Using DOK to Increase Academic Rigor in the Classroom

Presented by TSMcBride
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Treadwell Middle School
• “Do not confine your children to your own learning, for they were born in another time.”

Hebrew Proverb
Objectives

- Assess our current understanding of rigor in the classroom
- Review Webb’s Depth of Knowledge
- Explain how teachers can incorporate more Rigor using DOK
- Review a set of best practices for promoting academic excellence through rigor in the classroom
- Outline 10 steps to add rigor to any lesson.
Assess our current understanding of rigor in the classroom
True or False?

1. Lots of Homework is a Sign of Rigor
2. Rigor Means Doing More
3. Rigor is Not For Everyone
4. Providing Support Means Lessening Rigor
5. Resources Do Not Equal Rigor
Why Rigor Matters…

• Rigor matters because it imposes cognitive load on students, forcing them to confront misconceptions, reconsider positions, separate the implicit from the explicit, and other critical thinking practices that distinguish shaky familiarity from true understanding.
Rigor - Students

Assists students in fulfilling **predetermined outcomes** and competencies by challenging them with high expectations.

**Essential components for rigor in the classroom:**

- *Content acquisition*
- *Critical thinking*
- *Relevance*
- *Integration*
- *Ability to apply concepts*
- *Long term retention*
- *Responsibility*
Rigor - Staff

• Demanding
• Relevant
• Engaging
• Addressing different learning styles
• Self-challenge
• Adaptability
Factors that Correlate to Student Achievement Rates

- Parent Education
- Economics (poverty - affluence)
- Language Acquisition
- Ethnicity
Efforts to Improve Student Learning

- Class Size Reduction
- Whole School Reform
- Re-vamp Class time
  - (varied bell schedules, year-round schools, block schedules)
- Innovative Curriculum
- Traditional Curriculum (Back to Basics)
- Remediation Programs (Tracking, two-year algebra, etc.)
- Standards Based Education
  - (Pacing Guides, Benchmark Test, Data Driven, etc.)
- High-stakes Accountability
  - (Rewards, Sanctions, Differentiated Accountability)
- Choice (charter schools, magnet schools, etc.)
- Centralize Leadership and Policies (state or national)
- Professional Learning Communities
So...what is the most significant factor in student learning? ...

...the teacher
“Teachers must be the primary driving force behind change. They are best positioned to understand the problems that students face and to generate possible solutions.”

James Stigler and James Hiebert,

*The Teaching Gap*
“Good teaching can make a significant difference in student achievement, equal to one effect size (a standard deviation), which is also equivalent to the affect that demographic classifications can have on achievement.”

Paraphrase Dr. Heather Hill, University of Michigan
“Research indicates that there is a 15% variability difference in student achievement between teachers within the same schools.”

Deborah Loewenberg Ball, Dean of Education, University of Michigan
“What Matters Very Much is Which Classroom?”

“If a student is in one of the most effective classrooms he or she will learn in 6 months what those in an average classroom will take a year to learn. And if a student is in one of the least effective classrooms in that school, the same amount of learning take 2 years.”
Research has indicated that... “teacher quality trumps virtually all other influences on student achievement.”

(e.g., Darling-Hammond, 1999; Hamre and Planta, 2005; Hanushek, Kain, O'Brien and Rivken, 2005; Wright, Horn and Sanders, 1997)
Effective Teachers Think......

“What am I really asking my kids to do?”

“How am I keeping up with Cognitive Demand?”
Cognitive Demand

- The **kind and level of thinking** required of students to successfully engage with and solve a task

- Ways in which students **interact with content**

- ET’s help kids makes sense of content using worthwhile tasks – **TEACH WITH DEPTH**
Teaching with Depth
An Understanding of Webb’s Depth of Knowledge
What is Depth of Knowledge (DOK)?

- A scale of cognitive demand (thinking) to align standards with assessments
- Based on the research of Norman Webb, University of Wisconsin Center for Education Research and the National Institute for Science Education
Why depth is needed...TNReady is here!!!!

- Beginning in the 2015-16 school year, TNReady will become the state’s new and improved TCAP test for English language arts and math in grades 3-11. It will provide us with more and better information about our students’ progress. The new TNReady TCAP tests are designed to **assess true student understanding** and not just basic memorization and test-taking skills. TNReady will measure student understanding of our **current state standards** in English language arts and math, **not the previous SPIs**.

