RIGOR REDEFINED:
BUILDING A CULTURE OF HIGH EXPECTATIONS IN GEORGIA SCHOOLS AND CLASSROOMS

Lya R. Snell, Ph.D.
Mathematics Program Specialist
Georgia Department of Education
The call to increase rigor in schools increases daily. For more than 20 years, reports have described the lack of rigor in our schools. Since the release of *A Nation At Risk* (National Commission on Excellence in Education, 1983) the debate about the quality of America’s schools has grown exponentially.

Adoption of *No Child Left Behind* in 2001 raised the debate to a new level. For the first time, schools were held accountable for the achievement of every student, not just the most capable.

**The Characteristics of a Rigorous Classroom**

Barbara R. Blackburn, Ph.D., and Ronald Williamson, Ed.D.

The call to increase rigor in schools increases daily. For more than 20 years, reports have described the lack of rigor in our schools. Since the release of *A Nation At Risk* (National Commission on Excellence in Education, 1983) the debate about the quality of America’s schools has grown exponentially.

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**Issues**

- Many high school graduates are unprepared for college.
- Too few high school graduates are getting needed skills and are taking remediation courses in college.
- College readiness translates into work readiness as well;
- Employers say that high school graduates are lacking basic skills;
- Students planning to join the workforce after graduation do not need a less rigorous curriculum—they also need higher order thinking skills;
- Students are not prepared for high school.

*Sources: Achieve (2007); ACT (2007); American Diploma Project (n.d.); Cavanaugh (2004); Dyer (n.d.); National High School Alliance (2006); Williamson (2006).*

More recently there is growing recognition of the need to prepare students for life following high school—whether some type of higher education or employment. A comprehensive look at American’s classrooms (Wagner, 2008) found that even in some of the nation’s “best” schools, students were inadequately challenged and were not expected to use critical thinking and problem solving skills.
A New Understanding of Rigor
The first step toward increasing the rigor in our schools is to build a common understanding of rigor. While there are many definitions of rigor, there is no agreement on what it means.

Our perspective is simple: True rigor is creating an environment in which each student is expected to learn at high levels, each student is supported so he or she can learn at high levels, and each student demonstrates learning at high levels (Blackburn, 2008). Only when you create a culture of high expectations and provide support so students can truly demonstrate understanding do you have a rigorous classroom.

Launching a Conversation About Rigor

Begin the process by asking your teachers to answer three questions anonymously:
1. What is rigor?
2. What are teachers doing in a rigorous classroom?
3. What are students doing in a rigorous classroom?

Collate the responses and share them with everyone. This will help you and your teachers discuss your varied perspectives of rigor.

Then examine the characteristics of a rigorous classroom. What does rigor look like, according to your agreed upon definition? For each of the three components: increasing expectations, providing support, and demonstrating understanding, we’ve provided examples of a characteristic.

Increasing Expectations
The foundation of a rigorous classroom lies with high expectations for students. What does that look like in a classroom? We’ve identified three items principals should observe in a classroom of high expectations:
1. Through comments and actions, the teacher projects to students, “I believe you can.”
2. The teacher has a positive affect, but does not allow excuses for a lack of effort.
3. There is adequate wait time from the teacher which conveys the message that, “I expect you to answer.”

