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ACADEMIC RIGOR

At a Glance

Although academic rigor is one of the most discussed topics in education today, there is very little understanding or agreement within the educational community about what constitutes rigorous instruction in the classroom. This report provides several accepted definitions of academic rigor, but notes that most classrooms across the United States have not yet increased their levels of rigor. Misconceptions regarding rigor – the result of the ambiguity regarding the meaning of rigor - are summarized. Research-based strategies and examples of specific activities teachers can engage in to increase academic rigor in the classroom are provided. Finally, tools that are commonly used to assess the level of academic rigor in the classroom are summarized.

Academic rigor is one of the most discussed topics in education today. Although educators agree that rigor is important, there is very little understanding or agreement within the educational community about what constitutes a rigorous classroom. In many cases, rigor is an abstract idea that is defined by a "we know it when we see it" assertion (Blackburn, 2014a; Center for Educational Improvement, 2013; Gojak, 2013; Mason, 2013; College Board, 2012; Jenkins et al., 2012; Jackson, 2011; Williamson & Blackburn, 2011; Paulson, 2009; Rainwater & Mize, 2008).

Several scholars have developed definitions of rigor that have helped to clarify the concept for educators. One of the most widely accepted definitions was developed by Barbara Blackburn, a nationally recognized expert on rigor. Blackburn (cited in Williamson & Blackburn, 2011) defined rigor as "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."

Author and educator Robyn Jackson (cited in Allen, 2012) concluded that one of the key signs of rigor is independent thinking and learning. She stated that academic rigor has four main components:

- students know how to create their own meaning out of what they learn;
- students organize information to create mental models;
- students integrate individual skills into whole sets of processes; and
- students apply what they have learned to new or novel situations.

In general, experts agree that students in rigorous classrooms are actively engaged in analyzing, synthesizing, and evaluating ideas for themselves. They are able to explain what they are learning and how that learning can be applied in a variety of educational, career, and civic contexts throughout their lives (Great Schools Partnership, 2014; Gojak, 2013; Jackson, 2011; Williamson & Blackburn, 2011; Wren, 2008).

Some studies suggest that most classrooms across the United States have yet to become academically rigorous. For example, Marzano and Toth (2014) analyzed observer ratings on specific instructional strategies from classrooms across the country. They found that in spite of school districts' increased focus on instructional rigor, less than six percent of observed lessons were devoted to the highest level of cognitively complex tasks involving hypothesis generation and testing. Instead, the vast majority of lessons were focused on introducing and practicing new knowledge.

Researchers have concluded that Advanced Placement (AP) and International Baccalaureate (IB) classes are most likely to be characterized by rigorous instruction. They have found that the majority of AP and IB programs set high standards and administer rigorous exams that are well-aligned with the standards (Wiggins, 2014; College Board, 2012; Kingore, 2011; Gray & Sams, 2010; Snider, 2009; Rainwater & Mize, 2008).

Misconceptions Regarding Rigor

The word rigor is widely used in policy discussions. Governors, state legislators, and educators have adopted policies regarding rigor and promised rigorous programs of study without ever defining rigor (Gojak, 2013; Colvin & Jacobs, 2010; Crowley, 2009; Rainwater & Mize, 2008). Aungst (2014) stated, "Part of the problem is that we have adopted the jargon without a clear understanding of what we really mean."

The absence of a clear definition of rigor has led to a number of misconceptions, including:

- **Adopting rigorous academic standards automatically brings rigor to the classroom.** Rigorous standards provide a strong foundation for increasing rigor in the classroom, but they do not guarantee rigor in the classroom. Teachers' instructional practices, or how students are asked to reach the standards, are just as critical as the standards themselves (Blackburn, 2014a; Hess, 2013; Jackson, 2011).

- **Rigor means more work.** Experts agree that rigor does not consist of just adding curriculum requirements or raising grading standards, but is defined by the quality and intensity of assignments. Adding more assignments does not create a greater degree of rigor, especially when the assignments involve low-level activities, such as reciting facts or fill-in-the-blank tasks (Blackburn, 2014a; Stack, 2014; Center for Educational Improvement, 2013; Gray & Sams, 2010; Williamson & Blackburn, 2010; Rainwater & Mize, 2008). Jackson (2011) noted that rigorous classrooms often have fewer assignments than less rigorous classrooms.

