- D. Teaching Problem-Solving Skills
- E. Creating a culture of Numeracy and Mathematical Thinking
- F. Assessing Mathematics

EL's recommendations regarding core teaching practices were guided by multiple research sources. We've highlighted the standards of 3 three of these sources here: (1) the National Council of Teachers of Mathematics (“N.C.T.M”) (Table 5.2); (2) the National Research Council (Table 5.3); and (3) the 2010 Common Core State Standards (Table 5.4)

The National Council of Teachers of Mathematics (incidentally the same organization that published the 1980's research which so interested Akihiko Takahashi) continues to lead math reform efforts nationwide. They published their own process standards in 2000 (see Table 5.2). Table 5.3 comes from the National Research Council's 2001 review *Adding it Up* which reviewed how students

Table 5.2: N.C.T.M. Process Standards

1. Problem Solving
2. Reasoning and Proof
3. Representation
4. Communication
5. Connections

Table 5.3 National Research Council's 5 Strands of Mathematical Proficiency

1. *Conceptual Understanding:* Comprehension of mathematical concepts, operations, and relations
2. *Procedural fluency:* skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
3. *Strategic competence:* ability to formulate, represent and solve mathematical problems
4. *Adaptive reasoning:* Capacity for logical thought, reflection, explanation, and justification.
5. *Productive disposition:* Habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy

learn mathematics. Their five strands of mathematical proficiency (summarized in table 5.3)¹ are interdependent, meaning students' success in one will aid the development of others. One final source for EL Education's Core Practice in Mathematics came from the [Standards for Mathematical Practice](#) from the Common Core State Standards (2010) (Table 5.4).

These three major sources - written building on the prior tools research and ideas - create the backbone of belief around the best practices for mathematics instruction nationwide. The difficulty, as stated previously, comes in implementation of these methods with students.

Table 5.4 Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

¹ Copied from [Teaching Student Centered Mathematics](#), Van de Walle et al, pg 2).