- In reading and writing – students will read from texts and provide written responses to support their answers. In math – students will solve multi-step problems, many without using a calculator, to show what they know. Much like teachers already do in their classrooms, TNReady will give **students a variety of new ways to show what they can do**.
The manager of a youth soccer team bought 50 packages of socks for $10 each. He estimated the total cost to be $5,000.

Create an equation that shows how many times more the manager’s estimate, \( e \), was than the actual cost, \( a \).
Middle school students are growing tomatoes. They record the width, in inches, of 17 tomatoes, as shown.

3, 3.5, 3.5, 3.5, 3.5, 3.5, 4, 4, 4, 4, 4, 4, 4.5, 4.5, 4.5, 5

Click above the number line to create a line plot that represents the data shown.
Bridger’s stories were funny, extravagant, and often unbelievable. He would tell stories of glass mountains, “peetrified” birds singing “peetrified” songs, and talk about days when Pike’s Peak was just a hole in the ground. These outrageous stories were told both to tease new arrivals from the east and to amuse the locals who knew they weren’t true.

The Rocky Mountains were largely unexplored and Bridger spent many years hiking them and trapping animals. In his travels, he learned a great deal about the terrain and wildlife of the area. Because of his knowledge and skills, he became a valued guide. People often hired him to lead them across the mountains.

In 1850, Bridger found a short cut through the mountains of Wyoming through the Rocky Mountains. This path became known as Bridger’s Pass.
tall tales to the people passing through.

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What three details can the reader get from both the map and the passage?

- the state where Bridger died
- the route of Bridger’s travels
- the location of Bridger’s Pass
- the state where Bridger was born
- a place that was named after Bridger
Lost Cities, Lost Treasure

1. In 1871, an adventurer named Heinrich Schliemann started digging in the ground of a Turkish city, seeking the lost land of Troy. Schliemann, a businessman and scholar, was born in Germany in 1822. As a young man he dreamed of discovering the treasures of the ancient world, and even made a plan for it when he was nine years old.

2. His youthful sense of adventure eventually brought him to California, where he made a fortune in the gold rush. With his profits, he began his second career in archaeology.

3. Archaeology was still a young science in the 1800s. In fact, it was hardly a science at all. The promise of treasure and adventure in foreign lands, however, drew many people to it.
Why Depth of Knowledge?

Focuses on complexity of content standards in order to successfully complete an assessment or task. The outcome (product) is the focus of the depth of understanding.
Why Use Depth of Knowledge?

• Used to determine the level of the expected outcomes of the TNReady State Standards and benchmarks

• Determines the complexity of TNReady test items (success with items leads to AMO’s met)
Why (DOK)?

Mechanism to ensure that the intent of the standard and the level of student demonstration required by that standard matches the assessment items.

To ensure that teachers are teaching to a level that will promote student achievement.
Webb’s Depth of Knowledge: Four Levels of Cognitive Complexity

- **Level 1**: Recall and Reproduction
- **Level 2**: Skills & Concepts
- **Level 3**: Strategic Thinking
- **Level 4**: Extended Thinking
DOK Level 1: Recall and Reproduction

• Requires recall of information, such as a fact, definition, term, or performance of a simple process or procedure

• Answering a Level 1 item can involve following a simple, well-known procedure or formula
DOK Level 1 Examples

• List animals that survive by eating other animals
• Locate or recall facts found in text
• Describe physical features of places
• Determine the perimeter or area of rectangles given a drawing or labels
• Identify elements of music using music terminology
• Identify basic rules for participating in simple games and activities
DOK Level 2: Skills/Concepts

- Includes the engagement of some mental processing beyond recalling or reproducing a response
- Items require students to make some decisions as to how to approach the question or problem
- Actions imply more than one mental or cognitive process/step
DOK 2 Examples

• Compare desert and tropical environments
• Identify and summarize the major events, problems, solutions, conflicts in literary text
• Explain the cause-effect of historical events
• Predict a logical outcome based on information in a reading selection
• Explain how good work habits are important at home, school, and on the job
• Classify plane and three dimensional figures
• Describe various styles of music
DOK Level 3: Strategic Thinking:

- Requires deep understanding exhibited through planning, using evidence, and more demanding cognitive reasoning
- The cognitive demands are complex and abstract
- An assessment item that has more than one possible answer and requires students to justify the response would most likely be a Level 3
DOK Level 3 Examples

• Compare consumer actions and analyze how these actions impact the environment

• Analyze or evaluate the effectiveness of literary elements (e.g., characterization, setting, point of view, conflict and resolution, plot structures)

• Solve a multiple-step problem and provide support with a mathematical explanation that justifies the answer
DOK Level 3 Examples

- Develop a scientific model for a complex idea
- Propose and evaluate solutions for an economic problem
- Explain, generalize or connect ideas, using supporting evidence from a text or source
- Create a dance that represents the characteristics of a culture
DOK Level 4: Extended Thinking

• Requires high cognitive demand and is very complex

• Students are expected to make connections, relate ideas within the content or among content areas, and select or devise one approach among many alternatives on how the situation can be solved

• Due to the complexity of cognitive demand, DOK 4 often requires an extended period of time
DOK 4 Examples

- Gather, analyze, organize, and interpret information from multiple (print and non print) sources to draft a reasoned report

- Analyzing author’s craft (e.g., style, bias, literary techniques, point of view)

- Create an exercise plan applying the “FITT (Frequency, Intensity, Time, Type) Principle”
“Extending the length of an activity alone does not necessarily create rigor!”

<table>
<thead>
<tr>
<th>Task</th>
<th>Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collecting data samples over several months</td>
<td>Recall</td>
</tr>
<tr>
<td>Organizing the data in a chart</td>
<td>Skills/ concepts</td>
</tr>
<tr>
<td>Using this chart to make and justify predictions</td>
<td>Strategic Thinking</td>
</tr>
<tr>
<td>Developing a generalized model from this data and applying it to a new situation</td>
<td>Extending Thinking</td>
</tr>
</tbody>
</table>
DOK is NOT...

- a taxonomy (Bloom’s)
- the same as difficulty
- about using “verbs”
It’s NOT about the verb...

The Depth of Knowledge is **NOT** determined by the verb (Bloom’s Taxonomy), but by the context in which the verb is used and the depth of thinking required.
Verbs are not always used appropriately...

Words like *explain* or *analyze* have to be considered in context.

- “Explain to me where you live” does not raise the DOK of a simple rote response.

- Even if the student has to use addresses or landmarks, the student is doing nothing more than recalling and reciting.
DOK is about what follows the verb...

What comes after the verb is more important than the verb itself.

“Analyze this sentence to decide if the commas have been used correctly” does not meet the criteria for high cognitive processing.”

The student who has been taught the rule for using commas is merely using the rule.
Same Verb—
Three Different DOK Levels

DOK 1- **Describe** three characteristics of metamorphic rocks. *(Requires simple recall)*

DOK 2- **Describe** the difference between metamorphic and igneous rocks. *(Requires cognitive processing to determine the differences in the two rock types)*

DOK 3- **Describe** a model that you might use to represent the relationships that exist within the rock cycle. *(Requires deep understanding of rock cycle and a determination of how best to represent it)*
DOK is about intended outcome, not difficulty

DOK is a reference to the complexity of mental processing that must occur to answer a question, perform a task, or generate a product.

• Adding is a mental process.
• Knowing the rule for adding is the intended outcome that influences the DOK.
• Once someone learns the “rule” of how to add, 4 + 4 is DOK 1 and is also easy.
• Adding 4,678,895 + 9,578,885 is still a DOK 1 but may be more “difficult.”
DOK is **not** about difficulty...

Difficulty is a reference to how many students answer a question correctly.

- "How many of you know the definition of exaggerate?"
  - DOK 1 – recall
  - If all of you know the definition, this question is an easy question.

- "How many of you know the definition of prescient?"
  - DOK 1 – recall
  - If most of you do **not** know the definition, this question is a difficult question.
DOK is about complexity

- The intended student learning outcome determines the DOK level.
- Instruction and classroom assessments must reflect the DOK level of the objective or intended learning outcome.
1) Give an example of a statement that uses a verb that “sounds” like a high DOK but is used inappropriately.

2) Fill in the blanks: What _____ the verb is more _____ than the verb itself when deciding the DOK level.

3) What is the difference between difficulty and complexity?

4) What really determines the DOK level?
1) Give an example of a statement that uses a verb that “sounds” like a high DOK but is used inappropriately. 