<table>
<thead>
<tr>
<th>Definitions of Rigor</th>
<th>Authors</th>
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<tr>
<td>Quality of thinking, not quantity, can occur in any grade and at any subject.</td>
<td>Bogess (2007)</td>
</tr>
<tr>
<td>High expectations are important and must include effort on the part of the learner.</td>
<td>Wasley, Hampel and Clark (1997)</td>
</tr>
<tr>
<td>Deep immersion in a subject which should include real-world settings and working with an expert.</td>
<td>Washor and Mojkowki (2006)</td>
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<tr>
<td>“Rigor would be used to say something about how an experience or activity is carried out and to what degree. Specifically, a ‘rigorous’ experience would be one that involves depth and care as, for example, in a scientific experiment or literary analysis that is done thoughtfully, deeply with sufficient depth and attention to accuracy and detail.”</td>
<td>Beane (2001)</td>
</tr>
<tr>
<td>“Goal of helping students develop the capacity to understand content that is complex, ambiguous, provocative, and personally or emotionally challenging (page 7).”</td>
<td>Strong, Silver and Perrini (2001)</td>
</tr>
<tr>
<td>Rigor for the 21st century includes a focus on skills for life: critical thinking and problem solving, collaboration and leadership, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analyzing information, and curiosity and imagination.</td>
<td>Wagner (2008)</td>
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</table>
Providing Support
Supporting students so that they can learn at high levels is central to our definition: Each student is supported so he or she can learn at high levels. It is critical that teachers craft lessons that move students to more challenging work while simultaneously providing ongoing scaffolding to support students as they learn. To simply increase expectations without helping students move to those higher levels is inappropriate. There are three explicit activities you will see in a rigorous classroom with appropriate support.
1. Extra help is regularly provided to all students in a non-threatening way.
2. Opportunities for review and individualized support are built into the lesson.
3. Individual or small group tutoring is required for students who do not master material. Ideally this occurs during the regular school day.

Demonstrating Learning
Finally, classrooms with a culture of rigor provide opportunities for each student to demonstrate learning at high levels. In such a classroom you can observe:
1. When the teacher asks a question, all students are asked to respond through pair/share, interactive white boards, or some other form of response.
2. Students are given a variety of ways to demonstrate learning. This may include tests with a wide range of types of questions, or it may be that students are allowed to show their understanding through creative projects.
3. Students are given multiple opportunities to demonstrate understanding. This may occur through a “not yet” grading policy or through opportunities to rework missed questions of a test for partial credit.

Conclusion
In a rigorous learning environment, the role of the principal is to remove barriers to success. To increase rigor in your school, you may need to begin by developing a shared understanding of rigor so that all stakeholders have a common frame of reference. Then discuss the characteristics of a rigorous classroom and look for their presence when you visit classrooms in your school.

Authors
Dr. Barbara R. Blackburn is an Assistant Professor in the Department of Middle, Secondary and K-12 Education at the University of North Carolina, Charlotte. Dr. Ronald Williamson is Professor of Leadership and Counseling at Eastern Michigan University.

References

In a rigorous classroom with appropriate support.
What is Academic Rigor, What Do We Do with It?

By: Jordan Catapano

The term “academic rigor” has been perambulating its way through educational circuits, but many teachers are not familiar with the concept or how to support rigor within their classroom. Understanding rigor is essential for understanding how to approach and measure the learning of students. It questions the standards we demand from our students and reconsider exactly what we consider as true achievement.

“Rigor,” in the academic sense, is referring to that fine line between challenging and frustrating a student. It means that students are challenged to think, perform, and grow to a level that they were not at previously. It means that students must work, like an athlete at a team practice, to build their skills, understanding, and thinking power so that they can achieve at higher and higher levels. It means that the standards of the course are calibrated so that students are compelled to grow, but are not frustrated and overwhelmed in the process.

Academic rigor is commonly thought of in three different phases of the educational process. The first is setting the standard for students; the second is equipping students through instructional and supportive methods; the third is student demonstration of achievement. These three phases were popularized by Barbara Blackburn’s 2008 book “Rigorous Schools and Classrooms: Leading the Way.”

Setting the Standard

We all know that there is a certain standard of excellence that we implicitly expect of our students. Sometimes these standards are made clear to students via examples, rubrics, directions, and instruction. Sometimes these standards are less defined. What is essential for establishing the appropriate degree of rigor in your classroom is making sure that you overtly demonstrate to students what the expected outcome is. Here are a few key characteristics of a classroom that communicates the standards.

