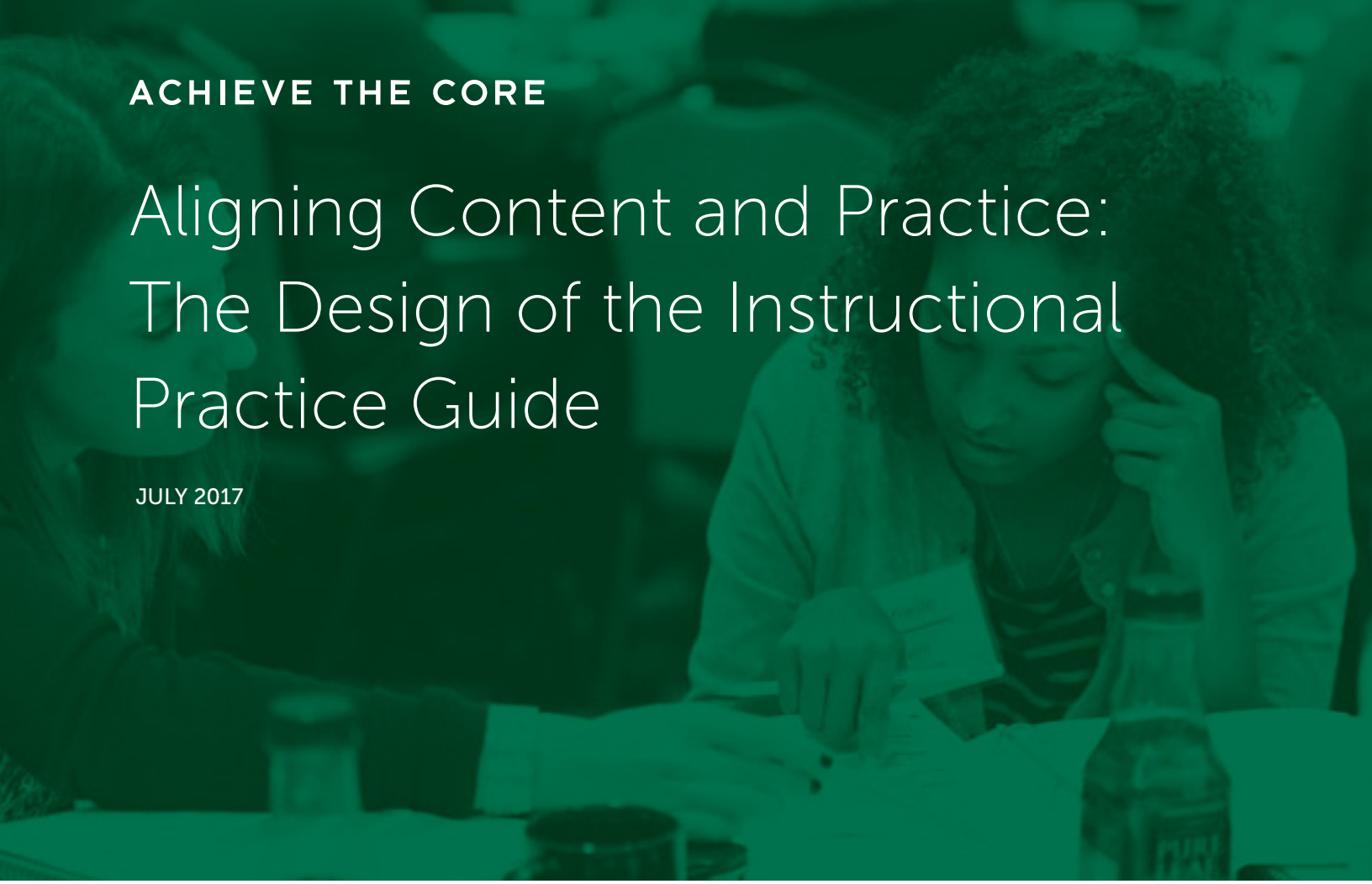

ACHIEVE THE CORE

Aligning Content and Practice: The Design of the Instructional Practice Guide

JULY 2017

Executive Summary

Content-specific feedback is a critical part of a teacher's professional development. The highest-impact feedback and professional learning are framed in the context of the student-teacher-content interactions of the instructional core (Elmore, 2000). However, there is a lack of commonly used teacher observation and evaluation rubrics that encourage content-specific feedback. Most rubrics focus on generic aspects of instruction, such as student engagement, with little focus on what is being taught. The Instructional Practice Guide (IPG) is a K–12 classroom observation rubric that prioritizes what is observable and expected of student-teacher-content interactions aligned to college- and career-ready standards in ELA/literacy and mathematics. This memo provides an overview of the evidence base for the construction of the IPG as an observation rubric for ELA/literacy and mathematics classrooms.

Introduction

A short description of the Instructional Practice Guide and why it was developed

Education researchers have long acknowledged student-teacher interactions with content as critical. Richard Elmore (2000) describes a dynamic relationship among three factors that make up the "instructional core": teacher knowledge and skill, the role of students in the learning process, and the level and complexity of the content the student is being asked to learn. Deborah Ball and Francesca Forzani (2007), who refer to these same interactions as the "instructional triangle," suggest that one of the limitations of education research is that studies tend to focus on only one corner of the triangle at a time. Curriculum researchers including Russ Whitehurst, Matthew Chingos, and Morgan Polikoff have demonstrated that curricula aligned to college- and career-ready standards can have a significant impact on student learning (Steiner, 2017). Content clearly matters. Moreover, since the 2010 Common Core State Standards Initiative, a majority of states have remade their K–12 ELA/literacy and mathematics standards to align to more rigorous college- and career-ready expectations (Carmichael, Martino, Porter-Magee, & Wilson, 2010). Instruction that leads to student achievement in the context of higher expectations requires as much, if not more, focus on the content of what is being taught as on how it is being taught.

Most teacher observation rubrics are not focused on content. There are a handful of exceptions, including the subject-specific instruments used in the Measures of Effective Teaching (MET) study, the Mathematical Quality of Instruction and the ELA-focused Protocol for Language Arts Teaching Observation, and the mathematics-focused Teaching for Robust Understanding rubric. In 2016 the American Institutes for Research compared 45 state observational rubrics for alignment to state standards, and found alignment to be low in general

"States and districts cannot hope to substantively change instruction with generic, uniform rubrics that contain significant amounts of non-instructional content."

(Welch et al., 2016). In many cases, they found that subject-specific indicators were missing altogether. The authors of that work conclude that "too many instruments seem devoted to creating a universal description of good teaching at the expense of providing real guidance for the many kinds of instruction that take place in a typical Grades K–12 system. States and districts cannot hope to substantively change instruction with generic, uniform rubrics that contain significant amounts of non-instructional content" (p. 34).

Most commonly used observation rubrics, in addition to being content-agnostic, are long; some of the best known teacher practice frameworks contain well over 50 indicators for an observer to track. The Measures of Effective Teaching (MET) study suggests that classroom observation is likely more reliable and useful if observers are responsible for providing ratings on fewer discrete measures (Bill and Melinda Gates Foundation, 2012). Research from TNTP (2013) suggests that in order to encourage useful, specific, and detailed feedback on what is being taught, "An observer's time is better spent focusing on a small number of essential components of a successful lesson. … We will do better when we score what counts rather than everything we can count…" (p. 6).

