

# The National Mathematics Panel Report: **Instructional Practices and RtI**

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## **RTI: IDEA 2004**

- In December, 2004, the Individuals with Disabilities Education Improvement Act of 2004 provided response to intervention as a practice for identifying students with learning disabilities.
- Recommends but does not require abandoning use of the IQ-discrepancy
- Urges early screening and intervention
- Recommends a multi-tiered intervention strategy
- Integrate services between general and special education : the third attempt

## Key Principles of RTI

- Incorporate prevention and early intervention rather than waiting
- Include universal screening to identify student needs
- Effective practices implemented class-wide in general education (primary intervention or Tier 1)
- Successive levels of support increasing in intensity and specificity provided to students as needed (secondary/tertiary intervention)

## Purpose

1. Begin with overall instructional practices
  2. Discuss strategies for struggling learners
- In all cases: clearly specify level of evidence

## Methodology: Task Group Research Reviews

Committed to assembling the most rigorous scientific research addressing questions of effectiveness about the types of interactions occurring in mathematics classrooms relative to student performance.

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**Instructional Practices group focused on studies that met the most rigorous standards: experimental studies and quasi-experiments**

Other studies used to provide context and generate hypotheses

## Key Messages on Content

- Adequate time on fractions and whole number
- This means:
  - Cut out some topics that are not Critical
    - E.g. pattern recognition not critical
  - Do not tolerate texts that flit around/immerse
  - Focus state assessments on Benchmarks
    - Develop a major strand on fractions and ratio

## Instructional Practices Topics

1. Teacher directed vs. Student centered
2. Real world problem solving
3. Use of formative assessment
4. Special populations:
  - Mathematically precocious
  - Learning disabilities (relevant to RtI)
  - Low achieving (relevant to RtI)

## Formative Assessment

**Formative assessment significantly enhances mathematics achievement, particularly when:**

- Teachers are given tools for use of these data
- Based on only one type of formative assessment
- This term has taken on many new meanings and many have not been seriously studied

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## Instructional Practices: Selection of Topics

- No particular theoretical framework was used to generate this list. Panelists selected topics that were perceived as:
  - high interest to the teachers and policymakers
  - areas requiring additional attention in terms of implementation of recent federal policies (NCLB and IDEA).
  - topics deemed critical by organizations such as NCTM.

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✓ Many widely used instructional practices were omitted because of time limitations

Chose to focus on hot button issues

## Instructional Practices Finding 1

1. No evidence to support an all-encompassing recommendations that instruction should be student-centered or teacher-directed
  - These terms remain murky
  - For purposes of this analysis, student centered included students working together in highly structured fashion
- Positive effects for cooperative learning & peer assisted learning
  - Both entailed a good deal of structure in terms of activities

## Instructional Practices Finding 2

**Formative assessment significantly enhances mathematics achievement, particularly when:**

- Teachers are given tools for use of these data

*Note:* Based on only one type of formative assessment

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## **Finding 3: Students with difficulties in mathematics including special education students should receive**

- ✓ *explicit instruction*  
on a regular basis that
  1. Covers critical foundation topics in depth
  2. Integrates concepts, procedures, story problems
  3. Uses visual representations such as number line.

No reason to assume this is the only type of instruction students should receive.

## Explicit Systematic Instruction

entails . . .

- ✓ teachers explaining and demonstrating specific strategies, and
- ✓ allowing students many opportunities to ask and answer questions and
- ✓ to think aloud about the decisions they make while solving problems
- ✓ careful sequencing of problems by the teacher or through instructional materials to highlight critical features.

## Other Instructional Variables

1. Clear model of steps involved in solving a problem
2. Carefully orchestrated examples/ sequences of examples.
3. Concrete objects to understand abstract representations and notation.
4. Teachers should encourage students to think aloud and talk about decisions made

See RtI Practice Guide

## Instructional Practices Findings

### Use of technology shows promise when:

- Computer-assisted instruction supports drill and practice
- Well designed tutorials are delivered through computer-assisted instruction
- Learning is supported by the careful, targeted application of computer programming

### More research is needed

**Note: did not address graphing calculators**

## Instructional Practices Findings

Mathematically precocious students with sufficient motivation appear to be able to learn mathematics successfully at a much higher rate than normally-paced students, with no harm to their learning.

✓Supportive evidence weak

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## Real World Problems

The use of "real-world" contexts to introduce mathematical ideas has been advocated, with the term "real-world" being used in varied ways.

- If mathematical ideas are taught using "real-world" contexts, then students' performance on assessments involving similar problems is improved.

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## Summary: Findings and Recommendations

1. No evidence that child centered or teacher-directed instruction is better than the other
  - Few studies did head on comparisons
  - These terms remain murky

**Recommendation: Don't mandate 100% one or the other**

### Findings and Recommendations (continued)

2. Use of complex multi-step problems helps students solve them but does not help general mathematics achievement

**Recommendation: Use "real world" problems sparingly (not weekly) and make sure students know the underlying mathematics**

3. Formative Assessment can raise mathematics achievement by approximately 8 percentile points

**Recommendation: Use valid and reliable measures**  
If teachers have tools to help them, effects double  
**Note: these are not clinical, diagnostic assessments (no research on these)**

## A Few Next Steps

1. Ensuring assessments adhere to benchmarks and are reliable and valid.....
2. Ignore ideologues in terms of how to teach
3. Provide appropriate interventions to struggling students that covers core content for success in algebra
4. Interventions in early grades equally essential
5. Consider serious evaluations of intervention strategies, given our limited knowledge base.