- Total classroom environment endorses a high-degree of performance from each student.
- Teacher believes in the potential for each student’s success and communicates this belief.
- Lessons and tasks are designed to lead students to expected outcomes.
- Examples of desired outcomes and undesired outcomes are overtly shared with students.
- Students have opportunity to revise their academic attempts.
- Higher-level, thought-provoking questions are asked by teacher.
- High-level, thought-provoking answers are shared by students.
- Teacher does not accept lower-level thinking or answers in discussion or academic tasks.
Supporting Rigorous Achievement

Not only is maintaining a high standard essential for student success, but excellent teachers must also make sure that they are supporting each and every student to move progressively toward the desired level of achievement. Teachers must consistently ensure that whatever the content or skill they are covering, they provide the requisite materials and instructional patterns. Here are the signs of a classroom environment supportive for student progress:

- Lessons are systematically scaffolded from one to the next.
- Materials are consistently organized to clearly provide instructions and demonstration of task.
- Intervention tasks or instructions are regularly utilized to ensure no students are left behind.
- Teacher is available for helping students individually at other points throughout the day.
- Parents are communicated with regularly regarding the academic goals of the course.
- Learning tools are color-coded, graphically organized, reinforced, and interactive.
- Content is made relevant and relatable to student background information and interest.

Validation of Achievement

It’s not enough for teachers simply to “teach” and expect students then to “learn.” The final step for true assessment of academic rigor within the classroom is for the teacher to provide students with various opportunities to demonstrate their degree of achievement in relation to the given standard. Here are a variety of methods available for allowing students to exemplify their progress:

- A balance of formative and summative assessments intermittently provided.
- Student demonstration measured using a rubric or other standard-based assessment tool.
- Students allowed the opportunity to conference and revise work.
- Homework and class activities thought of as “practice.”
- Students work independently or collaboratively on a given project.
- Students connect material to real-life examples and situations.
- Students provide a written or spoken summative report.
- Students metacognitively apply a variety of content learned.
- Student performance compared to previous student attempts.
- Students provide high-level answers to high-level questions.
- Students do not give up or feel overwhelmed when faced with challenges.
- Students reflect on their learning progress and efforts.

So what are your standards in your classroom? How are those communicated, supported, and demonstrated throughout the year? Take time to consider how “rigorous” the academic requirements are for your classroom, and shape the environment to consistently demand of students higher and higher levels of academic progress!

REMEMBER...IT’S ALL ABOUT STUDENT OUTCOMES!!
**ACT 1**

What did/do you notice?

<table>
<thead>
<tr>
<th>What questions come to your mind?</th>
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</thead>
</table>

**Main Question:**

Estimate the result of the main question? Explain?

*Place an estimate that is too high and too low on the number line*

Low estimate   *Place an “x” where your estimate belongs*   High estimate

**ACT 2**

What information would you like to know or do you need to solve the MAIN question?

Record the given information (measurements, materials, etc…)

If possible, give a better estimate using this information: _____________________________
Act 2 (con’t)
Use this area for your work, tables, calculations, sketches, and final solution.

ACT 3

What was the result?

<table>
<thead>
<tr>
<th>Which Standards for Mathematical Practice did you use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Make sense of problems &amp; persevere in solving them</td>
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<tr>
<td>□ Reason abstractly &amp; quantitatively</td>
</tr>
<tr>
<td>□ Construct viable arguments &amp; critique the reasoning of others.</td>
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<tr>
<td>□ Model with mathematics.</td>
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<tr>
<td>□ Use appropriate tools strategically.</td>
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<tr>
<td>□ Attend to precision.</td>
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<tr>
<td>□ Look for and make use of structure.</td>
</tr>
<tr>
<td>□ Look for and express regularity in repeated reasoning.</td>
</tr>
</tbody>
</table>
### Standards for Mathematical Practice Look Fors

#### Student Behaviors

1. **Make sense of problems and persevere in solving them.**
   
   **Students are:**
   - Reading the problem carefully (TKES 3.7)
   - Drawing pictures, diagrams, tables, or using objects to make sense of the problem (TKES 3.7)
   - Discussing the meaning of the problem with classmates (TKES 4.3)
   - Making choices about which solution path to take (TKES 5.2)
   - Trying out potential solution paths and making changes as needed (TKES 8.2)
   - Checking answers and making sure solutions are reasonable and make sense (TKES 6.7)
   - Exploring other ways to solve the problem (TKES 8.7)
   - Persisting in efforts to solve challenging problems, even after reaching a point of frustration. (TKES 8.5 & 8.6)