  Too often, rigor is also equated with increased amounts of homework. Researchers point out, however, that teachers in rigorous classrooms focus on the depth of homework assignments, not the quantity of homework assigned (Blackburn, 2014a; Colvin & Jacobs, 2010; Williamson & Blackburn, 2010; Gray & Sams, 2010).

- **Rigor means tasks are more difficult.** Rigor is not a matter of increasing the level of difficulty. It is more about teachers fostering a deeper understanding for students (Center for Educational Improvement, 2013; Mason, 2013; Gray & Sams, 2010). According to Jackson (2011):

> "Although it's true that rigorous classrooms do present more challenge to students, there is a difference between what is challenging and what is difficult. Challenging work asks students to stretch and reach for new understanding. In contrast, 'difficult' work can be difficult for a variety of reasons, including unclear instructions, a lack of necessary resources, a lack of adequate support, and demands that are too great for the time allotted. . . It is a mistake to think that just because students have difficulty completing their work, they are engaged in a rigorous assignment."

- **Rigor is only for certain content areas.** Experts agree that although certain content areas may be more inherently rigorous than others, rigor can be added to any topic or content area. The way in which students are asked to engage in the content is the most powerful determinant of the level of rigor (Heick, 2013; Jackson, 2011; Kingore, 2011).

- **Rigor is not for all students.** There is a myth that academic rigor is only for elite students. Some teachers think that the only way to ensure that all students succeed is to lower standards and lesson rigor. This is based on a belief that some students are less capable and will hold back the more proficient students if given challenging assignments. On the contrary, researchers have found no evidence that supporting the success of all students leads to less rigor. They have concluded that all students can reach higher levels of learning when they have appropriate levels of support (Great Schools Partnership, 2014; Gojak, 2013; Jackson, 2011; Williamson & Blackburn, 2010).

- **Providing students with support lessens rigor.** Supporting students so they can learn at high levels is central to the definition of rigor. As teachers design lessons that move students toward more challenging work, they must provide ongoing scaffolding to support them as they learn (Blackburn, 2014a).

- **Resources equal rigor.** According to Blackburn (2014a), some resources are better than others and the right resources can certainly help increase classroom rigor. However, raising the level of rigor is not dependent on classroom resources. Instead, Blackburn (2014a) suggested that teachers use resources more effectively. For example, a textbook that includes true-false tests may not be rigorous because it is too easy for students to guess the answers. To increase rigor, teachers can ask students to rewrite all false answers into true statements.

Strategies Used to Increase Rigor in Classrooms and Schools

Researchers have identified the strategies that schools and classrooms use to increase academic rigor. These strategies are summarized below.

- **Teachers have high expectations for all students.** Adding rigor creates an environment where all students are expected to learn at high levels. Teachers in rigorous classrooms believe in each student's potential to succeed and frequently

communicate this belief (Blackburn, 2014a; Murray, 2014; Wallinger, 2012; Williamson, 2012; Kingore, 2011; Gray & Sams, 2010; Catapano, n.d.).

- **Students are engaged in cognitively complex tasks.** Rigorous lessons require students to go beyond a surface understanding of the material. Instead, students should be actively engaged in analyzing, synthesizing, and evaluating ideas for themselves. Rigorous instruction is designed to develop students' capacity to:
    - engage in disciplined inquiry and thought;
    - interpret and analyze data;
    - identify and consider multiple meanings and interpretations;
    - make connections between events;
    - make and defend claims with sound evidence;
    - adjust their approach when presented with new constraints;
    - tolerate uncertainty and work through ambiguity and complexity; and
    - offer original interpretations after conducting extensive research on a topic (Great Schools Partnership, 2014; Marzano & Toth, 2014; Jenkins et al., 2012; Wallinger, 2012; Jackson, 2011; Holmes, 2009; Snider, 2009; Wren, 2008; American Institutes of Research, 2005).

- **Learning is student-centered.** In rigorous classrooms, activities and assignments are student-centered and engaging. Teachers shift the responsibility for learning to students, allowing them to develop autonomy and responsibility for continuous learning (Marzano & Toth, 2014; Gojak, 2013; Mason, 2013; Jenkins et al., 2012, Kingore, 2011; Williamson & Blackburn, 2011). Jackson (2011) stated that rigor fosters ownership. She explained:

> "Rather than be passive recipients of knowledge, students actively participate in constructing knowledge, filling in unstated information, and imposing order on what they are learning . . . They learn how to tell when they are confused, how to select appropriate strategies, how to pace themselves, when and how to ask for help, how to persist through frustration, and how to tell whether they are struggling productively or destructively."

