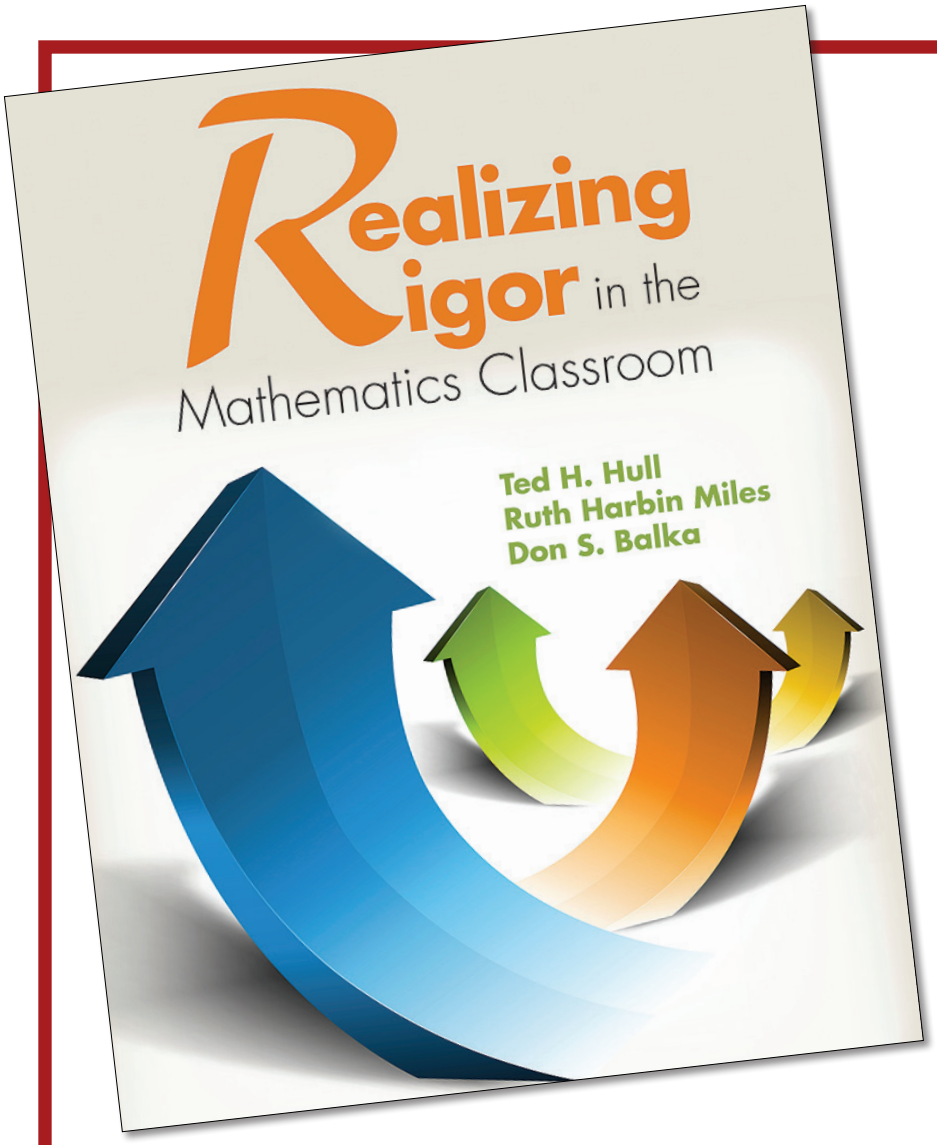

Thank you

FOR YOUR INTEREST IN CORWIN

Please enjoy this complimentary excerpt from *Realizing Rigor in the Mathematics Classroom*. Learn how to use this Matrix featured in Realizing Rigor to refine strategies and select student actions. (Secondary)

LEARN MORE about this title, including Features, Table of Contents, and Reviews.

CORWIN Mathematics

Classroom Formative Assessment and the Matrix

Classroom formative assessment—checking student understanding continually during classroom instruction—requires active engagement by students. To assess students' understanding, thinking, and reasoning, students must be engaged in ways that visibly demonstrate their thinking, reasoning, and understanding. In essence, students must be discussing, sharing, collaborating, and attending to a lesson. The Standards for Mathematical Practice point the direction for what students do, or actions they take, while learning mathematics. The Matrix expands on and clarifies actions for the practices. When students are engaged in these actions, their thinking is made visible, and teachers can assess students' depth of comprehension. In other words, the indicators identified in the Matrix provide the actions students must be doing for teachers to engage in classroom formative assessment. As students and teachers undertake these actions, mathematics classrooms increase in rigor.

The Matrix helps guide lesson planning and student actions that need to occur during instruction. While the Matrix is not a template used to plan lessons or a checklist of actions to be taken, it does serve as a reflective tool. Optimally, the Matrix is used during collaborative lesson planning. The lesson that follows provides an example of how teachers use the Matrix to guide their thoughts and actions in preparing for how students will be engaged during the lesson.

Lesson Example: Using the Matrix to Select Strategies and Student Actions While Planning

Ms. Edwards's Classroom

Ms. Edwards teaches fifth grade. She has been working to incorporate the Standards for Practice as she teaches the Common Core mathematics content. She has discovered that students are appearing to really enjoy mathematics class more. The students are comfortable working in pairs, so Ms. Edwards wants to try a more engaging problem with students working in groups of three. She wants her students to think and reason more deeply, model with mathematics, and critique the reasoning of the other students. Looking at the Proficiency Matrix, she focuses on the following:

Practice 2. Reason abstractly and quantitatively for initial and intermediate levels.