2. **Reason abstractly and quantitatively.**
   
   **Students are:**
   - Using mathematical symbols to represent situations (TKES 3.8)
   - Taking quantities out of context to work with them (decontextualizing) (TKES 3.8)
   - Putting quantities back in context to see if they make sense (contextualizing) (TKES 3.8)
   - Considering units when determining if the answer makes sense in terms of the situation (TKES 3.8)

3. **Construct viable arguments and critique the reasoning of others.**
   
   **Students are:**
   - Making and testing conjectures (TKES 8.7)
   - Explaining and justifying their thinking using words, objects, and drawings (TKES 6.2)
   - Listening to the ideas of others and deciding if they make sense (TKES 4.5)
   - Asking useful questions (TKES 3.7)
   - Identifying flaws in logic when responding to the arguments of others (TKES 4.5)
   - Elaborating with a second sentence (spontaneously or prompted by the teacher or another student) to explain their thinking and connect it to their first sentence. (TKES 8.6)
   - Talking about and asking questions about each other’s thinking, in order to clarify or improve their own mathematical understanding. (TKES 4.3)
   - Revising their work based upon the justification and explanations of others. (TKES 8.2)

4. **Model with mathematics.**
   
   **Students are:**
   - Using mathematical models (i.e. formulas, equations, symbols) to solve problems in the world (TKES 3.8)
   - Using appropriate tools such as objects, drawings, and tables to create mathematical models (TKES 3.8)
   - Making connections between different mathematical representations (concrete, verbal, algebraic, numerical, graphical, pictorial, etc.) (TKES 8.6)
   - Checking to see if an answer makes sense within the context of a situation and changing the model as needed (TKES 8.2)

5. **Use appropriate tools strategically.**
   
   **Students are:**
   - Using technological tools to explore and deepen understanding of concepts (TKES 3.5)
   - Deciding which tool will best help solve the problem. Examples may include: (TKES 3.5)
     - Calculator
     - Concrete models
     - Digital Technology
     - Pencil/paper
     - Ruler, compass, protractor
   - Estimating solutions before using a tool (TKES 3.4)
   - Comparing estimates to solutions to see if the tool was effective (TKES 3.5)

6. **Attend to precision.**
   
   **Students are:**
   - Communicating precisely using clear language and accurate mathematics vocabulary (TKES 1.4)
   - Deciding when to estimate or give an exact answer (TKES 1.5)
   - Calculating accurately and efficiently, expressing answers with an appropriate degree of precision (TKES 1.2)
   - Using appropriate units; appropriately labeling diagrams and graphs (TKES 1.6)

7. **Look for and make use of structure.**
   
   **Students are:**
   - Finding structure and patterns in numbers (TKES 1.2)
   - Finding structure and patterns in diagrams and graphs (TKES 1.2)
   - Using patterns to make rules about math (TKES 1.2)
   - Using these math rules to help them solve problems (TKES 1.2)

8. **Look for and express regularity in repeated reasoning.**
   
   **Students are:**
   - Looking for patterns when working with numbers, diagrams, tables, and graphs (TKES 1.2)
   - Observing when calculations are repeated (TKES 8.6)
   - Using observations from repeated calculations to take shortcuts(TKES 8.7)

*Please note that most of the teacher and student behaviors listed can be paired with more than one TKES indicator.*
## Standards for Mathematical Practice Teacher Behaviors

**1. Make sense of problems and persevere in solving them.**

*Teachers are:*
- Providing rich problems aligned to the standards (TKES 1.2)
- Providing appropriate time for students to engage in the productive struggle of problem solving (TKES 8.6)

*Teachers ask:*
- What information do you have? What do you need to find out? What do you think the answer might be?
- Can you draw a picture? How could you make this problem easier to solve?
- How is ___’s way of solving the problem like/different from yours? Does your plan make sense? Why or why not?
- What tools/manipulatives might help you? What are you having trouble with? How can you check this?

**2. Reason abstractly and quantitatively.**

*Teachers are:*
- Providing a variety of problems in different contexts that allow students to arrive at a solution in different ways (TKES 4.1)
- Using think aloud strategies as they model problem solving (TKES 3.4)
- Attentively listening for strategies students are using to solve problems (TKES 5.4)

*Teachers ask:*
- What does the number ____ represent in the problem? How can you represent the problem with symbols and numbers?
- Can you make a chart, table or graph?