- **Academically rigorous learning is challenging, but not overly difficult.** Educators have observed that overcoming academic challenges gives students a sense of pride, fulfillment, and personal accomplishment. In contrast, lessons that are too difficult tend to lead to student disengagement, frustration, and discouragement (Great Schools Partnership, 2014; Gojak, 2013; Jackson, 2011; Catapano, n.d.). Williamson (2012) stated, "Students are more motivated to learn when they . . . believe they have a chance for success."

- **Content is relevant and relatable to student backgrounds and interests.** In rigorous classrooms, students see the relevance in lessons and are able to connect the material to real-life examples and situations. Even when students are engaged in simulated

activities or practice exercises, they can make the connection between their classroom assignments and how they may be useful outside of the classroom (Great Schools Partnership, 2014; Center for Educational Improvement, 2013; Jenkins et al., 2012; Williamson, 2012; Jackson, 2011; American Institutes of Research, 2005; Catapano, n.d.).

- **Students are provided with support.** Researchers have concluded that the most rigorous classrooms are those in which students are provided with ongoing scaffolding to support their higher-level learning. Examples of scaffolding strategies include:
    - asking guiding questions;
    - chunking information into smaller bits;
    - color-coding the steps of a project;
    - writing standards as questions for students to answer;
    - using visual and graphic organizers;
    - providing tools such as interactive reading guides and study guides; and
    - modeling learning for students (Blackburn, 2014a; Marzano & Toth, 2014; Murray, 2014; Williamson & Blackburn, 2011; Gray & Sams, 2010; Quint et al., 2008; Wren, 2008).

- **Students use their knowledge to solve real-world problems.** Rigor requires students to not only *know* information, but also to *apply* and *demonstrate* their understanding of that information. In rigorous classrooms, students use their knowledge to solve problems, not to simply recall content (Marzano & Toth, 2014; Wallinger, 2012; Jackson, 2011; Gray & Sams, 2010; American Institutes of Research, 2005).

- **Students learn there can be multiple correct answers.** Teachers in rigorous classrooms provide students with open-ended assignments for which there are no clear "right" answers. Rigorous instruction helps students understand that learning is unpredictable and that there are often multiple approaches, interpretations, and solutions to problems (Blackburn, 2013; Jackson, 2011).

- **Students are allowed to revise their work.** Rigorous instruction provides students with opportunities to revise their work based on informative teacher feedback before they create a final product and receive a grade (Marzano & Toth, 2014; Wren, 2008; American Institutes of Research, 2005; Catapano, n.d.).

- **Students work collaboratively.** In rigorous classrooms, students work collaboratively on projects. Teachers provide students with support and guidance regarding how to collaborate with their classmates in a manner that encourages them to interact with content in a cognitively complex manner (Marzano & Toth, 2014; Wallinger, 2012; Kingore, 2011).

- **Students communicate clearly.** In rigorous classrooms, students are asked to communicate clearly, logically, and concisely (Wallinger, 2012; Kingore, 2011; American Institutes of Research, 2005).

- **Students are rewarded for their persistence.** Rigorous instruction rewards students for persisting in solving problems when the path to a solution is not immediately obvious (Blackburn, 2014a; Gojak, 2013; Jackson, 2011). Catapano (n.d.) stated that students in rigorous classrooms learn not to "give up or feel overwhelmed when faced with challenges."

- **Student efforts are recognized and praised.** In rigorous classrooms, teachers reinforce step-by-step progress with continuous encouragement (Blackburn, 2014b; Williamson, 2012; Kingore, 2011). According to Murray (2014), adding rigor creates an environment where students are "cheered on as they demonstrate learning at high levels."

- **Teachers ask open-ended questions.** Researchers recommend that teachers ask higher-level, thought-provoking questions. For example, in classrooms with high levels of academic rigor:
    - teachers use open-ended questions to probe and guide students;
    - teachers do not accept lower-level responses;
    - students are given time to think through answers. If they do not have an immediate answer, the teacher does not automatically call on another student;
    - students are asked to recall something they already know and use it to solve a new problem;
    - all students are engaged, not just the student who is answering the question; and
    - all students have an opportunity to demonstrate their understanding. Options include having all students respond through pair-share, thumbs up or down, interactive whiteboards, or computers that tally responses (Williamson & Blackburn, 2011; Colvin & Jacobs, 2010; Gray & Sams, 2010; Catapano, n.d.).

