Understanding

RIGOR

in the Classroom

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The Nature of Rigor

The term *rigor* is ubiquitous in K–12 education, and one hears it bandied about as if it were a well-defined construct among educators. Unfortunately, this is not the case. Depending on which source you consult, you will encounter differing perspectives on what it means and how it is accomplished (see Blackburn, 2008; Hechinger Institute, 2009; Wagner 2008a, 2008b; Williamson & Johnston, 1999). In education, the term certainly became popular in the 1990s with the advent of the "rigor, relevance, and relationships" movement (see McNulty & Quaglia, 2007). I maintain that the precursor to the rigor, relevance, and relationships movement was the "thinking skills" movement of the 1980s that was initiated by the Association for Supervision and Curriculum Development (now known as ASCD) and cosponsored by the Association Collaborative for Teaching Thinking, which involved twenty-eight professional organizations including the American Educational Research Association, the National Council of Teachers of English, the International Reading Association (now the International Literacy Association), the National Council for Social Studies, the National Science Teachers Association, and the National Council of Teachers of Mathematics, among others. Although the term *rigor* was not a focal point of this initiative, many of the terms that are now used to define rigor were described and exemplified as a part of that effort. Those terms included *metacognitive skills*, *knowledge application skills*, *cognitive skills*, *habits of mind*, *dispositions*, and the like.

Regardless of the exact etymology of the term *rigor*, one thing is quite clear. If one is to propose techniques for enhancing rigor, one must define what is meant by rigor. In this book, I define it in a relatively straightforward manner. Rigor involves discerning new relationships between topics and new distinctions within topics. It also involves discerning new distinctions about oneself as a learner. I believe that everything currently discussed as being an aspect of rigor is secondary to these basic goals even though many of those things are noteworthy in their own right.

I should also note that the discussion in this book will exclude some strategies that have historically been thought of as standard fare when trying to enhance rigor. The most prominent of these exclusions is the use of "higher-order questions."

The Myth of Higher-Order Questions

One of the most enduring beliefs about enhancing rigor is that it can be developed simply by asking higher-order questions. Arguably, this perspective became prominent in the late 1970s and early 1980s when two related studies (Redfield & Rousseau, 1981; Winne, 1979) reported larger effect sizes for "higher-order" questions than for "lower-order" questions. Educators embraced this perspective quite readily and quickly, probably because it provided an easy solution to the problem of enhancing the complexity of students' thinking—simply ask higher-order questions.

In the years since, research has not supported the earlier beliefs about the benefits of higher-order questions and in fact refute the notion that higher-order questions produce more complex thinking (see Good & Brophy, 2003; Marzano & Simms, 2014; Wilen & Clegg, 1986). To illustrate, in 2014, Marzano and Simms conducted a synthesis of 39 studies that directly compared the effects of higher-order questions with lower-order questions: 21 of those studies found no difference, 10 of those studies found better effects for higher-order questions, and 8 of those studies found better effects for lower-order questions. In short, the simple use of questions as the primary approach to enhancing rigor is too simple in its application. Teachers must do far more than ask questions to improve the thinking of their students.

A Situated Perspective on Rigor

In this book I take the perspective that rigor is situational. Activities that spawn rigor in one situation are different from the activities that spawn rigor in a different situation. Furthermore, I take the perspective that the classroom situations in which rigor might occur can be defined by the interaction of two interacting variables: (1) the type of knowledge with which students are engaged and (2) how familiar students are with the content. We first consider the different types of knowledge.

Historically, cognitive scientists have made a distinction between declarative and procedural knowledge. Declarative knowledge is informational in nature. For example, the following statements that might be found in a state or local standards document are declarative in nature:

Mathematics:	Understands the basic characteristics of a data distribution.
Literature:	Can describe the defining characteristics of historical fiction.
Science:	Understands the basic ways the sun supplies heat and light to the earth.
History:	Can describe the circumstances that shaped the Civil War and its outcomes.

Procedural knowledge involves skills and processes. For example, the following statements that might be found in state and local standards documents are procedural in nature:

Mathematics:	Is able to solve linear equations.
Writing:	Edits a composition for overall logic.
Science:	Is able to balance chemical equations.
Social Studies:	Evaluates a persuasive article for its validity.

Being rigorous about declarative knowledge involves mental activities like discerning how one type of information is different from another type of information. For example, take the math concept of distributions. An activity that requires students to describe different types of distributions and what is similar and different about those types would deepen the level of rigor with which students understand the topic of distributions.

Being rigorous about procedural knowledge involves activities like breaking the steps into smaller parts. For example, consider the mental process of editing for overall logic. An activity that requires students to describe the process in terms of what you should do first, what you should do second, and so on would increase the rigor with which students execute the process.

The second dimension on which activities involving rigor can vary is how familiar students are with the content. When students are first introduced to an idea, activities involving rigor might be approached differently than how they would be if students have already acquired a basic understanding of the knowledge. Again, let's consider the declarative knowledge of distribution. If students are first being introduced to the topic of distributions in the context of a short video presentation, the teacher might cue them to continually ask themselves if they are confused about this new information and encourage them to turn these confusions into questions. This activity would increase the rigor of their initial understanding. We discuss this in Chapter 2. However, if students have previously been exposed to the concept of distribution, then the comparison activity just described, in which students describe similarities and differences for various distributions, would enhance the rigor of their understanding. We address this in Chapter 1.