**3. Construct viable arguments and critique the reasoning of others.**

*Teachers are:*
- Posing tasks that require students to explain, argue, or critique (TKES 8.6)
- Providing many opportunities for student discourse in pairs, groups, and during whole group instruction (TKES 4.3)

*Teachers ask:*
- Why or why not? How do you know? Can you explain that? Do you agree?
- How is your answer different than _____’s? What math language will help you prove your answer?
- What examples could prove or disprove your argument? What questions do you have for ____?

**4. Model with mathematics.**

*Teachers are:*
- Providing opportunities for students to solve problems in real life contexts (TKES 3.8)
- Identifying problem solving contexts connected to student interests (TKES 4.1)

*Teachers ask:*
- Can you write a number sentence to describe this situation? What do you already know about solving this problem?
- What connections do you see? Why do the results make sense? Is this working or do you need to change your model?

**5. Use appropriate tools strategically.**

*Teachers are:*
- Making a variety of tools readily accessible to students and allowing them to select appropriate tools for themselves (TKES 3.5)
- Helping students understand the benefits and limitations of a variety of math tools (TKES 8.3)

*Teachers ask:*
- How could you use manipulatives or a drawing to show your thinking?
- Which tool/manipulative would be best for this problem? What other resources could help you solve this problem?

**6. Attend to precision.**

*Teachers are:*
- Explicitly teaching mathematics vocabulary (TKES 1.5)
- Insisting on accurate use of academic language from students (TKES 8.5)
- Modeling precise communication (TKES 10.4)
- Requiring students to answer problems with complete sentences, including units (TKES 10.4)
- Providing opportunities for students to check the accuracy of their work (TKES 5.2)

*Teachers ask:*
- What does the word ____ mean? Explain what you did to solve the problem.
- Compare your answer to _____’s answer. What labels could you use?
- How do you know your answer is accurate? Did you use the most efficient way to solve the problem?

**7. Look for and make use of structure.**

*Teachers are:*
- Providing sense making experiences for all students (TKES 2.3)
- Allowing students to do the work of using structure to find the patterns for themselves rather than doing this work for students (TKES 8.7)

*Teachers ask:*
- Why does this happen? How is ____ related to ____? Why is this important to the problem?
- What do you know about ____ that you can apply to this situation? How can you use what you know to explain why this works?
- What patterns do you see?

**8. Look for and express regularity in repeated reasoning.**

*Teachers are:*
- Providing sense making experiences for all students (TKES 2.3)
- Allowing students to do the work of finding and using their own shortcuts rather than doing this work for students (TKES 8.7)

*Teachers ask:*
- What generalizations can you make? Can you find a shortcut to solve the problem?
- How would your shortcut make the problem easier? How could this problem help you solve another problem?
<table>
<thead>
<tr>
<th>SMP</th>
<th>NEEDS IMPROVEMENT</th>
<th>EMERGING</th>
<th>PROFICIENT</th>
<th>EXEMPLARY</th>
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<td><strong>Teacher:</strong></td>
<td>□ Requires students to check answers by plugging in numbers.</td>
<td>□ Allots too much or too little time to complete task.</td>
<td>□ Allows ample time for all students to struggle with task.</td>
<td>□ Allows for multiple entry points and solution paths.</td>
</tr>
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<td><strong>Teacher:</strong></td>
<td>□ Does not allow for wait time; asking leading questions to rush through task.</td>
<td>□ Encourages students to individually complete tasks, but does not ask them to evaluate the processes used.</td>
<td>□ Requires students to evaluate processes implicitly.</td>
<td>□ Requires students to defend and justify their solution by comparing multiple solution paths.</td>
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<td>□ Does not check errors publicly.</td>
<td>□ Models making sense of the task (given situation) and the proposed solution.</td>
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</tr>
<tr>
<td><strong>Teacher:</strong></td>
<td>□ Is focused solely on answers rather than processes and reasoning.</td>
<td>□ Explains the reasons behind procedural steps.</td>
<td>□ Links mathematical solution with a question’s answer.</td>
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Adapted from Institute for Advanced Study/Park City Mathematics Institute
### Standards for Mathematical Practice

