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In collaboration with **DaSy, ECTA, NCSI, & NTACT**

What We Know About Mathematics Instruction for Students With Disabilities - Evidence-Based Practices

SSIP Interactive Institutes

Albuquerque, NM; April 29-30, 2015
Jonathan Stout, Lock Haven University

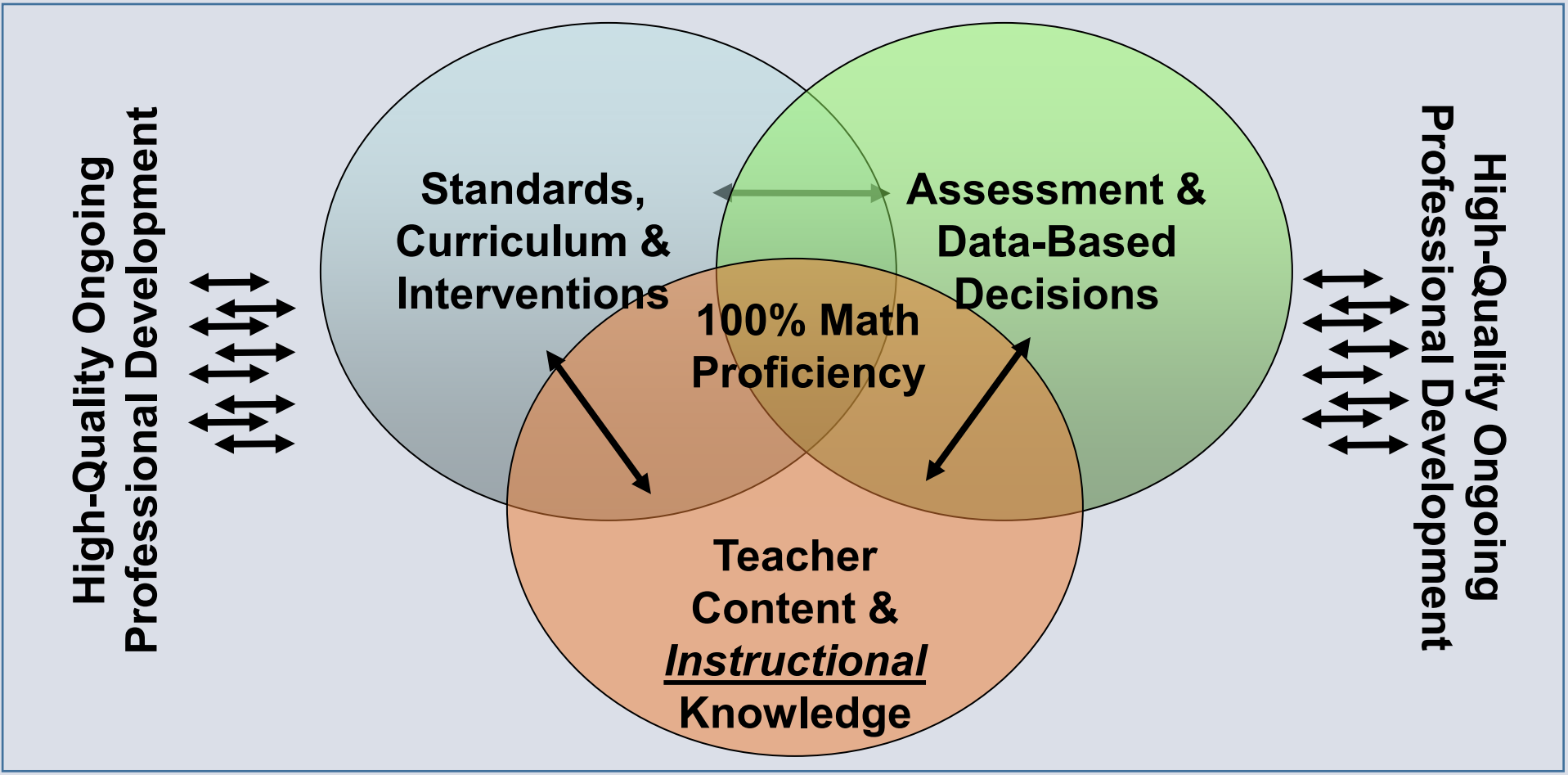
Jacksonville, FL; May 12-13, 2015
Paul Riccomini, The Pennsylvania State University

Chicago, IL; May 27-28, 2015
Paul Riccomini, The Pennsylvania State University

Today's Focal Points

- *PLANNING, DESIGNING, IMPLEMENTING, and SUSTAINING* instructional programs in mathematics to improve the learning outcomes of students with disabilities
- Pillars of Effective Mathematics Instructional Programs
- Evidenced-Based Practices in Mathematics
  - National Mathematics Advisory Panel Final Report
- Mathematical Practices
- Summary and Questions

Pillars of Effective Mathematics Programs



Learning Processes—NMAP-2008

- To prepare students for Algebra, the curriculum must ***simultaneously*** develop ***conceptual understanding***, ***computational fluency***, ***factual knowledge*** and ***problem solving skills***.

- Limitations in the ability to keep many things in mind (***working-memory***) can hinder mathematics performance.
  - ***Practice*** can offset this through automatic recall, which results in less information to keep in mind and frees attention for new aspects of material at hand.
  - Learning is most effective when ***practice is combined with instruction*** on related concepts.
  - Conceptual understanding ***promotes transfer*** of learning to new problems and better long-term retention.

Instructional Practices—NMAP-2008

Instructional practice *should be informed by high quality research*, when available, and by the best professional judgment and experience of accomplished classroom teachers.

- All-encompassing recommendations that instruction should be *student-centered* or *teacher-directed* ***are not supported by research***.