The Instructional Practice Guide, created by Student Achievement Partners in 2012, prioritizes standards-aligned instructional content. The IPG names a small number of observable classroom practices. By recording observations on these classroom practices, coaches and teachers will be able to gauge whether students are engaging with

content in ways that address the expectations of college- and career-ready standards for ELA/literacy and mathematics. The IPG rubric criteria–three "Core Actions" and their supporting "Indicators"–are articulations of classroom interactions among students, teachers, and content required by college- and career-ready standards. The rubric criteria are followed by a series of supporting "Beyond the Lesson" questions that are designed to put the content of the lesson in the context of a broader instructional plan for a unit, several units, or an entire year. To remain focused on standards-aligned instruction, the IPG deliberately does not attend to other components commonly found in observation rubrics (e.g., professionalism and collegiality). Instead, the rubric relentlessly prioritizes fewer indicators (12 in ELA/literacy and 15 in mathematics). The IPG is grounded in the research-based content progression shared by the Common Core and other college- and career-ready standards in ELA/literacy and mathematics. It was influenced by the work of the National Council of Teachers of Mathematics (NCTM), Strategic Education Research Partnership, and TNTP. The IPG is designed for formative use, to facilitate nonevaluative teacher observation and promote professional development through discussion and planning. It is not intended for teacher evaluation or to serve any other summative measure, and it has not been validated for those purposes. This memo summarizes the evidence for the standards-aligned indicators of the IPG.

The Evidence for the Standards-Aligned Indicators of the IPG

How college- and career-ready expectations are reflected in the language of the IPG

Whether or not states have chosen to include Common Core in the name of their standards, most largely continue to include the content of the Common Core State Standards (Korn, Gamboa, & Polikoff, 2016). The Common Core and other similar college- and career-ready standards share a set of design principles: "(1) research and evidence based, (2) aligned with college and work expectations, (3) rigorous, and (4) internationally benchmarked" (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010). These standards prioritize the content and skills students need to be prepared for postsecondary opportunities. Instructional practice aligned to these standards must embody several fundamental shifts. In ELA/literacy, teachers must ensure that students have regular practice with complex text; read, write, and speak using evidence from text; and build knowledge through reading a range of content-rich nonfiction. In mathematics, teachers must ensure that students learn more thoroughly the key mathematical topics that underlie college and career readiness; strengthen learning by coherently connecting mathematical topics within and across grades; and show mastery of mathematics through the demonstration of conceptual understanding, procedural skill and fluency, and application. The IPG Core Actions and Indicators encompass these shifts as described below.

English Language Arts/ Literacy in the IPG

The Importance of Complex Text

College- and career-ready standards require students to develop proficiency and independence reading complex texts so that they can readily access information across a variety of sources and disciplines. For all students to read texts of grade-level complexity, educators must make the selection of complex texts a central part of their lesson planning and the foundation upon which all other instructional actions are predicated. The IPG articulates this primarily in Core Action 1, with additional emphasis throughout the tool, prompting teachers to ensure that students are spending significant time on texts that are both complex and worthy of study.

Building proficiency in reading complex texts requires exposure and practice. Students cannot learn how to read complex texts independently unless they are given complex text to read (Shanahan, Fisher, & Frey, 2012). However, evidence

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shows that the median measured complexity of 12th grade texts is 1130L (Williamson, 2008)–170 Lexiles below the postsecondary median complexity of 1300 (Stenner, Sanford-Moore, & Williamson, 2012). In fact, leveled reading programs, which match students with texts that meet their existing reading abilities, are pervasive in classrooms across the United States. In a 2016 American Teacher Panel survey of a nationally representative set of elementary-level teachers, "80 percent of ELA

teachers reported using leveled readers at least once per week and 59 percent reported using them daily or almost daily" (Opfer, Kaufman, & Thompson, 2016, p. 30). These data suggest that leveled reading is being used as a mainstay of instruction rather than as a supplement. Providing the opportunity for regular reading of complex texts is critical to helping students prepare for college- and career-ready expectations, and research supports that adjusting instruction and using scaffolds are effective ways of facilitating access to complex text for all students (Morgan, Wilcox, & Eldredge, 2000; Brown, Mohr, Wilcox, & Barrett, 2017).

In their 2012 study about the measures of text difficulty, Nelson, Perfetti, Liben, & Liben reviewed more than 1300 retired state test passages and showed that, independent of the test questions, as text complexity increased within each grade level, student scores declined. According to the authors, "the question of whether objectively measured text complexity predicts student performance was answered in the affirmative. Indeed the metrics were at their best when they were predicting measures that included student performance" (p. 48). Thus as complexity increases, students' ability to comprehend complex text when reading independently decreases. While high school students are rarely held accountable for independent reading, it is an expectation of both class participation and completing assignments in college (Heller & Greenleaf, 2007). So this issue, which can have significant consequences for students while they are in high school, will also have far broader implications for students after graduation since "the ability to comprehend complex text is the most significant factor differentiating college-ready from non-college-ready readers" (ACT, 2006).

The Instructional Practice Guide makes complex texts central to the ELA/literacy classroom in these Indicators and questions:

- Indicators: 1A, 1B, 1C, 2C, 3A, 3D
- Beyond the Lesson Questions: 1, 4, 5, 6, 7

The Importance of Text-Based Evidence and Academic Vocabulary

Because being able to locate and deploy evidence is the hallmark of strong readers and writers, mastery of this skill is a critical element of any college- and career-ready ELA/literacy standards. The IPG reinforces this expectation in Core Action 2 and Core Action 3, as well as in the Beyond the Lesson questions. To ensure that students are able to draw meaning from text through evidence, the IPG prompts the teacher to specifically and intentionally focus questions and assignments on critical features and vocabulary from the text while encouraging students to provide detailed responses using evidence from what they have read.

There is a significant body of research that supports the IPG's focus on evidence from text. To be college- and career-ready, students must write and speak to sources, i.e., use evidence from texts to present careful analyses, well-defended claims, and clear information. Top performers on the National Assessment of Educational Progress (NAEP) are able to cite evidence from what they read. For example, 13-year-old students in the top quartile were likely able to do things like "provide an example of language and explain the effect on the reader," "support an opinion about a story using details," and "provide an example to illustrate the author's device for creating a mood" (National Center for Education Statistics, 2012, p. 11). The American Diploma Project, a multiyear research project that looked at employment data and surveyed college faculty, similarly found that both colleges and employers expected high school graduates to be able to work closely with texts and cite text-based evidence (Achieve, Inc., 2004).

For students to demonstrate they have comprehended the text and its themes or central ideas, classroom questions, discussion, and activities should refer students back to the text(s) they are reading to make logical claims and conclusions and to complete assignments. This text-based

approach to learning has been shown to result in significant benefits, including better recall; longer, more detailed student responses; and more focused discussions (McKeown, Beck, & Blake, 2009). A broad collection of research summarized by psychologist Daniel Willingham (2009) offers additional support for this strategy, including evidence that asking students to pay attention to specific words, phrases, and concepts through text-based discussion and written responses aids in comprehension and builds students' knowledge.

Inextricably connected to comprehending meaning from text is a focus on academic/tier 2 vocabulary: teachers must specifically ask students about the meaning of consequential words that appear in a variety of content areas (such as *ignite* and *commit*). Knowing fewer words makes reading more difficult; struggling readers are often given fewer texts to read, which in turn results in exposure to fewer words than their peers with larger vocabularies (Stanovich, 1986). Research shows direct vocabulary instruction does not significantly increase the rate of future word acquisition (Hart & Risley, 2003) and that students build much of their vocabulary in the context of texts (Stanovich, 1986). As with students' ability to draw evidence from text, scores on the NAEP vocabulary questions are strongly correlated with scores in NAEP reading comprehension, demonstrating a powerful link between vocabulary and comprehension (National Center for Education Statistics, 2012). For example, 13-year-old students scoring in the upper percentiles were likely able to both "recognize the meaning of a word as used in a document" and accomplish other tasks such as "summarize the main ideas to provide a description" and "generalize from details to recognize the meaning of a description" (National Center for Education Statistics, 2012, p. 11). This points to the importance of teachers providing questions and activities that attend to the vocabulary and sentences within texts. This finding is supported by a 2012 study about the measures of text difficulty, which suggests that there is value in "more practice with texts containing more complex syntax" and "better vocabulary instruction" (Nelson et al., 2012, p. 50).