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<tr>
<th>Use Appropriate Tools Strategically</th>
<th>Look for and Use Use of Structure</th>
<th>Look for and Express Regularity in Reasoning</th>
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<tbody>
<tr>
<td>□ Does not incorporate additional learning tools. Teacher: □ Does not incorporate additional learning tools.</td>
<td>□ Is disconnected from prior and future concepts. □ Has no logical progression that leads to pattern recognition. Teacher: □ Does not show evidence of understanding the hierarchy within concepts. □ Presents or examines task in isolation.</td>
<td>□ Is overly repetitive or has gaps that do not allow for development of a pattern. Teacher: □ Hides or does not draw connections to prior or future concepts.</td>
</tr>
<tr>
<td>□ Lends itself to one learning tool. □ Does not involve mental computations or estimation. Teacher: □ Demonstrates use of appropriate learning tool.</td>
<td>□ Requires students to analyze a task before automatically applying an algorithm. Teacher: □ Does not recognize students for developing efficient approaches to the task. □ Does not require students to apply the same algorithm to a task although there may be other more effective approaches.</td>
<td>□ Reviews prior knowledge and requires cumulative understanding. □ Lends itself to developing a pattern or structure. Teacher: □ Connects concept to prior and future concepts to help students develop an understanding of procedural shortcuts. □ Demonstrates connections between tasks.</td>
</tr>
<tr>
<td>□ Lends itself to multiple learning tools. □ Gives students opportunity to develop fluency in mental computations. Teacher: □ Chooses appropriate learning tools for student use. □ Models error checking by estimation.</td>
<td>□ Requires students to analyze a task and identify more than one approach to the Problem. Teacher: □ Consistently intervenes when students are imprecise. □ Identifies incomplete responses but does not require student to formulate further response.</td>
<td>□ Requires students to identify the most efficient solution to the task. Teacher: □ Consistently demands precision in communication and in mathematical solutions. □ Identifies incomplete responses and asks student to revise their response.</td>
</tr>
<tr>
<td>□ Requires students to automatically apply an algorithm to a task without evaluating its appropriateness. Teacher: □ Does not intervene when students are being imprecise. □ Does not point out instances when students fail to address the question completely or directly.</td>
<td>□ Allows students to choose appropriate learning tools. □ Creatively finds appropriate alternatives where tools are not available.</td>
<td>□ Requires multiple learning tools (i.e., graph paper, calculator, manipulatives). □ Requires students to demonstrate fluency in mental computations. Teacher: □ Allows students to choose appropriate learning tools. □ Creatively finds appropriate alternatives where tools are not available.</td>
</tr>
<tr>
<td>□ Gives imprecise instructions. Teacher: □ Does not intervene when students are being imprecise. □ Does not point out instances when students fail to address the question completely or directly.</td>
<td>□ Reviews prior knowledge and requires cumulative understanding. □ Lends itself to developing a pattern or structure. Teacher: □ Connects concept to prior and future concepts to help students develop an understanding of procedural shortcuts. □ Demonstrates connections between tasks.</td>
<td>□ Allows students to choose appropriate learning tools. □ Creatively finds appropriate alternatives where tools are not available.</td>
</tr>
<tr>
<td>□ Has overly detailed or wordy instructions. Teacher: □ Inconsistently intervenes when students are imprecise. □ Identifies incomplete responses but does not require student to formulate further response.</td>
<td>□ Has precise instructions. Teacher: □ Consistently demands precision in communication and in mathematical solutions. □ Identifies incomplete responses and asks student to revise their response.</td>
<td>□ Requires recognition of pattern or structure to be completed. Teacher: □ Encourages students to connect task to prior concepts and tasks. □ Prompts students to generate exploratory questions based on current task.</td>
</tr>
</tbody>
</table>

**Teacher:** __________________________________________

**Date:** ________________

**Notes:**

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Adapted from *Institute for Advanced Study/Park City Mathematics Institute*
### Table 2.2: Mathematical Practices—Look-Fors as Classroom Indicators

