

CENTER FOR THE
STUDY OF CURRICULUM

THE TEXTBOOK NAVIGATOR/JOURNAL

>> DEVELOPMENT AND
BACKGROUND

MICHIGAN STATE
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There are widespread reports in popular publications that many mathematics textbooks are poorly aligned with the Common Core State Standards in Mathematics (CCSSM). (EdWeek, Washington Post, Ed Week Survey, NPR). Research indicates that textbooks are a central feature of mathematics instruction, both in the U.S. and around the world. The poor alignment of U.S. math textbooks means that teachers around the country are experiencing difficulty in implementing the new mathematics standards, creating a major barrier to the success of the new standards.

Developed by the Center for the Study of Curriculum (CSC) at Michigan State University, the Textbook Navigator/Journal is a web-based tool for aligning mathematics instruction with the Common Core State Standards in Mathematics (CCSSM). Using the navigator, teachers are able to pick a particular standard and ask which portions of the textbook cover it, or to identify which Common Core standards are embodied in a particular lesson in the textbook. The Navigator allows teachers to take control of their own mathematics instruction, liberating them from rigidly following their textbooks so that they can focus on teaching the content their students are expected to learn.

The Navigator is based on the results of careful analyses of 34 textbook series and 185 individual mathematics textbooks

(See Table 1). Books were selected based on two criteria. First, as part of a 2010 survey a random sample of school districts in the 45 states that had adopted the Common Core at that time, district curriculum directors were asked to indicate their current textbook series and when they expected to buy a new one.

The responses to these questions were used to draw a sample of books that cumulatively would be in use by approximately one half of students in the 45 states. Curriculum directors suggested that most districts did not plan to buy a new series for five years or more, with one fourth of them probably waiting a decade or more to buy new books. As a result it is highly likely that *a substantial percentage of teachers will be expected to implement the Common Core with older, pre-Common Core textbooks.*

The CSC research team also sampled newer books that had been published recently and that were marketed as Common Core-aligned. Although not yet in widespread use, we took a small sample of the books (10) that seemed to best represent the new generation of textbooks in order to compare them to older textbooks.

Once the books were selected, the CSC organized a system of coding lessons in the textbooks to assess their alignment to the Common Core State Mathematics standards. The methodology used in

coding the books is based on that used in the Third International Mathematics and Science Study (TIMSS). In the TIMSS over 100 textbooks from some 40 countries were analyzed by trained coders. There was high cross-rater agreement with reliabilities ranging from 75% to 90% depending on the level of specificity of the codes. That same methodology was adapted to do research related to a Longitudinal Study of Adolescent Youth (LSAY) and as a part of the 2005 NAEP high school transcript study. As part of its effort to study the implementation of the CCSSM, the Center for the Study of Curriculum (CSC) refined the coding framework from the TIMSS study, which focused on mathematics topics, to one that was defined by the Common Core standards.

However, this was done so the two frameworks could be mapped onto each other. This was done as a part of an Ed Researcher article comparing the CCSSM to the international benchmark developed in TIMSS. The framework was changed but the basic methodology remained the same.

The coders of the textbooks were rigorously trained and monitored. The same personnel who oversaw the TIMSS textbook coding also oversaw and evaluated the quality of the CCSSM textbook coding, randomly sampling coded lessons to ensure quality and consistency. Coders had strong

mathematics backgrounds, including math specialist undergraduates and graduate students and former or current mathematics teachers. Coders coded each lesson in the textbook by identifying the Common Core standards that lesson addressed. The coding was done to reflect the focus (the main purpose) of each lesson. Coders were given a broad mandate to identify any standards (including none) present in a lesson – including those from other grades. This approach was designed to reduce the risk of confirmation bias and to allow us to determine whether the textbook material was “on grade.”

Before turning to a further description of the Textbook Navigator/Journal, we present some general findings that describe the consistency of a typical textbook with the Common Core.

COHERENCE

International research shows that *coherence* – that mathematics topics follow a logical sequence both within any single year and across grades – is an important feature of mathematics instruction. One of the principal goals of the Common Core is to bring greater coherence to U.S. mathematics teaching. In general, textbooks should cover all of the standards at each grade level to reflect the coherence called for in the standards.

Unfortunately, our analysis indicates that *not one textbook series covered 100% of the on-grade standards called for in the Common Core*. Averaging over all eight grades and all textbook series analyzed, the estimated percentage of Common Core standards appropriate to that grade that were covered was 72%, ranging across the 34 series from 42% to 98%. In other words, on average one-fourth of the necessary standards at each grade were missing from the textbooks. First grade textbooks had the higher average fidelity to the Common Core (82%). The sixth grade and fifth grade had the lowest average coverage of on-grade standards (about 60%).

There was substantial variation across textbooks in general. One sixth grade textbook had less than 20% of the grade appropriate standards included in the books' lessons, compared with seven books where all the standards were covered (three at 7th grade, and two each at 1st grade and 4th grade). Again, no series was 100% compliant with the Common Core at all grade levels. One encouraging note emerges from the data: the post-2011 textbooks we studied covered, on average, a higher percentage of the grade specific standards (82%) than did the older books (64%).

The failure to adequately cover all of the necessary material at each grade level can have serious long-term effects. Mathematics learning is a cumulative process, with earlier

topics providing a critical foundation for understanding later topics. By neglecting to address all of the standards at the proper time, incomplete textbooks will pose obstacles to student academic achievement and force teachers to search out supplementary materials.

