

High-Quality Mathematics Instruction: What Teachers Should Know

Use this outline to follow along with the module's main features. The blank "Notes" panels below each section are interactive and can be filled in using Adobe Acrobat. Otherwise, print this document and record your notes by hand.

Module Home

- **Module Description:** This module describes the components of high-quality mathematics instruction: a standards-based curriculum and evidence-based practices. It also highlights several effective practices teachers can use to teach mathematics (est. completion time: 1.5 hours).
- *STAR Legacy Cycle*
- **Related to This Module**
 - Link: [Module Outline](#)
 - Video: [Navigating an IRIS STAR Legacy Module](#)
 - Link: [IRIS and Adult Learning Theory](#)
 - [Wrap-Around Content Map](#)

Challenge

- **Video:** For the past five years, the principals and teachers in the Lincoln School district have focused their attention and resources on improving reading instruction, and the students' reading scores have improved. Now the administrative personnel at the district level wish to do the same for their students' mathematics performance.

Notes

Initial Thoughts

- What is high-quality mathematics instruction and why is it important?
- What evidence-based mathematics instructional practices can teachers employ?

Notes

Perspectives & Resources

❖ Module Objectives

High-Quality Mathematics Instruction: What Teachers Should Know

- After completing the entire Perspectives & Resources section and reviewing the accompanying activities, you should be able to:
 - Understand the importance of providing high-quality mathematics instruction
 - Identify the components of high-quality mathematics instruction
 - Recognize the need for implementing a standards-based mathematics curriculum
 - Describe some evidence-based practices for teaching mathematics
 - Recognize effective classroom practices that promote and support the implementation of high-quality mathematics instruction
- This IRIS Module aligns with the following licensure and program standards and topic areas...

Notes

❖ Page 1: The Importance of High-Quality Mathematics Instruction

- Research Shows
- What Do These Data Indicate?
 - Consider This
- Why Do Some Students Struggle More with Math?
 - Students with Learning Disabilities
 - Link: mathematics learning disability (MLD) [definition]
 - Students with a MLD tend to display any of a number of characteristics...[bullet points]
 - Audio: Diane Bryant describes why students with mathematics learning disabilities and those who struggle with mathematics are often grouped together in research
 - English Language Learners
 - Link: academic language [definition]
- What Can Teachers Do?
 - High-quality mathematics instruction involves the implementation of both...[bullet points]
 - Research Shows
- Activity: Among the factors that sometimes influence high-quality mathematics instruction are teacher and student perceptions and beliefs about mathematics itself
 - Link: Click here to discover your own attitudes and beliefs about mathematics and to reflect on how they might influence your instruction

High-Quality Mathematics Instruction: What Teachers Should Know

Notes

❖ Page 2: A Standards-Based Mathematics Curriculum

- Discussion of the most effective method of teaching mathematics
- Definition of standards-based curricula
- Most states have adopted the Common Core State Standards for Mathematics (CCSSM) [bullet points]
- For Your Information
 - Audio: Diane Pedrotty Bryant discusses the purposes of the CCSSM
- The components that make up the CCSSM [graphic]
- Standards for Mathematical Practice
 - Link: the National Council of Teachers of Mathematics (NCTM) [definition]
 - Link: the National Research Council [definition]
 - CCSSM Standards for Mathematical Practice [table]
- Standards for Mathematical Content
 - Kindergarten – 8th grade
 - Domains and grade levels [table]
 - High School
 - Definition of generalization
 - The high school standards are separated into conceptual categories...[bullet points]
- For Your Information
 - Link: CCSSM Website
 - Link: Standards for Mathematical Practice
 - Link: Standards for Mathematical Content
 - Link: Standards in Your State
- Curricular Materials
 - Did You Know?
 - Link: Click the link to learn more about exemplary standards-based mathematics programs
 - Definition of curricular materials
 - Click here to view a list of these instructional features that teachers can look for when assessing curricular materials [turn-down]
 - Link: Guidelines for Design of Mathematics Instruction and Materials for ELLs

High-Quality Mathematics Instruction: What Teachers Should Know

- Audio: Kim Paulson provides more information about supplementing the curriculum
- For Your Information

Notes

❖ Page 3: Evidence-Based Mathematics Practices

- The most effective way to teach concepts and procedures is to implement evidence-based practices (EBPs)
- For Your Information
- Why Should Teachers Use EBPs?
 - Link: Every Student Succeeds Act (ESSA) [definition]
 - Link: Individuals with Disabilities Education Act (IDEA '04) [definition]
 - Link: scientifically based research [definition]
 - The benefits of using EBPs [bullet points]
- Identifying and Selecting EBPs
 - Link: Click here for a list of Web-based resources for determining whether a practice or program is evidence-based
- Implementing EBPs with Fidelity
 - Discussion of fidelity
 - To implement an EBP with fidelity, a teacher should...[bullet points]
 - Audio: Sarah Powell discusses why educators should implement EBPs and the importance of doing so with fidelity
- For Your Information
 - To learn more about identifying EBPs, implementing them with fidelity, and evaluating whether they are beneficial for individual students, view the following IRIS Modules [links to IRIS resources]
- EBPs for Mathematics
 - This module will highlight four practices [bullet points]
 - Link: moderate to strong evidence [definition]
 - HLP and CCSSM Standards Alignment
 - Definition of high-leverage practices (HLPs)
 - Link: High-Leverage Practices in Special Education
 - Link: CCSSM Standards for Mathematical Practice