<table>
<thead>
<tr>
<th>Mathematical Practice</th>
<th>Look-Fors: Classroom Indicators</th>
</tr>
</thead>
</table>
| **Mathematical Practice 1:** Make sense of problems, and persevere in solving them. | **Students:** Are engaged in solving problems and high-cognitive-demand tasks  
**Teacher:** Provides adequate time with formative feedback for students to discuss problem pathways and solutions with peers |
| **Mathematical Practice 2:** Reason abstractly and quantitatively. | **Students:** Are able to contextualize or decontextualize problems  
**Teacher:** Provides access to and uses appropriate representations (manipulative materials, drawings, or online renderings) of problems and asks questions focused on determining student reasoning |
| **Mathematical Practice 3:** Construct viable arguments, and critique the reasoning of others. | **Students:** Understand and use prior learning in constructing arguments  
**Teacher:** Provides opportunities for students to listen to or read the conclusions and arguments of others—as students discuss approaches and solutions to problems, the teacher encourages them to provide arguments for why particular strategies work and to listen and respond to the reasoning of others and asks questions to prompt discussions. |
| **Mathematical Practice 4:** Model with mathematics. | **Students:** Analyze and model relationships mathematically (such as when using an expression or equation)  
**Teacher:** Provides contexts for students to apply the mathematics learned |
| **Mathematical Practice 5:** Use appropriate tools strategically. | **Students:** Have access to and use instructional tools to deepen understanding (for example, manipulative materials, drawings, and technological tools)  
**Teacher:** Provides and demonstrates appropriate tools (like manipulatives) |
| **Mathematical Practice 6:** Attend to precision. | **Students:** Recognize the need for precision in response to a problem and use appropriate mathematics vocabulary  
**Teacher:** Emphasizes the importance of precise communication, including appropriate use of mathematical vocabulary, and emphasizes the importance of accuracy and efficiency in solutions to problems, including use of estimation and mental mathematics, when appropriate |
| **Mathematical Practice 7:** Look for and make use of structure. | **Students:** Are encouraged to look for patterns and structure (for example, when using properties and composing and decomposing numbers) within mathematics  
**Teacher:** Provides time for students to discuss patterns and structures that emerge in a problem’s solution |
| **Mathematical Practice 8:** Look for and express regularity in repeated reasoning. | **Students:** Reason about varied strategies and methods for solving problems and check for the reasonableness of their results  
**Teacher:** Encourages students to look for and discuss regularity in their reasoning |

*Source: Adapted from Kanold, Briars, & Fennell, 2012.*
Figure 2.3:
Team Planning Questions That Promote CCSS Mathematical Practice 1

As we develop common tasks and problems to be used during the unit, we should consider:

1. Is the problem interesting to students?

2. Does the problem involve meaningful mathematics?

3. Does the problem provide an opportunity for students to apply and extend mathematics?

4. Is the problem challenging for students?

5. Does the problem support the use of multiple strategies or solution pathways?

6. Will students’ interactions with the problem and peers reveal information about their mathematics understanding?
Increasing Rigor
As educators increasingly focus on increasing the level of rigor in their schools, it is important to first agree on what rigor is. If you ask teachers in your building to define rigor, you will likely hear a variety of responses. The same is true in the research on rigor.

Many researchers note that rigor involves critical thinking and deep learning about a particular topic (Bogess, 2007; Wagner, 2008). Rigor has also been the responsibility of teachers to provide lessons that focus on real-world settings and expert knowledge (Strong, Silver, & Perrini, 2001; Washor & Mojkowki, 2006/2007).

Ultimately, rigor is more than just the content of the lesson or even what teachers expect students to do. Too often, teachers simply raise expectations without providing appropriate support for students to succeed. True rigor means creating an environment in which each student is expected to learn at high levels, each student is supported so that he or she can learn at high levels, and each student demonstrates learning at high levels (Blackburn, 2008). Only by creating a culture of high expectations and providing support so that students can truly succeed do you have a rigorous classroom.

**Providing Support**

Supporting students so that they can learn at high levels is central to the definition of rigor. It is essential that teachers craft lessons that move students toward challenging work while providing scaffolding to support them as they learn. To simply increase expectations without helping students achieve at higher levels is inappropriate. There are two specific ways teachers can help students succeed as they move to higher levels of learning: incorporate motivational elements and use engaging instructional strategies.