The Instructional Practice Guide makes analytical thinking, with a specific focus on evidence from text and academic vocabulary, central to the ELA/literacy classroom in these Indicators and questions:

- Indicators: 1A, 2A, 2B, 2C, 3A, 3B, 3C
- Beyond the Lesson Questions: 8, 9, 10

The Importance of Building Knowledge

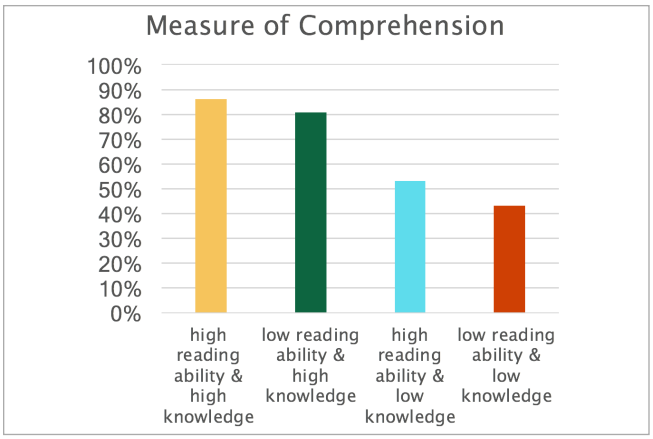
One of the most influential models of reading comprehension, "The Situation Model," by Walter Kintsch, indicates that knowledge plays a primary role in comprehension (Kintsch, 1998). Multiple pieces of research, summarized by psychologist Daniel Willingham (2009), show how knowledge of a subject aids thinking, memory, and learning of new information. Building knowledge requires that students read a large volume of texts on a given topic; having multiple opportunities to revisit a topic through a variety of texts helps to build content-specific/tier 3 vocabulary, as well as academic/tier 2 vocabulary, which can then be applied to a broader set of texts across content

When familiar with the topic, students can comprehend highly complex texts even if their reading skills are comparatively weak, while students with little familiarity of a topic will quickly be matched or outperformed, regardless of their general reading ability, by their more content-knowledgeable peers.

areas (Landauer & Dumais, 1997; Cervetti, Wright, & Hwang, 2016). This emphasis on knowledge building and vocabulary has been central to the work of E. D. Hirsch, Jr. (2006) for over three decades and led him conclude that, "the only way to attain the long-desired educational goal of high achievement with fairness to all students is through a structure in which each grade, especially grades one through five, builds knowledge cumulatively" (p. xii). The IPG addresses the importance of building knowledge primarily through the Beyond the Lesson questions, with additional emphasis in Core Action 1. Effective knowledge-building is the result of careful, sequenced planning throughout the year, which the IPG reinforces by prompting the teacher to consider the purpose of the texts selected. The IPG also asks teachers to ensure that students read across a range and volume of literary and informational texts, giving frequent opportunities for reading independently.

Some of the most compelling research has found that students' comprehension of texts can depend on how much they already know about the subject in the text. When familiar with the topic, students can comprehend highly complex texts even if their reading skills are comparatively weak, while students with little familiarity of a topic will quickly be matched or outperformed, regardless of their general reading ability, by their more content-knowledgeable peers (Recht & Leslie, 1988).

Carefully chosen and sequenced informational texts (at a variety of complexity levels) are necessary to build student knowledge (Cervetti, Jaynes, & Hiebert, 2009; Liben & Liben, 2013). Building knowledge, particularly through content-rich nonfiction, is essential to learning in every discipline and is often a prerequisite for two- or four-year degree programs and professions (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010). For students to be prepared for college and careers, instruction must include opportunities for students to read a variety of texts on the same topic at different complexity levels to help build their content knowledge and vocabulary.



In this graph, you see the results of a study where students were asked to read a text about baseball and answer comprehension questions. Students with high knowledge of baseball, even those with a low reading ability, outperformed their peers who were unfamiliar with baseball and its genre-specific vocabulary (Recht & Leslie, 1988).

The Instructional Practice Guide makes building knowledge central to the ELA/literacy classroom in these Indicators and questions:

- Indicators: 1C, 2D
- Beyond the Lesson Questions: 1, 2, 3, 4, 10

What's Different About K–2

Instruction in the early grades must be modified to address specific needs of young learners, while remaining in service of college- and career-ready standards' focus on text complexity, evidence, and building knowledge for all students. This is reflected in the language of the IPG, which includes additions in the K–2 version to account for the particulars of reading/listening comprehension in the early years and developing foundational skills. In reading, foundational skills are what students must master so they can become fluent readers; they include concepts of print, phonological awareness, phonics, and fluency.

Teachers should capitalize on opportunities to provide instruction on foundational skills in the context of students making meaning of texts. Research shows that students who are not succeeding with early reading skills by the end of first grade will continue to struggle (Juel, 1988) and

that students who are not proficient readers by the end of third grade have poor long-term academic outcomes, including lower high school grades, graduation rates, and college-attendance rates (Hernandez, 2011). As a result, in a reading/listening comprehension lesson, the K–2 IPG—like the 3–12 IPG—suggests that most of class time be spent on reading, writing, or speaking about or listening to texts. These lessons must prioritize developing the foundational skills critical to reading, such as building phonological awareness (understanding that words are made up of a string of sounds) and mastering to automaticity phonics (the sounds letters and letter combinations make), both of which are strongly predictive of later reader success (Stanovich, Cunningham, & Cramer, 1984).

In addition, teachers of developing readers must focus on the skills required to master the basic building blocks of reading. These building blocks include letters, sounds, and print concepts (e.g., the concept that English moves from left to right on a page or that spaces separate words). Lessons must include explicit phonics instruction in order for students to build decoding skills (Moats, 1998). This practice is supported by findings from the National Reading Panel (2000), which showed that students who received explicit and systematic phonics instruction saw significant benefits in reading comprehension and oral reading skills over peers who did not. Developing readers also need sustained practice with phonetic patterns and letter recognition in order to begin to access texts and make meaning from them (Henry, 2010). Additionally, fluency-building is essential to move students beyond the work of decoding words to comprehending them (Armbruster, Lehr, & Osborn, 2003).

The Instructional Practice Guide makes foundational skill development central to the K–2 ELA/literacy classroom in these Indicators:

- Indicators: 1A, 1B, 1C, 1D, 1E, 3E

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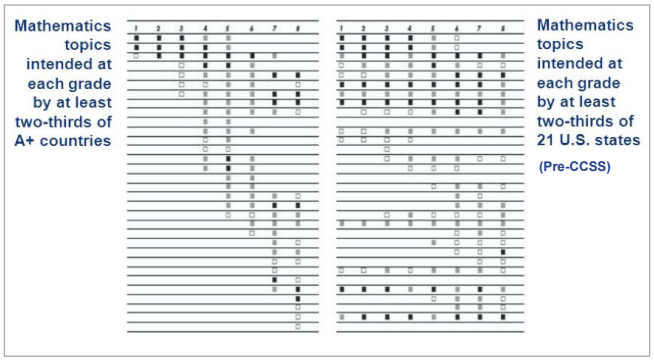
Mathematics in the IPG

The Importance of Focus

Evidence from a variety of sources including "standards documents from high-performing countries, previous state standards documents, major national reports, such as Foundations for Success and Mathematics Learning in Early Childhood, published research about math education, and research about college and career readiness" all point toward prioritizing a narrower and more coherent set of topics that help build toward deep understanding of algebra (Zimba, 2014, p. 3). The IPG emphasizes this principle of focus in Core Action 1, Core Action 2, and in several Beyond the Lesson questions.