- **Teachers use data to inform instruction.** To increase rigor, teachers use student data such as tracking sheets and interim assessment results to analyze their teaching strategies and make necessary changes. They examine the amount of time spent on particular content areas, identify concepts that present difficulties for students, determine the degree of scaffolding and extra support each student needs, and look for differences in achievement when students are provided with additional support (Williamson & Blackburn, 2012; Bambrick-Santoyo, 2010; Rainwater & Mize, 2008).

- **Frequent assessment reflects higher standards of teaching and learning.** Experts agree that rigorous assessments are thought-provoking and challenging, requiring students to fully explain their understanding. Multiple-choice formats are the exception, not the rule. Rigorous assessments are open-ended and focus on analysis and knowledge utilization, rather than rote memorization of facts. Assessments can take

many forms, such as research projects, journals, presentations, multimedia projects, and demonstrations. Researchers have found that assessment of students' mastery of content in non-traditional formats often yields more accurate information about students' range, depth, and quality of learning than traditional paper and pencil tests (Blackburn, 2014a; Marzano & Toth, 2014; Gojak, 2013; Wallinger, 2012; Williamson, 2012; Kingore, 2011; Gray & Sams, 2010; Wren, 2008).

- **School leaders involve stakeholders in decisions to increase rigor.** Williamson and Blackburn (2012) reported that resistance from teachers, students, parents, and other stakeholders presented one of the major obstacles to creating more rigorous schools and classrooms. Experts therefore suggest that school leaders work with the following groups in order to gain their support for greater academic rigor in the classroom:
    - teachers and other staff, to overcome any resistance they may have;
    - District level staff, to secure the flexibility and resources needed to increase academic rigor at their schools; and
    - families and community members, to convey the importance of rigor and mobilize resources (Williamson & Blackburn, 2012; Gray & Sams, 2010; Williamson & Blackburn, 2010; Quint et al., 2008).

- **Teachers receive appropriate professional development.** Researchers agree that teachers must have the training and support needed to transform their classrooms into more rigorous learning environments. Training should provide teachers with opportunities to:
    - refine and adjust their pedagogy to more rigorous academic standards;
    - learn the teaching practices that best support rigor;
    - learn how to integrate learning from a variety of sources;
    - analyze and revise assignments and assessments in order to increase their cognitive complexity; and
    - develop the skills needed to support and assess student learning in rigorous classrooms (Gojak, 2013; Allen, 2012; Williamson & Blackburn, 2012; Gray & Sams, 2010; Rainwater & Mize, 2008; Dounay, 2006).

  Studies indicate that many teachers do not feel prepared to add rigor to their classrooms. For example, the Bill and Melinda Gates Foundation reported that while 78% of teachers knew about the Common Core State Standards in 2012, only 22% felt very prepared to teach to meet the standards. Over 79% of unprepared teachers said they needed professional development to understand the standards and teach to meet them effectively. According to a Center for Education Policy survey, the majority of school districts have not made professional development an integral part of their plan to increase academic rigor. More than one-half of the 315 school districts surveyed by the Center reported that they had no plans to provide professional development on new standards for teachers of math or English Language Arts during the 2011-2012 school year (reported in Marzano & Toth, 2014).

Activities that Help Teachers Increase Academic Rigor in the Classroom

As noted above, it is the quality of instruction, assignments, and assessments that determines the level of academic rigor. Researchers have found that implementation of the following activities can increase classroom rigor.

- Create an environment favorable to rigorous instruction:
  - Make the classroom a safe, non-judgmental learning environment where students can practice their higher-level cognitive thinking skills.
  - Let students know they are capable and competent.
  - Encourage students to invent novel solutions to problems.
  - Require students to use academic and domain-specific vocabulary.
  - Differentiate instruction based on students' needs.
  - Provide different ways for students to demonstrate their mastery of the content. For example, students might construct a model or diorama, conduct a demonstration, write a blog entry, or create a puzzle or game (Murray, 2014; Hess, 2013).