Initial: Reason with models or pictorial representations to solve problems.

Table 6.1 Proficiency Matrix (also in Appendix A)

	Students:	(I) = Initial	(IN) = Intermediate	(A) = Advanced
1a	Make sense of problems.	Explain their thought processes in solving a problem one way. *(Pair-Share)*	Explain their thought processes in solving a problem and representing it in several ways. *(Questioning/Wait Time)*	Discuss, explain, and demonstrate solving a problem with multiple representations and in multiple ways. *(Grouping/Engaging)*
1b	Persevere in solving them.	Stay with a challenging problem for more than one attempt. *(Questioning/Wait Time)*	Try several approaches in finding a solution, and only seek hints if stuck. *(Grouping/Engaging)*	Struggle with various attempts over time, and learn from previous solution attempts. *(Allowing Struggle)*
2	Reason abstractly and quantitatively.	Reason with models or pictorial representations to solve problems. *(Grouping/Engaging)*	Translate situations into symbols for solving problems. *(Grouping/Engaging)*	Convert situations into symbols to appropriately solve problems as well as convert symbols into meaningful situations. *(Encouraging Reasoning)*
3a	Construct viable arguments.	Explain their thinking for the solution they found. *(Showing Thinking)*	Explain their own thinking and thinking of others with accurate vocabulary. *(Questioning/Wait Time)*	Justify and explain, with accurate language and vocabulary, why their solution is correct. *(Grouping/Engaging)*
3b	Critique the reasoning of others.	Understand and discuss other ideas and approaches. *(Pair-Share)*	Explain other students' solutions and identify strengths and weaknesses of the solutions. *(Questioning/Wait Time)*	Compare and contrast various solution strategies, and explain the reasoning of others. *(Grouping/Engaging)*

(Continued)

Table 6.1 (Continued)

	Students:	(I) = Initial	(IN) = Intermediate	(A) = Advanced
4	Model with mathematics.	Use models to represent and solve a problem, and translate the solution into mathematical symbols. *(Grouping/Engaging)*	Use models and symbols to represent and solve a problem, and accurately explain the solution representation. *(Question/Prompt)*	Use a variety of models, symbolic representations, and technology tools to demonstrate a solution to a problem. *(Showing Thinking)*
5	Use appropriate tools strategically.	Use the appropriate tool to find a solution. *(Grouping/Engaging)*	Select from a variety of tools the ones that can be used to solve a problem, and explain their reasoning for the selection. *(Grouping/Engaging)*	Combine various tools, including technology, explore, and solve a problem as well as justify their tool selection and problem solution. *(Allowing Struggle)*
6	Attend to precision.	Communicate their reasoning and solution to others. *(Showing Thinking)*	Incorporate appropriate vocabulary and symbols in communicating their reasoning and solution to others. *(Allowing Struggle)*	Use appropriate symbols, vocabulary, and labeling to effectively communicate and exchange ideas. *(Encouraging Reasoning)*
7	Look for and make use of structure.	Look for structure within mathematics to help them solve problems efficiently (such as $2 \times 7 \times 5$ has the same value as $2 \times 5 \times 7$, so instead of multiplying 14 x 5, which is $[2 \times 7] \times 5$, the student can mentally calculate 10×7.) *(Question/Prompt)*	Compose and decompose number situations and relationships through observed patterns in order to simplify solutions. *(Allowing Struggle)*	See complex and complicated mathematical expressions as component parts. *(Encouraging Reasoning)*
8	Look for and express regularity in repeated reasoning.	Look for obvious patterns, and use if/then reasoning strategies for obvious patterns. *(Grouping/Engaging)*	Find and explain subtle patterns. *(Allowing Struggle)*	Discover deep, underlying relationships (uncover a model or equation that unifies the various aspects of a problem such as discovering an underlying function). *(Encouraging Reasoning)*

Source: © LCM 2011, Hull, Balka, and Harbin Miles, mathleadership.com

Intermediate: Translate situations into symbols for solving problems.

Practice 3b. Critique the reasoning of others for intermediate level.

Intermediate: Explain other students' solutions and identify strengths and weaknesses of solutions.

Practice 4. Model with mathematics for intermediate level.

Intermediate: Use models and symbols to represent and solve a problem, and accurately explain the solution representation.

She is planning for the lesson to take two class days but is okay with extending into three if class discussion about the mathematics is rich.

She has taken a more traditional problem about two boys mowing lawns and extended the problem. She plans to have students demonstrate their work on large sheets of paper, and then hang the work around the room. Students then take a gallery walk comparing different ways groups solved the problem. She will then consecutively number each group's paper.

After time for the groups to review the work, she is sending the students back to their small groups of three to offer their thoughts on the following:

A) Which group's work was accurate?
B) How can the different approaches (even if the solution was incorrect) be clustered, along with a written explanation of why the work was sorted as such?
C) If a group's solution was thought to be incorrect, where was the error made? The small groups were to select only one group's work to review if the solution was thought to be incorrect.

Finally, Ms. Edwards intends to pull several groups that used different approaches to the front of the classroom to explain their work and solution.

Ms. Edwards wants her students to understand that a solution approach could be correct even though a calculation was incorrect. She wants to emphasize the importance of effort and thinking. Furthermore, Ms. Edwards plans on carefully monitoring group work during the exploration phase. While mistakes could slip through, she intends to intervene with groups who are working the problem incorrectly. She recognizes this is a balancing act of providing guidance and probing questions without directly providing a singular solution path and answer.

Ms. Edwards plans to emphasize rigor by integrating content and instruction through using the Matrix.