It has been well-documented for decades that K–12 mathematics textbooks in the United States cover content in a "mile-wide, inch-deep" approach—covering many topics superficially without allowing students time to delve deeply into key concepts that influence their success with more complex mathematics in later grades (Schmidt, Houang, & Cogan, 2002; Schmidt, McKnight, & Raizen, 1997). As a result of this, even though U.S. students were exposed to nearly all the topics covered on the Trends in International Mathematics and Science Study (TIMSS) test, they have historically scored lower than their peers from other countries who

have been taught far fewer topics (Ginsburg, Cooke, Leinwand, Noell, & Pollack, 2005). This is because students from other countries develop a deeper understanding of the content they have learned, and, as a result, can apply it to concepts they might not have previously learned (Ginsburg et al., 2005).



"Figure 1. The shape of math in A+ countries compared with the United States before the Common Core. In both diagrams, grade levels 1–8 run horizontally and math topics (not named) run vertically, with elementary topics, such as whole numbers, at the top and advanced topics, such as functions, at the bottom. Left diagram: Mathematics topics intended at each grade by at least two-thirds of A+ countries. Right diagram: Mathematics topics intended at each grade by at least two-thirds of 21 U.S. states. Open squares denote two-thirds of countries or states; gray squares denote 83% of countries or states; and black squares denote 100% of countries or states" (Schmidt et al., 2002 as cited in Zimba, 2014, p. 4–5).

By shifting to a progression of content like that shown on the left in Figure 1 (Schmidt & Houang, 2007), college- and career-ready standards prioritize the content that matters most to build student mastery. In the United States, elementary math has historically required students to attend to many different things, "all of it portrayed as being equally important, despite the fact that arithmetic is much higher stakes for children and leads directly to algebra" (Zimba, 2014, p. 3). Mastery of number competency starting in kindergarten is predictive of success as students progress through the grades (Jordan, Kaplan, Ramineni, & Locuniak, 2009). Basic number concepts are necessary for work in fractions and algebra (Leinwand & Ginsburg, 2009); command of numbers and early algebra will have critical impact on careers and economic

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opportunity (Zimba, 2015; Geary, Hoard, Nugent, & Bailey, 2013; Clements, Fuson, & Sarama, 2017), and deep understanding of algebra is a requirement for college-level math courses. For standards to deliver on the promise of preparing students for careers and college, they must "emphasize arithmetic, algebra, and the connections between them. The standards' visible focus derives from their stated purpose" (Zimba, 2015, p. 2). For students to develop a strong foundation in mathematics, teachers must remain focused on arithmetic, algebra, and the connections between the two through strategic planning and instruction.

The Instructional Practice Guide makes focus central to the mathematics classroom in these Indicators and questions:

- Indicators: 1A, 2A, 2B, 2C, 2E
- Beyond the Lesson Questions: 1, 2, 6

The Importance of Coherence

The sequential nature of the discipline of mathematics lends itself to instruction that connects related concepts from the earliest grades all the way through to algebra (National Mathematics Advisory Panel, 2008b; Cuoco & McCallum, 2017). When there are gaps in this progression or when students do not develop proficiency before being introduced to new concepts, the effects can accumulate over time, a finding that led the National Mathematics Advisory Panel (2008) to recommend that "a

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focused, coherent progression of mathematics learning, with an emphasis on proficiency with key topics, [be] the norm in elementary and middle school mathematics curricula" (p. xvi). This approach is also supported by international comparisons that have shown that the top-performing countries foster the in-depth and logical development of mathematical knowledge by intentionally sequencing topics for students (Ginsburg, Leinwand, & Decker, 2009). The IPG addresses this in Core Action 1 and through a number of Beyond the Lesson questions. To ensure that teachers are regularly, consciously, and explicitly making the coherence of the mathematics clear to students, the IPG prompts teachers to intentionally connect new concepts to existing understanding and to regularly check for evidence of understanding in student work and responses.

Focus and coherence must go hand in hand in mathematics standards designed to prepare students for college and careers. Only by focusing on a grade-specific set of concepts within a logical progression can students master the foundational knowledge that will be necessary for making connections to new content in high school and beyond (National Mathematics Advisory Panel, 2008b; Schmidt, Wang, & McKnight, 2005). For students to successfully build upon prior skills and comprehend how new mathematical concepts extend their existing knowledge, teachers must consistently reinforce and connect instruction of mathematical ideas both within and across grades. Research shows that the ability to learn something new depends on an ability to accommodate the new thing according to what is already known (Schmidt et al., 2002). Further, transferring knowledge from a stage of initial acquisition to deeper long-term retention is accomplished through applying that learning to both closely and loosely related concepts and situations (National Mathematics Advisory Panel, 2008a). Coherence relies on students understanding the deeper structures that connect individual skills (Cuoco & McCallum, 2017). Even when a lesson focuses on the introduction or practice of a particular skill, the instruction should be delivered in the context of how the concept fits into the broader realm of math knowledge (Schmidt et al., 2005).

The Instructional Practice Guide makes coherence central to the mathematics classroom in this Indicator and these questions:

- Indicator: 1B
- Beyond the Lesson Questions: 1, 2, 3, 6

The Importance of an Equal Balance of Rigor

College- and career-ready mathematics standards ensure not only that students have the conceptual understanding they need to make meaning of the mathematics, but also that they have fluency to allow for efficient application. "Rigor" in this context means the appropriate balance of conceptual understanding, fluency, and applying what they know to real-world problems. The IPG addresses rigor in Core Action 1 and in the Beyond the Lesson questions. The IPG prompts teachers to carefully choose the instructional materials that address the aspect of rigor the standards call for in order to support the development of student understanding.

CONCEPTUAL UNDERSTANDING

As described previously, the absence of focus and coherence in math standards over time has resulted in standards that present voluminous lists of unconnected topics to "cover" each year.

Skills become disembodied from the concepts to which they apply, leaving teachers to provide instruction on a broad range of topics rather than a focused set of high-leverage concepts. Under these circumstances, instruction cannot accommodate much more than procedural skill development before moving students on to the next topic (Schmidt et al., 2002). To support this type of instruction, many math textbooks and instructional materials used in the United States focus on procedural skills, giving only a cursory glance to application and little time to developing a deeper conceptual understanding of how and why the math procedures work (National Research Council, 2001).

Deep understanding of math concepts can help students who do not easily think mathematically to solve problems (Willingham, 2009). Furthermore, "Conceptual understanding is critical for children's ability to identify and correct errors, for appropriately transferring algorithms to solve novel problems, and for understanding novel problems in general" (National Mathematics Advisory Panel, 2008a, p. xiv).

PROCEDURAL SKILL AND FLUENCY

Learning complicated, multistep math requires that students develop efficient ways to execute routine procedural steps quickly. "Mastery of standard algorithms is dependent on committing these problem-solving steps to long-term procedural memory," so that the algorithm can be solved automatically and effort can instead be expended on elements of a problem that may be less familiar and more difficult (National Mathematics Advisory Panel, 2008a, p. xiv). To build this facility where it is most critical, some standards explicitly require the development of procedural skill and fluency—often through the use of repeated practice (Clements et al., 2017). For instance, "In most aspects of the number and the relations/operation core, children need a great deal of practice doing a task, even after they can do it correctly" (National Research Council, 2009, p. 128). When appropriately applied, "there are substantial benefits to cumulative practice, which results in better short-term and long-term retention of individual rules and a better ability to apply rules to solve problems that involve the integration of multiple rules" (National Mathematics Advisory Panel, 2008a, p. xxiii). For students to demonstrate procedural skill and fluency with the concepts that demand them, they need for practice opportunities, tasks, and problems to reflect the purpose of the learning.

