Mathematics Instruction

Historical Perspectives:

- Historically, Math was taught as a set of facts, rules, and procedures for dealing with numbers and quantitative concepts (Mastropieri & Scruggs, 2004).
- More recently, reform efforts initiated the development of standards. The National Council of Teachers of Mathematics starting in 1989 developed standards for mathematics. Recent revisions to these standards were made in 2000 are now known as the *Principles and Standards for School Mathematics* (NCTM, 2000).
- This recent revision provides us with 6 overarching principles to describe features of high-quality math education. And include equity, curriculum, teaching, learning, assessment, and technology (NCTM, 2000).

Current Conditions:

- The current NCTM standards are developed for grades K-12 and include standards in the following ten areas:
    - Number and Operations
    - Algebra
    - Geometry
    - Measurement
    - Data Analysis and Probability
    - Problem Solving
    - Reasoning and Proof
    - Communication
    - Connections
    - Representations

- In 1990, McLeskey and Waldron found that 64 percent of students with learning disabilities were achieving below grade level in mathematics.

- Students with learning disabilities may experience several types of difficulties in the area of mathematics. Types of difficulties include:
    - Memory and strategic deficits can differentially affect mathematics performance, causing some students to experience difficulty conceptualizing mathematical operations, representing and automatically recalling math facts, conceptualizing and learning algorithms (e.g., computational procedures) and mathematical formulae, or solving mathematical word problems.
    - Language and communication disorders may interfere with students' functioning when they are expected to read, write, and discuss ideas about mathematics.
    - Deficiencies in processes and strategies specifically associated with solving mathematical word problems also can interfere with students' conceptual understanding of problem situations and how to address those situations mathematically.

- Low motivation, poor self-esteem, and a history of academic failure can arrest a student's desire to value mathematics and to become confident in his or her ability to become mathematically literate. (Montague, 1996, p.85).

Strategy Suggestions from research:

- According to Carnine (1998), five major components are required for effective mathematics instruction. These include:
  - Focus on "big ideas"; that is generalizable concepts rather than individual details.
  - Teach "conspicuous" strategies (neither too broad or too specific) for conducting math operations and solving problems (see also Montague, 1998).
  - Make efficient use of time on prioritized objectives.
  - Communicate strategies in a clear, explicit manner.
  - Provide practice and review to promote retention (Mastropieri & Scruggs, 2004; Harniss, Stein, & Carnine, 2000).

- Strong evidence is also available supporting the use of other useful strategies, not specific to mathematics. These strategies include the following:
  - Cooperative Learning,
  - ClassWide Peer Tutoring, and
  - Direct Instruction (Harniss, Stein, & Carnine, 2000).

- Mastropieri & Scruggs (2004) offer strategies specific to various mathematical skills. These strategies are divided into the following categories:
  - Early number concepts,
  - Teaching students to count,
  - One-to-one correspondence,
  - Helping students master numeration,
  - Introducing geometry in early years,
  - Addition and subtraction concepts,
  - Counting with number lines,
  - Writing numbers,
  - Understanding symbols,
  - Addition and subtraction computation
  - Remember addition and subtraction facts,
  - Place value and regrouping,
  - Teaching early problem solving with addition and subtraction,
  - Multiplication and division concepts,
  - Multiplication and division facts,
  - Calculators,
  - Arithmetic vocabulary,
  - Multiplication and division algorithms,
  - Error analysis for diagnosis,
  - Problem solving,
  - Money,
  - Time,
  - Fractions,
  - Decimals,
  - Area and volume concepts,
  - Algebra,
  - Mathematical reasoning problems, and

- Teach functional math (p. 412-442).

Resources:

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