- Engage students in cognitively complex tasks:
  - Require students to apply knowledge in new and unfamiliar situations.
  - Require students to synthesize data, positions, or theories from multiple sources or perspectives.
  - Use the divergent perspectives of authors, philosophers, artists, or other thinkers to offer contrasting perspectives.
  - Use a variety of media forms. For example, instead of relying on textbooks, ask students to analyze conversations, videos, tweets, poems, and interviews.
  - Help students examine similarities and differences in order to engage them in activities such as comparing, classifying, and creating analogies and metaphors.
  - Move beyond content area convention. For example, use literature to frame math, use science to promote political discussions, or use Google Earth to make sociological observations.
  - Require students to engage in long-term observation or analysis in order to promote higher-level cognitive skills, such as identifying patterns, cause-effect analysis, and problem-solving.
  - Require students to take and defend positions. Taking a position promotes cognitive ownership that is engaging and intellectually stimulating (Marzxano & Toth, 2014; Heick, 2013).

- Use high-level questioning techniques:
  - Develop whole class responses to student answers so that all students are able to participate. For example, ask students to snap if they agree or stomp if they do not agree; use whiteboards so all students can write down their responses to questions.
  - Avoid calling only on students with their hands raised.
  - Do not immediately call on a second student when the first student struggles with an answer.
  - Do not accept superficial answers.

- Instead of responding directly to students, ask students to respond to each other.
- Require students to support their answers with evidence.
- Do not solve problems for students.
- Instead of correcting answers, allow students to find errors in their responses themselves (Murray, 2014; Bambrick-Santoyo, 2010).

- Implement peer support strategies:
  - Enlist strong students to help weaker students determine the correct answers.
  - Have students teach parts of a lesson to small groups of their peers.
  - Encourage student-to-student interaction and academic talk (Bambrick-Santoyo, 2010).

Tools Used to Determine the Level of Rigor in the Classroom

In education, there are two widely accepted models used to assess the level of academic rigor in the classroom – Benjamin Bloom's Taxonomy and Norman Webb's Depth of Knowledge (DOK) levels. Bloom's Taxonomy categorizes the cognitive skills required of the brain to perform a task. Webb's DOK levels, on the other hand, relate more closely to the depth of content understanding and the scope of learning activities. In other words, Bloom's Taxonomy describes a neurological event, while Webb's DOK model describes a broader cognitive process (Stack, 2014; Walkup & Jones, 2014; Gray & Sams, 2010; Hess et al., 2009a).

Bloom's Taxonomy, first developed in 1956 and revised in 2001, answers the question - What type of thinking is needed to complete a task? Bloom developed a series of action words that describe the cognitive processes needed to interact with information during an activity:

- Remember – retrieve knowledge from long-term memory, recognize, recall, locate, identify.

- Understand – construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, predict, compare/contrast, match like ideas, explain, and construct models.

- Apply – carry out or use a procedure in a given situation, apply a procedure to a familiar task, and apply a procedure to an unfamiliar task.

- Analyze – break into constituent parts, determine how parts relate, differentiate between relevant and irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct.

- Evaluate – make judgments based on criteria, check, detect inconsistencies or fallacies, critique.

- Create – reorganize elements into new patterns/structures, generate, hypothesize, design, plan, construct, produce (Walkup & Jones, 2014; Hess, 2013; Hess et al., 2009b).

Webb's Depth of Knowledge (DOK) model describes the depth to which students are expected to demonstrate understanding of content. The DOK levels categorize tasks according to the complexity of thinking required to successfully complete them. The four DOK levels are:

- Recall and Reproduction – Basic tasks that require students to recall or reproduce knowledge and/or skills.

- Skills and Concepts – The engagement of mental processing beyond recalling or reproducing an answer. Tasks at this level generally require students to compare or differentiate among people, places, events, objects, and text types; apply multiple concepts when responding; classify items into meaningful categories; describe or explain relationships; and provide and explain examples.

- Strategic Thinking and Reasoning – Tasks falling into this category require the use of planning, reasoning, and higher order thinking processes, such as analysis and evaluation, to solve real-world problems or explore questions with multiple possible outcomes.

- Extended Thinking – Tasks assigned to this level require extended and integrated use of higher order thinking processes such as critical and creative thinking, reflection, and adjustment of plans over time (Aungst, 2014; Stack, 2014; Hess, 2013; Hess, 2010).

Some researchers say that rigor is not established by focusing on Bloom's Taxonomy, Webb's Depth of Knowledge levels, or other models. They maintain that rigor is a function of cognitive demand and situational complexity, not just the verb used to describe assignments. High-level verbs can be diminished by simplistic assignments and conversely, low-level verbs can be elevated when used in highly challenging and rigorous assignments (Jackson, 2011; Hess et al., 2009b).