REAL-WORLD APPLICATION

College and career readiness demands that students be able to apply the math they've learned to real-world contexts. For this reason, the Programme for International Student Assessment (PISA), a survey of 15-year-old students that is used to compare education systems worldwide, focuses specifically on "how well students can extrapolate from what they have learned and can apply that knowledge in unfamiliar settings, both in and outside of school. This approach reflects the fact that modern economies reward individuals not for what they know, but for what they can do with what they know" (Organisation for Economic Co-operation and Development [OECD], 2016, p. 3). OECD, in its first Survey of Adult Skills (PIAAC), which included 24 countries, reinforced this through its finding that "proficiency in literacy, numeracy and problem solving in technology-rich environments is positively and independently associated with the

"Conceptual understanding is critical for children's ability to identify and correct errors, for appropriately transferring algorithms to solve novel problems, and for understanding novel problems in general."

probability of participating in the labour market and being employed, and with higher wages" (OECD, 2013, p. 24). Being able to apply mathematics is also viewed as essential for citizenship (Steen, 2001) and for success in science courses in postsecondary education (Sadler & Tai, 2007).

The Instructional Practice Guide makes the balance of conceptual understanding, procedural fluency, and facility with application central to the mathematics classroom in this Indicator and question:

- Indicator: 1C
- Beyond the Lesson Question: 4

The Importance of Incorporating Mathematical Practices and Habits of Mind

The National Research Council set out to define "mathematical proficiency" in 2001, and its description included "strategic competence—ability to formulate, represent, and solve mathematical problems; adaptive reasoning—capacity for logical thought, reflection, explanation, and justification; and productive disposition—habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy" (p. 5). Mathematical practices are habits of mind that will enable students to be successful in later mathematics courses and to apply math to real-world settings (Cuoco, Goldenberg, & Mark, 1996; Conley, 2005). The IPG addresses these in Core Action 3, with emphasis on the following:

MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM

Perseverance has been found to be highly correlated with student success (Shechtman, DeBarger, Dornsife, Rosier, & Yarnall, 2013); as such, it has been featured prominently in the standards of high-performing school systems such as Massachusetts, even prior to adoption of the Common Core State Standards (Massachusetts Department of Education, 2000), and Singapore (Ginsburg et al., 2005). When students learn to represent, discuss, and make connections among mathematical ideas in multiple forms, they demonstrate deeper mathematical understanding and enhanced problem-solving abilities (Fuson, Kalchman, & Bransford, 2005; NCTM, 2014). To foster this, teachers need to provide students with the opportunity to work through challenging problems with patience and perseverance (NCTM, 2014). Providing a variety of solution-method examples of different representations of the same concept enables "examining the concept through a variety of lenses, with each lens providing a different perspective that makes the picture (concept) richer and deeper" (Tripathi, 2008 as cited in NCTM, 2014, p. 25).

CONSTRUCT VIABLE ARGUMENTS AND CRITIQUE THE REASONING OF OTHERS

Mathematical communities highly value characteristics such as brevity, logical coherence, and precision, along with skills such as making claims, searching for clarity, making generalizations, and abstracting; all of these should be fostered in student discussions (Moschkovich, 2007). The call for active classroom talk and the discussion of mathematical ideas is a primary way teachers can engage students and determine their understanding of various concepts (Massachusetts Department of Education, 2000). Educators should guide student discussions that are based not merely in procedural descriptions or summaries, but in mathematical arguments and rationales, using other students' explanations to increase their own understanding (NCTM, 2000).

The call for active classroom talk and the discussion of mathematical ideas is a primary way teachers can engage students and determine their understanding of various concepts.

USE APPROPRIATE TOOLS STRATEGICALLY

Using tools to support mathematical processes is one of the skills students are expected to be able to perform under the Singapore Framework (Ginsburg et al., 2005) and in the NCTM Principles (NCTM, 2014). There is a wide array of tools and technologies available to students to facilitate learning and deeper understanding. However, the misuse of tools can thwart efficiency, confuse thinking, and, at times, lead a student to the wrong conclusion. Focus on the words "appropriate" and "strategically" is critical to meeting this expectation.

ATTEND TO PRECISION

Students need to learn to communicate about math ideas using appropriate language and terminology (NCTM, 2014). It is not sufficient for a student only to understand the math; to be college- and career-ready, students must be able to communicate their understanding clearly and accurately to others (National Research Council, 2001). Teachers need to be mindful of introducing and using precise language, and of finding opportunities for students to use it.

Students should have opportunities to exhibit mathematical practices over the course of the year, but only as appropriate within a specific lesson. Effectively incorporating the practices will allow students to engage more deeply with the content, while developing the habits necessary to support the use and further development of their mathematical content knowledge through high school and beyond.

The Instructional Practice Guide makes the mathematical practices central to the mathematics classroom in these Indicators and this question:

- Indicators: 3A, 3B, 3C, 3D, 3E, 3F, 3G
- Beyond the Lesson Question: 7

Practical Application of the IPG

A short summary of how the IPG is being used in classrooms and studied in the field

Since its release as a free digital tool on Student Achievement Partners' website, *achievethecore.org*, the IPG has been used in schools and districts across the country to support planning, reflection, collaboration, and coaching. There is a practical need in the field for college- and career-ready standards-aligned observation instruments like the IPG, given that the majority of commonly used teacher observation and evaluation frameworks remain intentionally content-agnostic (TNTP, 2013). The demand for this resource can be seen in the volume of downloads of the IPG from *achievethecore.org*, which number nearly 200,000 in the first four years since online publication in 2013. The IPG is actively used in classrooms across the United States, and derivatives of the IPG have been used by numerous districts working to meaningfully implement college- and career-ready standards, including Cincinnati Public Schools, Fresno Unified School District, and Washoe County Schools. Further, the IPG has evolved over time through feedback from practitioners, and as a result of partners working closely with districts to tackle standards-aligned instructional practice and improve professional learning.

In addition to evidence of the IPG's usefulness from its growing demand and organic uptake, field research has supported that the IPG does in practice what it was designed to do: foster more effective coaching conversations grounded in college- and career-ready standards-aligned content. Over the course of two years, Caitlin K. Martin and Véronique Mertl (2014) conducted a study designed to investigate practitioner perspectives about the intersection of teacher evaluation and the Common Core State Standards "specifically to support the Danielson Group in making decisions about modifications to the Framework for Teaching (FfT) in order to incorporate Common Core State Standards (CCSS)" (p. 1). The study considered teacher and leader responses to Charlotte Danielson's 2013 Framework for Teaching (FfT) and the 2012 Instructional Practice Guide. Participants from four diverse school districts were asked to complete an average of three cycles of nonevaluative observation, each of which included a preobservation (planning) conference, classroom observation(s) with the rubrics, and a postobservation (reflection) conference between the observer(s) and the teacher being observed.

"I think the Instructional Practice Guides give teachers more specific information about how classroom math instruction will be influenced by the CCSS, especially the math practices and shifts in mathematics."

As described in the report by Martin and Mertl (2014), "Case observers appreciated the brevity of the guides [IPGs] and the focus on what they described as an enhanced lens to look at Common Core" (p. 5). Participants in the study valued the standards specificity of the IPG and the feedback they received from observers when the rubric was used. For example, one Connecticut teacher offered, "I think the Instructional Practice Guides give teachers more specific information about how classroom math instruction will be influenced by the CCSS, especially the math practices and shifts in mathematics" (p. 32).