FOCUS

A second key feature of the Common Core Standards supported by international research is the concept of *focus*: that at each grade instruction should center on a small number of key topics or ideas. This allows a more thorough grounding in the material before students move on to more advanced topics. For textbooks to be focused they should not only cover all of the grade-specific standards, but they should also refrain from including too many additional topics. The latter has the effect of diverting limited instructional time away from the on-grade mathematics.

Looking first at the number of off-grade standards covered in the textbooks, we found that on average only about half of the total number of standards covered in the lessons were appropriate for that grade. The average is somewhat higher in newer books (63%) than older books (37%), suggesting that Common Core aligned textbooks are more focused – with about

one quarter fewer off-grade standards covered.

Simply counting the number of standards addressed could be misleading, however. Some of the standards may only receive minor coverage in textbook lessons; for example they might be brief review lessons. A more accurate gauge of a textbook's focus is to count the number of instructional days devoted to on-grade standards. Each textbook includes a guide indicating the number of days that should be used for a particular lesson. As another method of examining focus, we used the number of days specified by the textbooks for coverage of a lesson to weight the relative importance of the standard being covered. To standardize the measure across all textbooks, the relative importance of each standard was calculated against a total of 160 instructional days.

Weighting the standards by the number of days, we estimated that on average the analyzed textbooks allocated between 62% and 74% of their class days to the grade-appropriate standards. The consequence of this is that at least one quarter of the instructional days focused on off-grade standards. In other words, students are likely to spend between eight and thirteen weeks on extraneous material.

For some books the problem is much worse, with as much as two-thirds of the school years spent covering off-grade standards. Meanwhile other textbooks allocate virtually all of their instructional days to grade-relevant Common Core standards.

There is also a substantial difference between newer, Common Core based textbooks, and those that pre-date (pre-2011) the Common Core. Older books allocate between ten and fifteen weeks to off-grade material, compared with six to eight weeks for newer books. Clearly the newer textbooks are more focused, allocating most of the 160 days to covering lessons reflecting the Common Core standards. However, a substantial proportion of time is still dedicated to off-grade topics. The Textbook Navigator/Journal is designed to help teachers make more effective use of their current textbook in implementing the Common Core standards.

THE TEXTBOOK NAVIGATOR

The coding of the 34 commonly used textbook series summarized above forms the foundation of the Navigator, which is designed to help teachers implement the Common Core by letting the standards, not the textbooks, guide the process.

Metaphorically, the Navigator provides a table of contents for each textbook that connects each Common Core standard to all the textbook lessons that cover that standard as well as to the relevant lessons found at other grade levels within that same textbook series to which the textbook belongs. Teachers have the ability to use the navigator in one of two ways. First, they can use the Navigator to determine which standards are covered in which lessons. Second, teachers can select a given grade-level Common Core standard and will be presented with all of the lessons in the textbook that focus on that particular standard. Using this method teachers will be able to decide for themselves what order they wish to cover the textbook lessons (and which lessons they can and probably should skip), rather than being tied rigidly to the order defined in the textbook. If there are no lessons of the textbook covering a particular standard, the Navigator will point to several free, on-line sources of curricula materials. These sources are included for the purpose of providing teachers a first step in seeking out supplementary materials, without necessarily explicitly endorsing them (although we hope to periodically update those links).

TABLE 1. TEXTBOOK SERIES INCLUDED IN ANALYSES

Textbook Series	Grades	Copyright Year
Big Ideas Math Accelerated: A Common Core Curriculum	7	2014
Big Ideas Math Advanced 1 & 2: A Common Core Curriculum	7-8	2014
Big Ideas Math Algebra 1: A Common Core Curriculum	8	2014
Big Ideas Math: A Common Core Curriculum	6-8	2014
Connected Mathematics 2	6-8	2006
Connected Mathematics 2	6-8	2009
Connected Mathematics 3	6-8	2014
enVision Math Common Core	K-5	2012
Everyday Mathematics	K-6	2007
Glencoe Mathematics Applications and Concepts, Course 1-3	6-8	2006
GO Math! Grade Middle School	7-8	2014
GO Math!	K-6	2011
Holt GA Mathematics, Course 1-3	6-8	2007
Holt Mathematics Course 1-3	6-8	2007
Holt McDougal Mathematics Common Core	6-8	2012
Impact Mathematics Course 1-3	6-8	2009
Investigations in Number, Data, and Space	K-5	2008
Investigations in Number, Data, and Space	K-6	2012
Jump Math	4-6	2013
Math Expressions	K-5	2006
Math Expressions	K-5	2009
Math Expressions	K-5	2011
Math Georgia Houghton Mifflin	K-5	2007
Math in Focus: A Singapore Approach - Common Core	K-5	2013
Math in Focus: A Singapore Approach	K-5	2009
Math Trailblazers	K-5	2008
Mathematics in Context	6-8	2006
MyMath Common Core	K-5	2013
Prentice Hall Mathematics Course 1-3 Common Core	6-8	2012
Progress in Mathematics with Transitions to Common Core	K-6	2012
Scott Foresman-Addison Wesley Mathematics Diamond Ed	K-6	2008
Scott Foresman-Addison Wesley Mathematics	K-6	2005
Scott Foresman-Addison Wesley MICH Mathematics Diamond Ed	K-6	2008
Scott Foresman-Addison Wesley OHIO Mathematics	K-6	2005

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