In order to create a more comprehensive model for defining rigor, Hess and colleagues (2009b) developed the **Cognitive Rigor (CR) matrix.** The matrix provides teachers with a tool for analyzing and deepening the rigor of their assignments and assessments. It combines Bloom's Taxonomy and Webb's DOK model, but superimposes the two models because they differ in scope and application. The CR Matrix is a table with rows representing the six levels of the revised Bloom's Taxonomy and four columns representing Webb's DOK levels. The resulting matrix has 24 cells (five of which are empty) containing curricular examples of activities. The CR matrix is fully described in Hess and colleagues' (2009b) article, *Cognitive Rigor: Blending the Strengths of Bloom's Taxonomy and Webb's Depth of Knowledge to Enhance Classroom-level Processes* and is available at http://files.eric.ed.gov/fulltext/ED517804.pdf.

Another tool for defining rigor, the **Rigor/Relevance Framework**, was developed by staff of the International Center for Leadership in Education (2014). The framework allows teachers to measure their progress in adding rigor and relevance to instruction and consists of two continua:

- The Thinking Continuum is based on the six levels of Bloom's Taxonomy.
- The Action Continuum, known as the Application Model, was developed by Willard Daggett and describes how knowledge is put to use. The five levels of the Action Continuum are:

- Knowledge in one discipline.
- Apply knowledge in the discipline.
- Apply knowledge across disciplines.
- Apply knowledge to real-world predictable situations.
- Apply knowledge to real-world unpredictable situations.

Application of Bloom's Taxonomy (Thinking Continuum) to the vertical axis and the Application Model (Action Continuum) to the horizontal axis yields a framework that consists of four quadrants of student learning:

- Quadrant A (low levels of both Bloom's Taxonomy and the Application Model) – Acquisition. Students gather and store bits of knowledge and information.
- Quadrant B (low levels of Bloom's Taxonomy and high levels of the Application Model) – Application. Students use acquired knowledge to solve problems, design solutions, and complete work.
- Quadrant C (high levels of Bloom's Taxonomy and low levels of the Application Model) – Assimilation. Students extend and refine their acquired knowledge to automatically and routinely analyze and solve problems as well as create unique solutions.
- Quadrant D (high levels of both Bloom's Taxonomy and the Application Model) – Adaptation. Students have the competence to think in complex ways and apply the knowledge and skills they have acquired.

A more detailed explanation of the Rigor/Relevance Framework and a verb list by quadrant are provided in Daggett's (2014) report, *Rigor/Relevance Framework: A Guide to Focusing Resources to Increase Student Performance.* The report is available at http://www.leadered.com/pdf/rigor_relevance_framework_2014.pdf.

Summary

Although educators agree that rigor is important, there is very little understanding or agreement within the educational community about what constitutes a rigorous classroom. In general, experts agree that students in rigorous classrooms are actively engaged in analyzing, synthesizing, and evaluating ideas for themselves. They are able to explain what they are learning and how that learning can be applied in a variety of educational, career, and civic contexts throughout their lives.

Studies have found that most classrooms across the United States have not yet increased their levels of academic rigor, but that Advanced Placement and International Baccalaureate classes are most likely to be characterized by rigorous instruction.

Ambiguity regarding the definition of rigor has led to a number of misconceptions – that adoption of rigorous academic standards automatically brings rigor into the classroom, that rigor means more work and more difficult assignments, and that rigor is only for elite students, for example.

Research-based strategies for increasing levels of academic rigor are reviewed. Strategies include ensuring that content is relevant and relatable to student backgrounds and interests, allowing students to work collaboratively, rewarding students for their persistence, asking open-ended questions, using data to inform instruction, administering thought-provoking and

challenging assessments, and providing teachers with appropriate professional development.

This paper also summarized specific activities teachers can engage in to increase academic rigor in the classroom. Teachers should create an environment favorable to rigorous instruction, engage students in cognitively complex tasks, use high-level questioning techniques, and implement peer support strategies.

Finally, four tools used to assess the level of academic rigor in the classroom are briefly reviewed – Bloom's Taxonomy, Webb's Depth of Knowledge model, Hess and colleagues' Cognitive Rigor matrix, and the International Center for Leadership in Education's Rigor/Relevance Framework.

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