**Incorporate Motivational Elements**

Students are more intrinsically motivated when they value what they are doing and when they believe that they have a chance for success. For students, the key elements for being motivated are seeing value in a lesson and believing that they can be successful. Encouraging teachers to incorporate these two elements within each lesson will increase students’ motivation.
Value. Rigor is directly connected to relevance. That is the value part of motivation. Students are more motivated to learn when they see the value, or the relevance, of learning. I’ve found that students have a radio station playing in their heads: WII-FM—What’s in It for Me? During a lesson, students are processing every activity through that filter: What’s in this for me? Why do I need to learn this? Will I ever use this again? When discussing the curriculum with your teachers, ask them, What is the relevance of this content for your students? How are you showing students the value of this material?

Success. Success is the second key to student motivation. Students need to achieve to build self-confidence, which is the foundation for a willingness to try something else. That in turn begins a cycle that results in higher levels of success. Success leads to success, and the achievements of small goals or tasks are building blocks to larger ones.

Building a culture that focuses on success begins with the principal. Celebrate success in a variety of ways. In addition to an honor roll for students who make As and Bs, create a Principal’s Progress Award to give to any student who makes progress toward a set goal. Encourage teachers to track progress in addition to achievement so that students build confidence. Build a success mentality: that everyone can and will be successful in your school.

Use Engaging Strategies
Students are also more successful when they are authentically engaged in a lesson. To be engaged in learning boils down to whether students are involved and participating in the learning process. If students are actively listening to a discussion, possibly writing down things to help them remember key points, they’re engaged. But if they’re really thinking about the latest video game while nodding so that you think they’re paying attention, they’re not.

Consider a Slinky as a way to conceptualize this idea. For a Slinky to work, you have to use two hands to make it go back and forth. If you hold it in one hand, it just sits there doing nothing. It doesn’t move correctly without both ends working. Similarly, if the teacher is the only one involved in the lesson, it isn’t as effective. The foundation of instructional engagement is involvement by both the teacher and the student. As you work with teachers in your building, encourage higher levels of engagement.

Principals use a variety of tools to gather data about their teaching and learning. (See figure 1.) They may include walk-through protocols, samples of student work, or an instructional supervision model. Regardless of the strategy, it is important to have a system

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**Figure 1**

**Observation Tool**

This observation tool can be used to gather data about student motivation and engagement.

<table>
<thead>
<tr>
<th>Sample Observation Tool: Motivation and Student Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivational Aspects</td>
</tr>
<tr>
<td>Examples of relevance and value</td>
</tr>
<tr>
<td>Reinforcement of authentic success</td>
</tr>
<tr>
<td>Student Engagement</td>
</tr>
<tr>
<td>Type of Activity</td>
</tr>
<tr>
<td>Teacher lecture/teacher talk during discussion</td>
</tr>
<tr>
<td>Individual students’ responses during lecture/discussion</td>
</tr>
<tr>
<td>Students talking to one another (as partners or in small groups)</td>
</tr>
<tr>
<td>Students involved in written response to learning (individual)</td>
</tr>
<tr>
<td>Students involved in projects or creative responses to learning (as individuals, partners, or in small groups)</td>
</tr>
<tr>
<td>Student-initiated questions or activities (on task)</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

for collecting data. Those data may then be used in discussions with teachers about their teaching.

Conclusion
In a rigorous learning environment, the role of the principal is to remove barriers to success. An effective principal must first understand the rationale for increased rigor and be an advocate for needed changes. Next, he or she should lead the conversation with a focus on learning, not punishment. Too often, efforts to increase rigor are focused on quantity, rather than quality. The principal has the opportunity to guide discussions about the differences between those two ideas.

Finally, for students to be successful, teachers must incorporate elements of motivation and engagement throughout their lessons. You can support this by prompting conversations about those elements; looking for them during observations or walk-throughs; and encouraging teachers to discuss how motivation, engagement, and rigor can increase the successful learning of all students.

REFERENCE

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