High-Quality Mathematics Instruction: What Teachers Should Know

Notes

❖ Page 4: Explicit, Systematic Instruction

- Discussion of explicit, systematic instruction, sometimes simply referred to as explicit instruction
- The key components of explicit, systematic instruction [table]
 - Link: scaffolded instruction [definition]
 - Link: maintenance [definition]
 - Click here to view a sample task analysis [turn-down menu]
- Research Shows
- How does this practice align? [box with bullets]
- Click here for a step-by-step description of a lesson that employs explicit, systematic instruction [turn-down menu]
 - Link: corrective feedback [definition]
- Video: Elementary School Example
- Video: High School Example
- For Your Information

Notes

❖ Page 5: Visual Representations

- Discussion of visual representations (schematic representations or schematic diagrams)
- Research Shows
- How does this practice align [box with bullets]
- Visual representations most commonly used by teachers and students [drop-down menus]
 - Number lines
 - Strip Diagrams
 - Pictures

High-Quality Mathematics Instruction: What Teachers Should Know

- Graphs/Charts
- Graphic Organizers
- Elementary Example
- High School Example
- Manipulatives
 - If you would like to learn more about this framework click here [turn-down menu]
 - The components of the Concrete-Representational-Abstract framework [bullet points]
 - For Your Information
 - Audio: Kim Paulsen discusses the benefits of manipulatives and a number of things to keep in mind when using them

Notes

❖ Page 6: Schema Instruction

- Discussion of schema
- Difficulty with Word Problems
 - Word problems require students to...[numbered list]
 - Research Shows
- Word Problem Structures
 - Additive Schemas [drop-down menu]
 - Total
 - Difference
 - Change
 - For Your Information
 - Multiplicative Schemas [drop-down menu]
 - Equal Groups
 - Comparison
 - Ratios/Proportions
 - Combined Schemas
 - Audio: Sarah Powell discusses the underlying focus of this strategy
- Teaching Word Problem Structures
 - Discussion of schema instruction, or schema-based instruction (SBI)
 - Steps for how to teach the combine schema [table]

High-Quality Mathematics Instruction: What Teachers Should Know

Notes

❖ Page 7: Metacognitive Strategies

- Discussion of metacognitive and cognitive strategies
- Metacognitive strategies help students learn to...[bullet points]
- How does this practice align [box with bullets]
- Research Shows
- Types of metacognitive strategies
 - Self-instruction and self-monitoring [table]
- Teaching Metacognitive Strategies
 - Teachers should use explicit instruction to help students understand how to use self-instruction and self-monitoring. Teachers can... [bullet points]
- Examples of Students Using Metacognitive Strategies
 - Video: Elementary School Example
 - Click here to view the self-monitoring checklist used by the elementary student in the video above [turn-down]
 - Video: High School Example
 - Audio: Diane Bryant discusses the importance of teaching students cognitive and metacognitive strategies
- For Your Information
 - Sample self-monitoring checklist

Notes

❖ Page 8: Effective Classroom Practices

- Classroom practices teachers can implement in conjunction with an EBP to increase the mathematical understanding of their students [bullet points]
- Research Shows
- For Your Information

High-Quality Mathematics Instruction: What Teachers Should Know

- Encouraging Student Discussion
 - How does this practice align? [box with bullets]
 - Definition of student discussion or discourse
 - To implement this practice teachers should...[bullet points]
 - Video: A teacher encourages his class to describe how they solved a mathematics problem
- Presenting and Comparing Multiple Solution Strategies
 - How does this practice align? [box with bullets]
 - To do this, teachers should...[bullet points]
 - Note
 - Video: A teacher presenting and comparing multiple strategies for solving a two-digit addition problem
- Assessing Student Understanding
 - How does this practice align? [box with bullet]
 - Formative assessment
 - Link: exit tickets [definition]
 - Link: progress monitoring [definition]
 - Link: Progress Monitoring: Mathematics [IRIS Module]
 - Error analysis
 - Definition of error patterns
 - Example: Error Analysis
 - Audio: Diane Bryant discusses the instructional implications for using formative feedback and error analysis
 - Link: Mathematics: Identifying and Addressing Student Errors [IRIS Case Study Unit]

Notes

❖ Page 9: References & Additional Resources

- Suggested module citation
- References
- Additional Resources

❖ Page 10: Credits

- Suggested module citation
- Content Experts
- Module Developers

High-Quality Mathematics Instruction: What Teachers Should Know

- Expert Reviewers
- Module Production Team
- Media Production Team
- Media
- Expert Interviews

Wrap Up

- Summary of the module
- High-quality mathematics instruction involves the combined implementation of both... [bullet points]
- Evidence-Based Practice/Definition [table]
- Additional classroom practices teacher can implement to increase the mathematical understanding of their students [bullet points]
- Audio: Lois Coles discusses the positive effects of using a standards-based curriculum and effective practices
- Revisit your Initial Thoughts responses

Notes

Assessment

- Complete the numbered questions. Please note that the IRIS Center does not collect your Assessment responses. If this is a course assignment, you should turn them in to your professor using whatever method he or she requires.

High-Quality Mathematics Instruction: What Teachers Should Know

Notes

You Have Completed This Module

- Give Us Your Feedback
 - Link: [Module feedback survey form](#)
- Professional Development Hours
 - Link: [IRIS PD Options](#)
- Related Resources [[links](#)]