Participants expressed a desire for their observation and evaluation systems to be standards-aligned, with both systems incorporating standards specificity. The vast majority of respondents agreed that "Alignment of CCSS and teacher evaluation will benefit

administrators" (88% agreement) and "Alignment of CCSS and teacher evaluation will benefit teachers" (86% agreement). Half of those surveyed valued all of the Indicators from Core Actions 1 and 2 from the ELA/literacy IPG and suggested incorporating them into the content-agnostic Framework for Teaching, with just over half of participants expressing particular interest in the IPG indicator *"The majority of time is spent reading, listening to, speaking, or writing about text(s)."*

Similarly, just over half of the participants valued specific mathematics IPG indicators, including *"The lesson focuses on grade/course-level cluster(s), grade/course-level content standard(s) or part(s) thereof."*; *"The lesson intentionally targets the aspect(s) of rigor (conceptual understanding, procedural skill and fluency, application) called for by the standard(s) being addressed"*; and *"The teacher provides time for students to work with and practice grade-level problems and exercises."* After participants used both the FfT and the IPG, "the Common Core ideas that were suggested for addition into the Framework for Teaching by a majority of respondents often overlapped with what they found most complex or daunting about implementation of the Common Core" (Martin & Mertl, 2014, p. 9). These findings, which helped to clarify where educators most needed support with the Common Core, were taken into consideration when the Framework for Teaching was subsequently revised.

Conclusion

Student Achievement Partners created the IPG to address a need, articulated by teachers and school leaders across the country, for grade- and subject-specific feedback that would support them in aligning their instruction to college- and career-ready standards in mathematics and ELA/literacy. The standards-aligned IPG intentionally aims to foster instructional planning and feedback specific to the content of a lesson, and it is supported by a considerable body of research that points to the most critical shifts.

The need for standards-aligned observation rubrics, and more generally for conversations focused on the critical relationships between students, teachers, and content, remains acute. The inclusion of ELA and mathematics-specific Clusters in the most recent revision of the widely-used Framework for Teaching is a significant development in support of college- and career-ready standards-aligned practice taking hold, but change is happening slowly at the classroom level. A 2016 study from the Center for Education Policy Research at Harvard University found some promising evidence of changing practice among teachers in five states. In those states, seven out of eight English teachers (85%) reported having increased the number of writing assignments in which students are expected to use evidence to support their arguments. A similar percentage increased assigned reading of nonfiction texts (Kane, Owens, Marinell, Thal, & Staiger, 2016). A 2016 Brown Center of Education Policy at Brookings report reveals evidence that more arithmetic is being taught in elementary school, and fourth grade teachers specifically are teaching less geometry and data in 2015 than they did previously (Loveless, 2016). Despite these positive signs of instructional content and practice adjustments, studies show that teachers continue to engage in instructional practice strategies that run counter to the college- and career-ready best practices, such as the heavy reliance on leveled reading programs found in RAND's American Teacher Panel Survey (Opfer et al., 2016). For teachers to more effectively teach materials aligned to college- and career-ready standards, teachers need feedback and coaching on the subject- and grade-specific content they are teaching (Hill & Grossman, 2013).

A growing body of research suggests that focus on the teacher-student-content instructional triangle through standards-aligned observation methods correlates positively with student achievement results. A 2015 study conducted by the Center for Education Policy Research at Harvard University found that, in mathematics, "more classroom observations with explicit feedback tied to the Common Core" was "associated with statistically significantly higher student performance on the PARCC and Smarter Balanced assessments in mathematics" (Kane et al., 2016, p. 4). Further research into practical use and application of the IPG in the field, including validation efforts for purposes beyond formative assessment, is necessary. One initiative to learn more about the IPG is currently under way in a study of District of Columbia Public Schools (DCPS) conducted by the University of Virginia. DCPS has undergone significant reform over the last few years: the district has focused intensely on the adoption of high-quality, aligned materials; teacher development and retention (through content-specific training, observation, and feedback); and revisions to its teacher evaluation system (IMPACT). The district has incorporated aspects of the IPG as examples that illustrate its teacher evaluation expectations, and, as a result, is using the IPG to inform the design of the formative teacher training and observation in its LEarning together to Advance our Practice program. Additional studies of this kind will be necessary in order to understand how content-specific training, observation, and feedback impact not only instructional practice but, most important, student achievement.

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Appendix

This section includes a 1-page summary of the Core Actions and Indicators from the Instructional Practice Guides for K–2 ELA/literacy, 3–12 ELA/literacy, K–8 Mathematics and HS Mathematics. It also includes the Beyond the Lesson Discussion Guide for Mathematics and ELA/literacy. You can find the complete Instructional Practice Guides at achievethecore.org/IPG.

Core Action 1[1] for Reading/Listening Comprehension

Focus each lesson on a high-quality text (or multiple texts).

Indicators

A. A majority of the lesson is spent listening to, reading, writing, or speaking about text(s).

B. The text(s) are above the complexity level expected for the grade and time in the school year.[2]

C. The text(s) exhibit exceptional craft and thought and/or provide useful information; where appropriate, the texts are richly illustrated.

Core Action 1 for Foundational Skills

Ensure that instruction and materials explicitly and systematically provide all students with the opportunity to master foundational skills.

Indicators

A. The foundational skills being taught are aligned to the standards for this grade.

B. Instruction and materials address foundational skills by attending to phonological awareness, concepts of print, letter recognition, phonetic patterns, and word structure. (Note: not all elements will be addressed in each lesson.)

C. Instruction and materials provide sufficient opportunities for all students to practice reading and writing newly acquired foundational skills.

D Instruction and materials connect acquisition of foundational skills to making meaning from reading.

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E. Instruction and materials provide opportunities for students to demonstrate understanding of the skills being taught through frequent monitoring of student progress.

Core Action 2

Employ questions and tasks, both oral and written, that are text-specific and accurately address the analytical thinking required by the grade-level standards.

Indicators[3]

A. Questions and tasks address the text by attending to its particular structure, concepts, ideas, events, and details.

B. Questions and tasks require students to use evidence from text to demonstrate understanding and to support their ideas about the text. These ideas are expressed through a variety of means (e.g., drawing, writing, dramatic play, speaking).

C. Questions and tasks attend to the words (academic vocabulary), phrases, and sentences within the text.

D. Questions are sequenced to build knowledge by guiding students to delve deeper into text and graphics.

Core Action 3

Provide all students with opportunities to engage in the work of the lesson.

Indicators

A. The teacher keeps all students persevering with challenging tasks. Students habitually display persistence with challenging tasks, particularly when providing textual evidence to support answers and responses, both orally and in writing.

B. The teacher encourages reasoning and problem solving by posing challenging questions and tasks that offer opportunities for productive struggle. Students persevere in solving questions and tasks in the face of initial difficulty.

C. The teacher guides students to read with purpose and understanding by making frequent connections between acquisition of foundational skills and making meaning from reading. Students demonstrate comprehension while developing foundational skills in reading.

D. The teacher demonstrates awareness and appropriate action regarding the variations present in student progress toward reading independently. When appropriate, students demonstrate progress toward independence in reading and writing.

E. The teacher focuses on explicitly and systemically strengthening students' reading foundational skills.[4] Students demonstrate use of language conventions and decoding skills, activating such strategies as needed to read, write, and speak with grade-level fluency and skill.

1. Refer to Common Core Shifts at a Glance (achievethecore.org/ELALitShifts) and the K–2 Publishers' Criteria for the Common Core State Standards for English Language Arts and Literacy (achievethecore.org/publisherscriteria-ela-k-2) for additional information about the Shifts required by the CCSS.
2. Intended for texts read aloud by the teacher in grades K–2. Evaluations of text complexity are only applicable to student reading materials beginning in grade 2. Refer to the text complexity collection (achievethecore.org/text-complexity) for resources to help analyze the complexity of texts.
3. These actions may be viewed over the course of 2–3 class periods.
4. Indicator 3E is only applicable during a Foundational Skills lesson.

Core Action 1[1]

Focus each lesson on a high-quality text (or multiple texts).

Indicators

A. A majority of the lesson is spent reading, writing, or speaking about text(s).

B. The text(s) are at or above the complexity level expected for the grade and time in the school year.[2]

C. The text(s) exhibit exceptional craft and thought and/or provide useful information.

Core Action 2

Employ questions and tasks, both oral and written, that are text-specific and accurately address the analytical thinking required by the grade-level standards.

