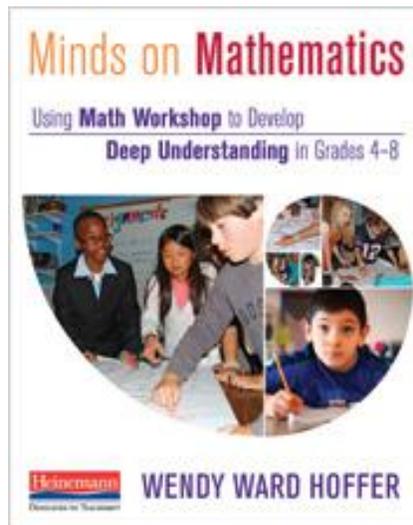


# Study Guide

## Minds on Mathematics:

*Using Math Workshop to Develop Deep Understanding in Grades 4-8*

Wendy Ward Hoffer



*"The aim of education should be to teach us rather how to think, than what to think -- rather to improve our minds, so as to enable us to think for ourselves, than to load the memory with the thoughts of other men. "*

– John Dewey

The purpose of the book, *Minds on Mathematics*, is to offer teachers a roadmap to promoting and honoring all learners' their thinking as mathematicians. The purpose of this study guide is to inspire educators to dig deeply into the ideas of the text and to make thoughtful and sustainable changes to their instructional practice.

## Before Reading

### Discussion Questions:

- How do you feel about yourself as a mathematician?
- What are your beliefs about how students develop their mathematical abilities?
- How are you integrating the Common Core Standards for Mathematical Practice into your daily lessons?
- How do you track learners' understanding?
- What are your aspirations as a math teacher?

### Activities:

- Write a brief description of an ideal day in your math class.
- Invite a colleague to observe you and your students during a typical math lesson and track how you spend your time – not what the lesson plan said, but how the lesson actually went. You might use one of the following record-keeping formats to track the nature of classroom talk:

	Asks a Question	Explains	Offers Feedback	Adds on to an idea	Paraphrases
Teacher					
Student					

Time	Teacher Voice / Action	Student Voice / Action

After the observation: What do you notice? What do you wonder? Is this what you expected the data to say?

- Find and solve a tough math problem you are not familiar with – you can choose one of the following or one from another source. Slow yourself down, document your work, and notice what you do as a problem solver to make meaning of the mathematics. Then, solve the same problem in a completely different way – think in words, pictures, symbols, numbers, kinesthetically. Document your solution again. Consider: how might awareness of your own innate strategies, as well as the challenge of using alternate strategies, inform you as a math teacher?

- The Earth is revolving at 900 miles per hour, orbiting the sun at nineteen miles per second. Relative to the Sun, how far will you travel in a twenty four hour day?

- Cletis buys a skateboard during a 20% off sale, but he has to pay 8.5% sales tax. Including tax, what fraction of the original \$135 price will he end up paying?

- A soccer ball is covered with 12 pentagons and 20 hexagons. If each of these polygons were flat, what would the angle between one and its neighboring shape be?

## During Reading

### *Chapter 1: Minds on Math Workshop*

#### Discussion Questions

- In what ways is the rationale behind minds on math workshops congruent with your beliefs? What challenges might you offer the author?
- How are the elements of a minds-on math workshop similar to and different from a typical day in your classroom?
- What is the difference between teaching for understanding and teaching algorithms?
- In what ways are you inspired to adjust your instruction?
- As you read on, what are you hoping to learn more about?

#### Activities

- Using the planning template on page 17, plan a workshop. Teach it, and share your experience with your study group.
- Observe a colleague striving to implement workshop model instruction. Use the planning template on page 17 to record what you see and hear during the lesson. Discuss your observation.

### *Chapter 2: Tools*

#### Discussion Questions

- What relationship do you see between the Common Core State Standards for Mathematical Practice and 21<sup>st</sup> century skills?
- How do you see the thinking strategies serving math learners?
- What other thinking “tools” do you offer to learners, and how do those connect with the recommendations in this chapter?
- How do you balance process and content instruction?

#### Activities

- Examine the graphic organizer on page 22-23. Annotate the text: Which of these bulleted recommendations are you

- 1) already implementing;
- 2) aspiring to implement;
- 3) hesitant to consider.

Make a plan to get started on the #2s.

- Listen in to student talk during work time, either your own students', or another teacher's: referring to the chart on page 27, record each time you hear a

student making a remarks that suggests he or she is thinking along the lines of one of the strategies. Offer explicit strategy instruction, and observe again.

### *Chapter 3: Tasks*

#### Discussion Questions

- How do you (or will you) select which tasks you will ask learners to complete?
- What are some of the challenges in finding or creating juicy math tasks? Where have you found / how have you developed great ones?
- What are some of the stumbling blocks inherent in facilitating students' success with challenging work?
- What might you say in response to a colleague who reports, "Not all my students are ready for high cognitive demand"?

#### Activities

- Review the work you have asked math learners to do in the past week. Rate each task by its level of cognitive demand. What do you notice?
- Select a familiar, straightforward math problem. Using the guide on page 42 – 43, create three or more different versions related to the learning target of the original problem. Discussion each version of the problem with colleagues, then test drive those with students.
- Teach your students about cognitive demand and why it's important. Ask them to revise some "typical" math problems to make them more challenging.

