Standards INSTITUTE

Rigor in the Standards-
Procedural Skills and Fluency

Handout, Grades K-2

Rigor in the Standards

The *K–8 Publishers' Criteria* gives a high level description of rigor for grades K through 8, and while it is not exhaustive, it is meant to frame your thinking around rigor for this grade band. This "Rigor in the Standards" handout, and the examples contained within, should be used to discuss the meaning, intent, and themes of the major work for this grade band. Use this document as a resource during planning or professional learning opportunities to frame conversations around rigor within this grade band and to reflect on the instructional practices necessary to appropriately attend to rigor in content standards.

"To help students meet the expectations of the Standards, educators will need to pursue, with equal intensity, three aspects of rigor in the major work of each grade: conceptual understanding, procedural skill and fluency, and applications. The word *understand* is used in the Standards to set explicit expectations for conceptual understanding, the word "*fluently"* is used to set explicit expectations for fluency, and the phrase "*real-world problems"* and the star symbol (*) is used to set expectations and flag opportunities for applications and modeling (which is a Standard for Mathematical Practice as well as a content category in High School)." —*K–8 Publishers' Criteria for the Common Core State Standards for Mathematics*

At UnboundEd, we've studied the state standards, spent time in classrooms, and looked at work done by other organizations to form an understanding of these three aspects of rigor that we think is most useful for educators to understand the standards and shift their practice. So while the words *understand*, *fluently*, and *real-world problems* do indicate the three aspects of rigor, they are not comprehensive. We've come to associate conceptual understanding with higher order thinking skills, working with multiple representations, and teaching more than just computational procedures. Procedural skills are about students accurately performing core functions required for grade-level mathematics; fluency is explicitly called for in certain standards and implies efficiency. Application can be thought of generally as problem solving, in real-world or mathematical contexts. For example, the words *recognize* or *compar*e can be used to indicate conceptual understanding, *count* can indicate procedural skill and fluency, and *solve addition and subtraction word problems* can be used to indicate application. Nevertheless, the example standards here that indicate an aspect of rigor should be used as examples and are not meant to be a checklist or keyword indicators.

Additional Aspects of the Rigor and Balance Criterion from the *K–8 Publishers' Criteria*:
(1) The three aspects of rigor are not always separate in materials. (Conceptual understanding needs to underpin fluency work; fluency can be practiced in the context of applications; and applications can build conceptual understanding.)

(2) Nor are the three aspects of rigor always together in materials. (Fluency requires dedicated practice to that end. Rich applications cannot always be shoehorned into the mathematical topic of the day. And conceptual understanding will not come along for free unless explicitly taught.)

Procedural Skills and Fluency

"Giving attention throughout the year to individual standards that set an expectation of fluency. The Standards are explicit where fluency is expected. Materials in grades K–6 help students make steady progress throughout the year toward fluent (accurate and reasonably fast) computation, including knowing single-digit products and sums from memory (see, e.g., 2.OA.B.2 and 3.OA.C.7). Progress toward these goals is interwoven with students' developing conceptual understanding of the operations in question. Manipulatives and concrete representations such as diagrams that enhance conceptual understanding are closely connected to the written and symbolic methods to which they refer (see, e.g., 1.NBT). As well, purely procedural problems and exercises are present. These include cases in which opportunistic strategies are valuable—e.g., the sum $698 + 240$ or the system $x + y = 1$, $2x + 2y = 3$ —as well as an ample number of generic cases so that students can learn and practice efficient algorithms (e.g., the sum $8767 + 2286$). Methods and algorithms are general and based on principles of mathematics, not mnemonics or tricks. Materials do not make fluency a generalized imperative to be applied with a broad brush, but attend most thoroughly to those places in the content standards where explicit expectations are set for fluency. In higher grades, algebra is the language of much of mathematics. Like learning any language, we learn by using it. Sufficient practice with algebraic operations is provided so as to make realistic the attainment of the Standards as a whole; for example, fluency in algebra can help students get past the need to manage computational details so that they can observe structure (MP.7) and express regularity in repeated reasoning (MP.8)." —*K–8 Publishers' Criteria for the Common Core State Standards for Mathematics*

The *K–8 Publishers' Criteria* sets expectations for materials to reflect the appropriate aspect of rigor called for in the Standards. In order to ensure instruction reflects the appropriate aspect of rigor, first we must unpack what rigor looks like in the standards and how instruction might reflect this aspect of rigor. The table below identifies the main goal and effective instructional strategies for building procedural skills and fluency.