Instructional Practices—NMAP-2008

Research on students who are ***low achievers, have difficulties in mathematics, or have learning disabilities*** related to mathematics tells us that the effective practice includes:

- ✓ ***Explicit methods of instruction available on a regular basis***
- ✓ ***Clear problem-solving models***
- ✓ ***Carefully orchestrated examples/sequences of examples***
- ✓ ***Concrete objects to understand abstract representations and notation***
- ✓ ***Participatory thinking aloud by students and teachers***

CCSS for Mathematical Practice

- "The *Standards for Mathematical Practice* describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important 'processes and proficiencies' with longstanding importance in mathematics education."

(CCSS, 2010)

CCSS for Mathematical Practices

1. Make sense of complex 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.

(CCSS, 2010)

Learning Outcomes of CCSS-MP

1. Make sense of problems and persevere in solving them
6. Attend to precision

2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others	Reasoning and explaining
4. Model with mathematics 5. Use appropriate tools strategically	Modeling and using tools
7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Seeing structure and generalizing

(McCallum, 2011)

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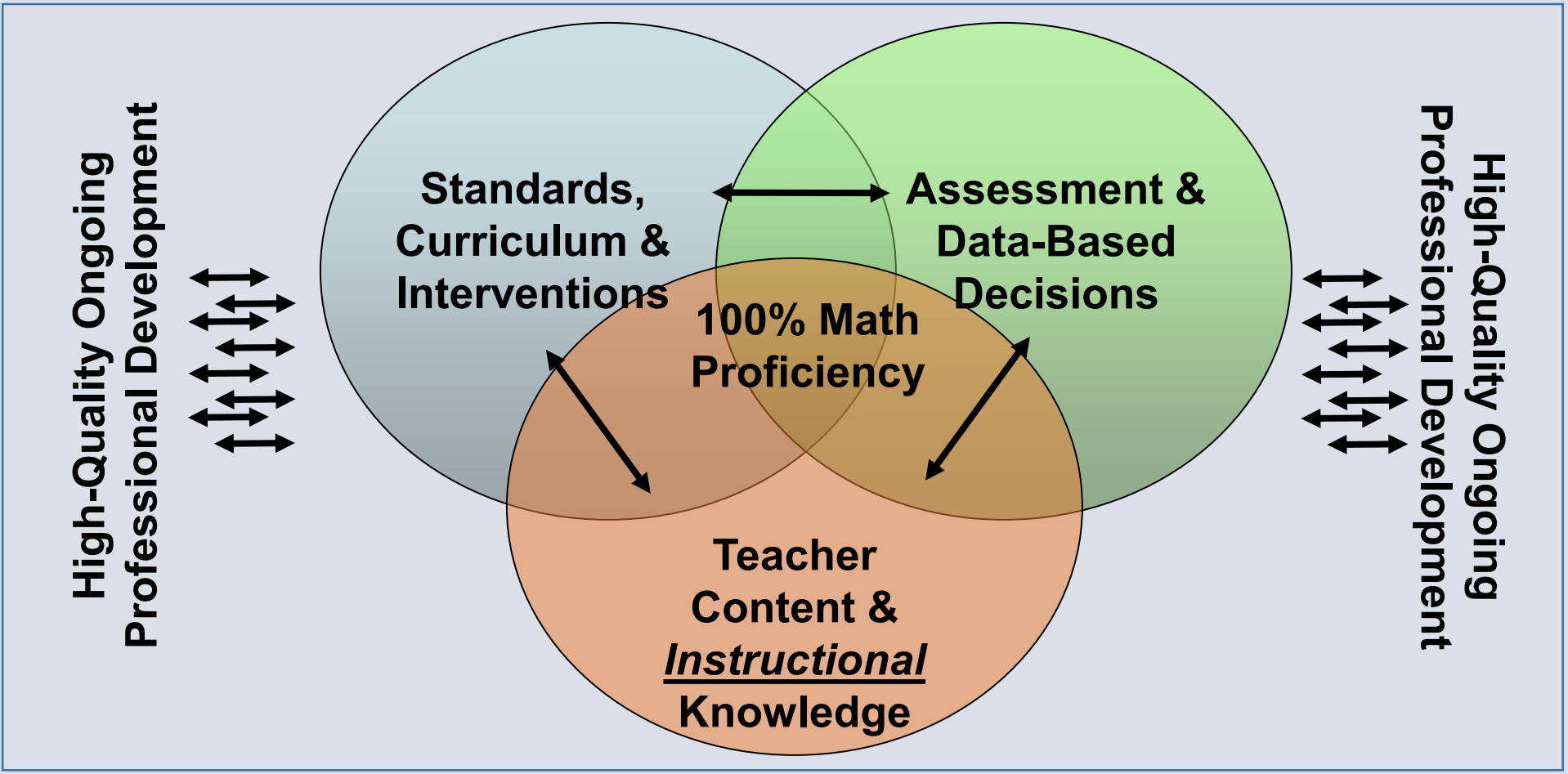
These are BIG challenges for students with disabilities and those that are struggling.
It will only happen if it is purposefully facilitated through teacher <u>INSTRUCTION!</u>

(McCallum, 2011)

Pillars of Effective Mathematics Programs



Essential Questions

- What is the current status of your state relating the 3 Main Pillars?
  - Standards, Curriculum, and Interventions
  - Assessments and Data-based Decisions
  - Teacher Content and Instructional Knowledge
- Instructional Support System
  - What is the current support system for struggling students?
  - Do students get extra instruction? How much? Where?
- Instruction and interventions
  - What is the core program?
  - What are the interventions?
  - What strategies do your teachers currently use?

For More Information

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