NCTM Professional Standards (1991)

- worthwhile mathematical tasks
- the teacher's role in discourse
- the student's role in discourse
- tools for enhancing discourse
- the learning environment
- the analysis of teaching and learning

NCTM Teaching Principle (2000)

Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well

- Effective teaching requires knowing and understanding mathematics, students as learners, and pedagogical strategies
- Effective teaching requires a challenging and supportive classroom learning environment
- Effective teaching requires continually seeking improvement

Standard 2: Teacher's Role in Discourse (1991)

- Pose thoughtful questions
- Listen carefully
- Require oral and written justification
- Decide next step during discussion
- Determine appropriate level of mathematical terminology
- Decide own role minute-by-minute
- Monitor student participation

Standard 3: Student's Role in Discourse (1991)

- Listen, respond, question
- Use variety of tools
- Initiate
- Make conjectures, present solutions
- Investigate through exploration
- Convince of validity through mathematical evidence and argument

The Communication Standard (2000)

Instructional programs from prekindergarten through grade 12 should enable all students to—

- organize and consolidate their mathematical thinking through communication
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- analyze and evaluate the mathematical thinking and strategies of others
- use the language of mathematics to express mathematical ideas precisely

Question Types: *Managing* (Richbart, Richbart)

- Help students get on task
- Help students get their work organized

Question Types: Clarifying (Richbart, Richbart)

- Used when teacher is unclear about student meaning or intention
- Also used when teacher is trying to help the student clarify his/her meaning

Question Types: Orienting (Richbart, Richbart)

- Gets students started or keeps them thinking
- Directs focus
- Motivate students toward correctness while moving them away from incorrect answer

Question Types:

Prompting Mathematical Reflection (Richbart, Richbart)

- Elicits original student mathematical thinking
- Can be reflective or explanatory
- Can be extensions

Newman Five Point Error Analysis (Richbart, Richbart)

- "Read me the problem, please"
- "What is the question asking you to do?"
- "How are you going to find the answer?"
- "Do what you need to do to get the answer and tell me what you're thinking as you work."
- "Write down the answer."

Question Types: Eliciting Algebraic Thinking (Richbart, Richbart)

- Prompts a particular type of thought
- More abstract in nature
- Pattern determination
- Bi-directional thought
- Justification for generalizations

Questioning "Try-To' s" (Johnson, <u>Every Minute Counts</u>)

- Wait time
- Avoid yes/no questions
- Don't answer your own questions
- Ask students "Why?"
- Avoid rote memory questions
- Don't use questions as discipline
- Don't repeat student answers
- Field student answers to other students
- Insist on attentiveness
- Avoid negative facial reactions and body language

Questioning "Try-To' s" (Johnson, Every Minute Counts)

- Facilitate a questioning environment
- Avoid questions containing the answer
- Don't call on a student prior to asking a question
- Don't call on a student <u>immediately after</u> asking a question (wait time)
- Ask open-ended questions
- Don't indicate (your interpretation of) a question's difficulty
- Leave an unanswered question occasionally
- Question rather than lecture
- Avoid whole group verbal responses
- Keep students actively involved

Straight Advice

- Balance between "pursuing" and "digging"
- Be aware of student comfort level
- Appropriate teacher response to student discourse can greatly enhance confidence
- Students ALWAYS HAVE questions, and you will unlikely help them find the answer to each one