Procedural Skills and Fluency	
Main goals:	**Effective instructional strategies:**
- Learn or develop algorithms. - Execute procedures accurately and efficiently. - Learn how to use models or tools.	○ **Connect procedures to conceptual understanding:** Link algorithms to concepts, help students understand the "why" behind the procedure. ○ **Explicit instruction:** I Do, We Do, You Do, teacher "Think Aloud," or teacher modeling. ○ **Practice:** Spiraled or distributed practice with consistent teacher feedback to lead to fluency.
Source: **Achievement Network** https://static1.squarespace.com/static/5321dc4ae4b0c72ad0ceedfe/t/59c4179537c5811bd8d9000c/1506023318140/Instructional+Approaches+for+Math+Rigor.pdf Retrieved Nov. 9, 2018	

The examples below are standards within grades K–2 that indicate procedural skills and fluency. Each example provided highlights language in the standard that indicates the aspect of rigor, rationale for why this standard indicates the aspect of rigor, other standards that similarly reflect the aspect of rigor, and additional information that helps to articulate the nuance of the Standards and helps to paint a more complete picture of rigor for this grade band. Language in the standard that reflects a different aspect of rigor than the one being highlighted has been grayed.

Language of the standards that indicates procedural skills and fluency:	
Count K.CC.A.1: **Count** to 100 by ones and tens.	
Rationale:	Addresses the procedural skills and fluency aspect of rigor because students have to demonstrate fluency with number names and the count sequence.
Standards:	K.CC.A.2, 1.NBT.A.1, 2.NBT.A.2
More to know:	K.CC.B.5 indicates conceptual understanding. Conceptual understanding is indicated in the standard with the language: ● K.CC.B.5: **Count** to answer "how many" questions about as many as 20 things arranged in a line, a rectangular array, a circle, or as many as 10 things in a scattered configuration; given a number from 1 to 20, count out that many objects. Counting to answer "how many" questions indicates conceptual understanding, the language "count" in this case does not indicate procedural skills and fluency. 1.NBT.A.1 indicates procedural skills and fluency in multiple ways, while also indicating conceptual understanding. Procedural skills and fluency is indicated in the standard with the language: ● 1.NBT.A.1: **Count** to 120, starting at any number less than 120. In this range, **read and write numerals** and **represent** a number of objects with a written numeral. This standard also indicates conceptual understanding in the language around representing a number of objects with a written numeral.

Language of the standards that indicates procedural skills and fluency:
Write numbers K.CC.A.3: **Write numbers from 0-20**. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

Rationale:	Addresses the procedural skills and fluency aspect of rigor because students have to demonstrate fluency with number names and the count sequence. This standard also indicates conceptual understanding because students have to represent a number of objects with a written numeral.
Standards:	1.NBT.A.1, 2.NBT.A.3
More to know:	2.NBT.A.3 indicates both procedural skills and fluency and conceptual understanding. Procedural skills and fluency is indicated by the language: ● 2.NBT.A.3: **Read and write numbers to 1000** using base ten numerals, number names, and expanded form. Conceptual understanding is indicated in the standard because students must read and write numbers using forms rooted in place value understanding.

Language of the standards that indicates procedural skills and fluency:
Fluently add or subtract 1.OA.C. 6: **Add and subtract within 20, demonstrating fluency for addition and subtraction within 10**. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

Rationale:	Addresses the procedural skills and fluency aspect of rigor because fluency is specifically called out in the standard. Students have to demonstrate fluency with addition and subtraction within 10. This standard also indicates conceptual understanding in the use of strategies like counting on, decomposing a ten, and making a ten which are conceptual strategies that support students in adding and subtracting within 20 efficiently.
Standards:	K.OA.A.5, 2.OA.B.2, 2.NBT.B.5