### *Chapter 4: Community*

#### Discussion Questions

- Describe the best learning community you have ever been a part of.
- What are the rules in your classroom? How did you develop, and how do you reinforce those?
- What community building rituals do you have in place in your classroom?
- "No one is done until everyone is done." What does this mean to you? How might a norm like this promote community in your classroom?

#### Activities

- Develop and distribute a survey among your students to learn how they feel about the learning community in your classroom. Tabulate and share the results; discuss how you all might strengthen the community even more.
- List common transgressions in your classroom and the consequences you frequently dole out. Consider how these consequences support the development of classroom community.

- For one week, devote time each day to document, offer feedback and invite learners to reflect their community-building behavior. What do you notice?

### *Chapter 5: Discourse*

#### Discussion Questions

- What does an amazing discussion sound like?
- How is discourse different from typical Question-Response-Evaluation (QRE) conversation patterns?
- What have you found effective in promoting classroom discourse?
- How do you manage the conversation when learners get off topic?
- What proportion of the class time do you aspire to devote to student talk? How will you assess your progress towards that goal?

#### Activities

- Ask a colleague to observe and record conversation patterns in your classroom. Offer her a diagram of the classroom setup, and ask that she draw a line from the first speaker to the next and so forth, depicting the flow of conversation. What do you see?
- Create classroom posters of sentence stems you would like to hear students using. Teach the stems; applaud students' use of them.
- Challenge yourself to make seven or fewer comments during five minutes of student sharing, and stick with it. Notice how it feels to bite your tongue. What would it take for you to feel comfortable making even fewer comments next time?

### *Chapter 6: Opening*

#### Discussion Questions

- How do you typically start class?
- What messages do your rituals and routines send?
- How do you find or develop opening problems?
- How do you manage homework? What new ideas might you try?
- If you use an opening problem, how do you manage accountability and paperwork?

#### Activities

- Observe the first ten minutes of several colleagues' math classes. Record and discuss what you notice.
- Review your recent opening problems through the lens of cognitive demand (see Chapter 3). What do you notice?

## ***Chapter 7: Mini-Lesson***

### Discussion Questions

- Often educators make a distinction between “teaching the math” and “teaching the mathematician.” What difference do you see between these approaches?
- How do or could you use a “think aloud” in your math class?
- How do you strike the balance between process and content learning targets?
- Sometimes “mini-lessons” expand into “maxi-lessons.” How could you keep yours mini?
- How do you assess students’ readiness to commence work time? How might you differentiate at this juncture?

### Activities

- Plan one mini-lesson with a focus on modeling thinking rather than showing examples. What do you find yourself attending to?
- Select one thinking strategy and design a series of mini-lessons to introduce and model that strategy in the context of math.

## ***Chapter 8: Work Time***

### Discussion Questions

- How do you typically differentiate? What new ideas do you have?
- How do you group students? Why? How is that strategy serving learners?
- How do you promote students’ stamina during work time?
- In what ways do you hold learners’ accountable? What else might you try?

### Activities

- Discuss the idea of “stuck” and “unstuck” with your students. Create a chart with them representing strategies for getting unstuck.
- Keep track of how you use your own time during student work time. What do you notice?
- Select and pilot a strategy for data gathering during work time (page 131-2). What did you learn?

## ***Chapter 9: Conferring***

### Discussion Questions

- Of the seven modes of teacher voice described on page 139, which are the most common in your instructional practice? Which are the least? What is your aspiration for the role of your voice in students’ lives?

- How do you see the distinction between “typical helping” and “conferring”? What do you need to remember in order to confer effectively?
- In what ways can you cultivate a classroom culture that allows for conferring?

### Activities

- Create a conferring log, and set a weekly conferring goal. Monitor how this initiative affects student learning.
- Try out the conferring questions on page 147, as well as your own. Hone a short list of conferring questions that feel authentic to you and draw forth learners’ thinking.
- Observe a colleague conferring. Write down all the questions she or he asks. What do you notice?

## ***Chapter 10: Sharing and Reflection***

### Discussion Questions

- What is metacognition, and why is it important?
- What is the difference between sharing and reflection? How might you devote time to both?
- What are some of the challenges associated with saving time for sharing and reflection? How might you overcome those?
- What is your experience with asking learners to write as mathematicians?

### Activities

- For one week, plan specific sharing and reflection activities. Reserve time for them every day. Track the effect on students’ understanding.
- Building on the example on page 165, develop a rubric for students’ mathematical writing. Share it with learners; use it to provide feedback on their work over time. How do explicit expectations promote student achievement?

## **After Reading**

### Discussion Questions

- What does the imperative to move from coverage to understanding mean to you as a math teacher?
- What elements of *Minds on Mathematics* do you aspire to integrate into your instruction? How?
- What do you not yet understand about math workshop that you would like to explore further?

### Activities

- Set goals for adjusting your instructional practice; invite a peer to hold you accountable for following through. Gather student assessment data to determine if your new strategies are promoting achievement.
- Share your successes! Create a place in your building - a bulletin board, bookshelf or back hallways – to document your successes as a math teacher. Post photos of learners at work, wonderful lesson plans, great math problems, impressive student thinking and inspiring reflections for all to see.
- As a study group, compile your comments and questions, and send those to the author, Wendy Ward Hoffer <[whoffer@pebc.org](mailto:whoffer@pebc.org)> She will write back!