Now let's reconsider the procedure knowledge of editing for overall logic. If students are newly learning this procedure, then helping them analyze the accuracy of the steps they employ would enhance rigor. We address this in Chapter 4. If students already have acquired a basic functionality with the procedure, then rigor is attained by helping them develop fluency as they execute the steps. We address this in Chapter 3.

In effect, then, there are four scenarios a teacher must consider when planning for instruction to enhance rigor. These are depicted in Table I.1:

Table I.1. *Four classroom situations to enhance rigor*

	Initial Learning of Content	After Initial Learning of Content
Declarative Knowledge	Plan activities that enhance rigor while students are initially learning declarative knowledge.	Plan activities that enhance rigor after students have initially learned declarative knowledge.
Procedural Knowledge	Plan activities that enhance rigor while students are initially learning procedural knowledge.	Plan activities that enhance rigor after students have initially learned procedural knowledge.

Table I.1 depicts the four situations that will be the focus of this book. The first four chapters articulate specific rigor-enhancing strategies for each of these four scenarios.

Using Cognitive Analysis Processes and Habits of Mind

In this book, I use two types of activities that can be employed within the four previously described scenarios: cognitive analysis processes and habits of mind.

Cognitive Analysis Processes

When used properly, cognitive analysis processes help students analyze knowledge in depth. These processes have been used for decades as tools for fostering higher-level thinking (see Marzano et al., 1988). For the purposes of this book, we focus on the five cognitive analysis processes listed in Table I.2:

Table I.2. *Cognitive analysis skills*

Cognitive Analysis Skill	Description
Comparing	Identifying how two items are similar and/or different relative to specific characteristics
Classifying	Identifying the category an item belongs to based on specific characteristics or grouping items into categories based on specific characteristics
Supporting Claims	Building a hierarchic system of support for statements believed to be true
Elaborating	Inferring characteristics based on assumptions or inferring consequences based on reasoning
Analyzing Errors	Identifying common errors in reasoning or errors in the execution of a procedure

As will be described in Chapters 1 through 4, these cognitive analysis processes can be applied to both declarative and procedural knowledge when they are initially being learned and after they have been initially learned. As we will see in Chapter 5, they can also be considered an explicit part of the curriculum and taught directly.

Habits of Mind

The habits have also been used for decades as tools not only for deepening students' understanding of content, but also for increasing their metacognitive awareness (Marzano et al., 1988). They are commonly referred to as *habits of mind* and as *dispositions*. In this book, I use both labels but will more commonly refer to them as habits of mind. Table I.3 lists the habits of mind featured in this book.

The dispositions can be used in tandem with the cognitive analysis processes to enhance rigor with declarative and procedural knowledge when they are initially learned and after they are learned. Chapters 1 through 4 describe

Table I.3. *Habits of mind*

Habits of Mind	Description
Staying focused when answers and solutions are not apparent	Recognizing you have become frustrated because you can't find an answer or solution and continuing to try
Seeking accuracy	Recognizing when it's important to be accurate and seeking sources to confirm your accuracy
Resisting impulsivity	Recognizing when you are making decisions or generating conclusions too quickly
Seeking clarity	Recognizing when you do not understand important content and taking steps to clear up misunderstandings
Developing fluency	Recognizing when you must balance speed and accuracy when executing a procedure and taking steps to do so
Seeking cohesion and coherence	Recognizing when content is composed of small units that interact to form a unified whole and attending to both
Taking incremental steps	Recognizing when a situation involves multiple steps that cannot be approached as a whole and breaking it into smaller parts

their use. They can also be taught directly as part of the curriculum. This is described in Chapter 6.

Identifying the Classroom Situation

A hard but overlooked fact about fostering rigor is that it requires thoughtful planning on the part of teachers. A basic premise of this book is that planning for rigor must involve identifying the specific classroom situation within which rigor will be addressed. Once this is done, specific cognitive analysis processes and specific habits of mind can be selected to create rigor-producing activities for students.

The planning process and its resulting decisions described in this book are summarized in Table I.4.

Table I.4. *Rigor planning process*

What type of content will I be addressing: declarative or procedural?	
Declarative	**Procedural**
If students are initially learning the declarative content, use the following cognitive analysis processes:	If students are initially learning the procedural content, use the following cognitive analysis processes:
• Analyzing errors • Elaborating	• Analyzing errors • Elaborating
Use the following habits of mind:	Use the following habits of mind:
• Seeking clarity • Seeking accuracy	• Seeking clarity • Taking incremental steps
If students have already been introduced to the declarative content, use the following cognitive analysis processes:	If students have already been introduced to the procedural content, use the following cognitive analysis processes:
• Comparing • Classifying • Constructing support	• Comparing • Classifying
Use the following habits of mind:	Use the following habits of mind:
• Staying focused when answers and solutions aren't apparent • Resisting impulsivity	• Developing fluency • Seeking cohesion and coherence

What You Will Find in This Book

Chapters 1 through 4 address the four classroom scenarios in which rigor might be addressed. Chapter 5 introduces the topic of teaching the cognitive analysis processes as content in their own right, and Chapter 6 addresses teaching the habits of mind as content in their own right. Finally, Chapter 7 addresses how project-based instruction can be used as a vehicle for enhancing rigor. In effect, this book attempts to provide a focused, yet comprehensive, framework for enhancing rigor across grade levels and subject areas.