Indicators[3]

A. Questions and tasks address the text by attending to its particular structure(s), concepts, ideas, and details.

B. Questions and tasks require students to use evidence from the text to demonstrate understanding and to support their ideas about the text. These ideas are expressed through both written and oral responses.

C. Questions and tasks attend to the words (academic vocabulary), phrases, and sentences within the text.

D. Questions are sequenced to build knowledge by guiding students to delve deeper into the text and graphics.

Core Action 3

Provide all students with opportunities to engage in the work of the lesson.

Indicators

A. The teacher keeps all students persevering with challenging tasks. Students habitually display persistence with challenging tasks, particularly when providing textual evidence to support answers and responses, both orally and in writing.

B. The teacher expects evidence and precision from students and probes students' answers accordingly. Students habitually display persistence in providing textual evidence to support answers and responses, both orally and in writing.

C. The teacher encourages reasoning and problem solving by posing challenging questions and tasks that offer opportunities for productive struggle. Students persevere in solving questions and tasks in the face of initial difficulty.

D. The teacher demonstrates awareness and appropriate action regarding the variations present in student progress toward reading independently. When appropriate, students demonstrate progress toward independence in reading and writing.

E. When appropriate, the teacher explicitly attends to strengthening students' language and reading foundational skills. Students demonstrate use of language conventions and decoding skills[4], activating such strategies as needed to read, write, and speak with grade-level fluency and skill.

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1. Refer to Common Core Shifts at a Glance (achievethecore.org/ELALitShifts) and the 3–12 Publishers' Criteria for the Common Core State Standards for English Language Arts and Literacy (achievethecore.org/publisherscriteria-ela-3-12) for additional information about the Shifts required by the CCSS.
2. Refer to the text complexity collection (achievethecore.org/text-complexity) for resources to help analyze the complexity of texts.
3. These actions may be viewed over the course of 2–3 class periods.
4. The CCSS for Reading: Foundational Skills are applicable for grades 3–5 only.

BEYOND THE LESSON: DISCUSSION GUIDE

ENGLISH LANGUAGE ARTS/LITERACY

INTRODUCTION

The Beyond the Lesson Discussion Guide is designed for the post-observation conversation using the Instructional Practice Guide Coaching Tool (achievethecore.org/coaching-tool) or any other observation rubric. The questions put the content of the lesson in the context of the broader instructional plan for the unit or year. The conversation should first reflect on the evidence collected during the observation to consider what worked, what could improve, and what resources are available to support improvement. If any parts of the Lesson Planning Tool (achievethecore.org/lesson-planning-tool) were used in preparing for the lesson, refer to that information during the discussion. After discussing the observed lesson, use the "Beyond the Lesson" questions to help clearly delineate what practices are in place, what has already occurred, and what opportunities might exist in another lesson, further in the unit, or over the course of the year to incorporate the Shifts into the classroom.

1. **Why was this text selected for today's lesson? Is this text one of a sequence of texts designed to build knowledge? Please explain.** For more information refer to page 33 of the Standards.

2. **What content knowledge are students expected to gain from reading this sequence of resources?** For sample resources refer to achievethecore.org/text-set-project

3. **Beyond this lesson, what steps have been taken to ensure that students are reading a range and volume of literary and informational texts as recommended by the CCSS? (Remember, Grades K–5 focus on 50% Literary and 50% Informational, while Grades 6–12 focus on 30% Literary and 70% Informational.)** For more information refer to page 5 of the Standards.

4. **What steps have been taken to ensure students are given frequent opportunities to read independently and engage with a high volume of texts? How are students held accountable for reading independently?** For sample resources refer to achievethecore.org/text-set-project

5. **Beyond this lesson, what steps have been taken to ensure all students are reading texts of increasing complexity with increasing independence over the course of the year?** For sample resources refer to achievethecore.org/text-set-project

6. **How are students monitored as they progress toward being able to read and comprehend grade-level literary and informational texts independently and proficiently?** For more information refer to page 5 of the Standards.

7. **How are all students supported in working with grade-level text? What scaffolds are provided for students who are reading below grade level? What opportunities are provided for students who are reading above grade level to engage more deeply with grade-level or above-grade-level texts?**

8. **How are students increasingly taking charge of speaking & listening, language and writing tasks expected by the grade level standards?**

9. **Beyond this lesson, what steps have been taken to ensure that student writing tasks reflect the range of tasks recommended by the CCSS? (Remember, CCSS recommends 30% argument, 35% explanatory or informational, and 35% narrative.)** For more information refer to page 5 of the Standards.

10. **What steps have been taken to ensure students regularly conduct both short and more sustained research projects?** For sample resources refer to achievethecore.org/text-set-project

CLASSROOM ENVIRONMENT: CREATING A LITERACY RICH ENVIRONMENT

In addition to the discussion between observer and teacher, be aware that the following environmental factors may also provide useful information. The classroom library organization supports the following:

- Reading a wide range of text genres and resources at varying levels of complexity (poetry, fiction, bibliographies, informational texts, videos, etc.)
- Building knowledge about a range of topics (history, social studies, science, technical subjects, arts, music, etc.)
- Integrating authentic response options for students (book reviews, recorded reading, writing, discsussions, etc.)

Core Action 1

Ensure the work of the lesson reflects the Shifts[1] required by the CCSS for Mathematics.

Indicators

A. The lesson focuses on the depth of grade-level cluster(s), grade-level content standard(s), or part(s) thereof.

B. The lesson intentionally relates new concepts to students' prior skills and knowledge.

C. The lesson intentionally targets the aspect(s) of rigor (conceptual understanding, procedural skill and fluency, application) called for by the standard(s) being addressed.

Core Action 2

Employ instructional practices that allow all students to learn the content of the lesson.

Indicators[2]

A. The teacher makes the mathematics of the lesson explicit by using explanations, representations, tasks, and/or examples. The mathematics presented is clear and correct.

B. The teacher provides opportunities for all students to work with and practice grade-level problems and exercises.

C. The teacher strengthens all students' understanding of the content by strategically sharing a variety of students' representations and solution methods.

D. The teacher deliberately checks for understanding throughout the lesson and adapts the lesson according to student understanding.

E. The teacher facilitates the summary of the mathematics with references to student work and discussion in order to reinforce the purpose of the lesson.

Core Action 3

Provide all students with opportunities to exhibit mathematical practices while engaging with the content of the lesson.[3]

Indicators[4 5]

A. The teacher poses high-quality questions and problems that prompt students to share their developing thinking about the content of the lesson. Students share their developing thinking about the content of the lesson.

B. The teacher encourages reasoning and problem solving by posing challenging problems that offer opportunities for productive struggle. Students persevere in solving problems in the face of initial difficulty.

C. The teacher establishes a classroom culture in which students explain their thinking. Students elaborate with a second sentence (spontaneously or prompted by the teacher or another student) to explain their thinking and connect it to their first sentence.

D. The teacher creates the conditions for student conversations where students are encouraged to talk about each other's thinking. Students talk and ask questions about each other's thinking, in order to clarify or improve their own mathematical understanding.

E. The teacher connects and develops students' informal language to precise mathematical language appropriate to their grade. Students use precise mathematical language in their explanations and discussions.

F. The teacher establishes a classroom culture in which students choose and use appropriate tools when solving a problem. Students use appropriate tools strategically when solving a problem.

G. The teacher asks students to explain and justify work and provides feedback that helps students revise initial work. Student work includes revisions, especially revised explanations and justifications.