   *answers vary*

2) Fill in the blanks: What *follows* the verb is more *important* than the verb itself when deciding the DOK level.

3) What is the difference between difficulty and complexity? *answers vary, but do not rely on the verb*

4) What really determines the DOK level? *the intended learning outcomes*
DOK Activity

But what is it?
Felipe and Marsha were studying forces and decided to do an experiment. They placed four equally sized blocks made of different materials on an elevated plastic tray. They watched the blocks move down the tray. Their setup is shown below.

Which block would experience the least amount of friction as it moved down the tray?
A. Ice Block
B. Sponge Block
C. Sandpaper Block
D. Plastic Block
Felipe and Marsha were studying forces and decided to do an experiment. They placed four equally sized blocks made of different materials on an elevated plastic tray. They watched the blocks move down the tray. Their setup is shown below.

How will changing the angle of the tray affect the movement of the blocks down the tray? Be sure your answer addresses the forces that affect the movement of the blocks.
Felipe and Marsha were studying forces and decided to do an experiment. They placed four equally sized blocks made of different materials on an elevated plastic tray. They watched the blocks move down the tray. Their setup is shown below.

Which of the following forces causes the blocks to move down the tray?
A. electric
B. friction
C. gravity
D. magnetic
5 Step Process for Using DOK to Add Rigor

1. Keep a list or collection of every task you ask students to do in a day, including classwork, homework, and projects.

2. Sort the tasks into categories according to the four DoK Levels.
   - Some resources which may help: This DoK “wheel”
   - These examples of DoK levels for four content areas
   - These examples of using DoK in the fine arts
3. Work with your team of colleagues to review the groupings weekly. Many tasks are easily categorized, but some will require deeper discussion to clarify your understanding of the levels. Strive toward consensus. A few pointers: The verb does not define the level. Instead, consider the cognitive effort that a student will use to complete the task. The verb "describe," for example, could be any level, depending on the kind of description.

- It is common to find tasks that seem to fall in between levels. When in doubt, assign the higher level.
- "Extended time" alone does not make a task Level 4. Lower-level tasks that are merely repeated over a period of time are still lower level.
4. Analyze your groupings. What patterns do you see? Is there a reasonable distribution of tasks across the four levels? Do you notice anything unexpected?

5. Rewrite a Level 1 or Level 2 task to be at least Level 3. These question stems are helpful in creating good tasks
DOK Levels Can Be Cumulative

An item/standard written to DOK 3 often contains DOK 1 and DOK 2 level demands.
How Can Teachers Add Rigor?

- Develop a set of best practices for promoting academic excellence through rigor in the classroom
Best Practices...

- Writing (journals, varied levels of writing, writing across the curriculum, etc.)

- Problem-solving (case studies, group activities, essay exams, etc.)

- Oral communication (debates w/expert judges, summary presentations, role playing)

- Reading/comprehension (reading and analyzing – ie. in-class discussion, quizzes, summaries, etc)

- Collaborative group projects
Best Practices...

- In-class small group discussion and report findings (think-pair-share)
- Socratic method/interactive discussion
- Knowing your students (contact, interaction, praise, showing interest, meeting w/students)
- Providing a detailed, clear lesson plan with student objectives; grading rubrics, calendar, etc.
- Class size - use technology to enhance efficiency of content delivery, engage students
10 Strategies To Add Rigor To Any Lesson, Unit, or Assessment

• Several common classroom tasks are inherently rigorous, including reading idea-dense literature, taking notes, and using the writing process itself, but these are rarely engaging, and don’t always fit with a given academic standard or task. But the following 10 strategies can be used to add rigor to almost anything.
How To Add Rigor To Anything
TeachThought.com

1. Necessitate a transfer of understanding
2. Require students to synthesize multiple sources
3. Design tasks with multiple steps that build cognitively
4. Use divergent perspectives
5. Use divergent media forms
6. Break away from content-area convention
7. Require design thinking (often in PBL)
8. Require long-term observation or analysis
9. Study nuance
10. Require students to take and defend positions
Remember...to achieve Rigor

The *alignment* between tasks, standards, and assessments MUST allow for cognitive complexity with a deeper understanding.

“A mile wide and an inch deep”
you were made to make a difference.
THANK YOU!