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1. Refer to Common Core Shifts at a Glance (achievethecore.org/mathshifts) and the K–8 Publishers' Criteria for the Common Core State Standards for Mathematics (achievethecore.org/publisherscriteria-math-k-8) for additional information about the Shifts required by the CCSS.
2. These actions may be viewed over the course of 2–3 class periods.
3. There is not a one-to-one correspondence between the indicators for this Core Action and the Standards for Mathematical Practice. These indicators represent the Standards for Mathematical Practice that are most easily observed during instruction.
4. Some portions adapted from 'Looking for Standards in the Mathematics Classroom' 5x8 card published by the Strategic Education Research Partnership (math.serpmedia.org/tools_5x8.html)
5. Some or most of the indicators and student behaviors should be observable in every lesson, though not all will be evident in all lessons. For more information on teaching practices, see NCTM's publication Principles to Actions: Ensuring Mathematical Success for All for eight Mathematics Teaching Practices listed under the principle of Teaching and Learning. (nctm.org/principlestoactions)

Core Action 1

Ensure the work of the lesson reflects the Shifts[1] required by the CCSS for Mathematics.

Indicators

A. The lesson focuses on the depth of course-level cluster(s), course-level content standard(s), or part(s) thereof.

B. The lesson intentionally relates new concepts to students' prior skills and knowledge.

C. The lesson intentionally targets the aspect(s) of rigor (conceptual understanding, procedural skill and fluency, application) called for by the standard(s) being addressed.

Core Action 2

Employ instructional practices that allow all students to learn the content of the lesson.

Indicators[2]

A. The teacher makes the mathematics of the lesson explicit by using explanations, representations, tasks, and/or examples. The mathematics presented is clear and correct.

B. The teacher provides opportunities for all students to work with and practice course-level problems and exercises.

C. The teacher strengthens all students' understanding of the content by strategically sharing a variety of students' representations and solution methods.

D. The teacher deliberately checks for understanding throughout the lesson and adapts the lesson according to student understanding.

E. The teacher facilitates the summary of the mathematics with references to student work and discussion in order to reinforce the purpose of the lesson.

Core Action 3

Provide all students with opportunities to exhibit mathematical practices while engaging with the content of the lesson.[3]

Indicators[4 5]

A. The teacher poses high-quality questions and problems that prompt students to share their developing thinking about the content of the lesson. Students share their developing thinking about the content of the lesson.

B. The teacher encourages reasoning and problem solving by posing challenging problems that offer opportunities for productive struggle. Students persevere in solving problems in the face of initial difficulty.

C. The teacher establishes a classroom culture in which students explain their thinking. Students elaborate with a second sentence (spontaneously or prompted by the teacher or another student) to explain their thinking and connect it to their first sentence.

D. The teacher creates the conditions for student conversations where students are encouraged to talk about each other's thinking. Students talk and ask questions about each other's thinking, in order to clarify or improve their own mathematical understanding.

E. The teacher connects and develops students' informal language to precise mathematical language appropriate to their course. Students use precise mathematical language in their explanations and discussions.

F. The teacher establishes a classroom culture in which students choose and use appropriate tools when solving a problem. Students use appropriate tools strategically when solving a problem.

G. The teacher asks students to explain and justify work and provides feedback that helps students revise initial work. Student work includes revisions, especially revised explanations and justifications.

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1. Refer to Common Core Shifts at a Glance (achievethecore.org/mathshifts) and the HS Publishers' Criteria for the Common Core State Standards for Mathematics (achievethecore.org/publisherscriteria-math-hs) for additional information about the Shifts required by the CCSS.
2. These actions may be viewed over the course of 2–3 class periods.
3. There is not a one-to-one correspondence between the indicators for this Core Action and the Standards for Mathematical Practice. These indicators represent the Standards for Mathematical Practice that are most easily observed during instruction.
4. Some portions adapted from 'Looking for Standards in the Mathematics Classroom' 5x8 card published by the Strategic Education Research Partnership (math.serpmedia.org/tools_5x8.html)
5. Some or most of the indicators and student behaviors should be observable in every lesson, though not all will be evident in all lessons. For more information on teaching practices, see NCTM's publication Principles to Actions: Ensuring Mathematical Success for All for eight Mathematics Teaching Practices listed under the principle of Teaching and Learning. (nctm.org/principlestoactions)

BEYOND THE LESSON: DISCUSSION GUIDE

MATHEMATICS

INTRODUCTION

The Beyond the Lesson Discussion Guide is designed for the post-observation conversation using the Instructional Practice Guide Coaching Tool (achievethecore.org/coaching-tool) or any other observation rubric. The questions put the content of the lesson in the context of the broader instructional plan for the unit or year. The conversation should first reflect on the evidence collected during the observation to consider what worked, what could improve, and what resources are available to support improvement. If any parts of the Lesson Planning Tool (achievethecore.org/lesson-planning-tool) were used in preparing for the lesson, refer to that information during the discussion. After discussing the observed lesson, use the "Beyond the Lesson" questions to help clearly delineate what practices are in place, what has already occurred, and what opportunities might exist in another lesson, further in the unit, or over the course of the year to incorporate the Shifts into the classroom.

1. **Is this unit targeting the major work of the grade? Does the prior unit target major work? Does the next unit target major work? How much time would you estimate will be spent on the major work in this class this year? (K-8)** Focus means significantly narrowing the scope of content in each grade so that students achieve at higher levels and experience more deeply that which remains. For more information on major work of the grade see achievethecore.org/focus

2. **Does this unit target the supporting work of the grade? If so, will this unit highlight the connection to the major work of the grade? Explain how. (K-8)** Supporting content enhances focus and coherence simultaneously by engaging students in the major work of the grade. For example, materials for K–5 generally treat data displays as an occasion for solving grade-level word problems using the four operations (see 3.MD.3); materials for grade 7 take advantage of opportunities to use probability to support ratios, proportions, and percents.

3. **Summarize how this lesson fits within the unit. Describe how the other lessons and tasks in this unit are intentionally sequenced to help students develop increasingly sophisticated understanding, skills, and practices.** For more information on coherent connections across and within grades see http://ime.math.arizona.edu/progressions/

4. **Which of the three aspects of rigor (conceptual understanding, procedural skill and fluency, and application) are attended to within this unit? If more than one aspect is attended to, when in the unit are they attended to individually, and when are students using them together?** Rigor is defined as pursuing conceptual understanding, procedural skill and fluency, and application with equal intensity. The Standards are written using language that informs the reader as to which aspect of rigor certain standards address. Some clusters or standards specifically require one aspect of rigor; some require multiple aspects. All aspects of rigor need not be addressed in every lesson.

5. **How will you meet all students' needs while working on grade/course-level content in this unit? (e.g., How will you provide scaffolding for students below grade/course level so they can reach the grade/course-level expectations? How will you create opportunities for students who are advanced to go deeper into the grade/course-level content?)** For more information, see Adapting The Lesson under Problems & Exercises in the Lesson Planning Tool achievethecore.org/lesson-planning-tool

6. **What off-grade/course-level standards have you taught this year and why?** There may be reasons for addressing topics in a strategic way before or after the grade in which the topic is central in the Standards. However, any such purposeful discrepancies should enhance the required learning, not unduly interfere with or displace grade/course-level content, and be clearly aimed at helping students meet the Standards as written.

7. **In what ways have you seen your students increase their independence in applying the Standards for Mathematical Practice in learning content this year? Which practice standards do students still need to develop and how can you support them in doing so?** For more information on the Standards for Mathematical Practice see corestandards.org/Math/Practice

8. **In what ways have your students made progress towards mastering the grade/course-level content standards? How are you monitoring and tracking their achievement of the standards? What work still needs to be done to ensure all students achieve mastery of each standard by the end of the year?** For more information on the Standards for Mathematical Content see corestandards.org/Math

CLASSROOM ENVIRONMENT: CREATING A MATHEMATICALLY RICH ENVIRONMENT

In addition to the discussion between observer and teacher, be aware that the following environmental factors may also provide useful information.

- Are a variety of tools available for students to independently access (graph paper, manipulatives, rules, etc.)?
- Are all displays in the classroom free from mathematical errors (posters and bulletin boards, etc.)?