Florida Department of Education
Specifications for the 2013-14 Florida Instructional Materials Adoption
Mathematics 6-12

Introduction

This document specifies the requirements for the 2013-2014 Florida instructional materials adoption for mathematics. Publishers should review this information carefully. The criteria contained in this document will serve as the basis for the evaluation of instructional materials bid for adoption.

The Florida mathematics call for adoption is comprised of the courses listed in Table 1 of this document. Each course has an updated course description available online at www.cpalms.org (the course titles in Table 1 link to the course page in CPALMS).

- Materials bid for adoption must clearly and completely align to each of the standards included in the applicable course description to be deemed acceptable for adoption.
- Materials will be thoroughly evaluated to ensure the content is accurate, appropriately rigorous, and comprehensive in their coverage of each of the standards in the course description and the additional criteria outlined in this document.

This adoption is for materials to be utilized in the classroom in the 2014-2015 academic year and later. As such, publishers must be sure to select the course description for the latest available academic year. The latest version of each course description, which should be utilized for developing materials for the 2013-14 mathematics adoption, is indicated Table 1 below.

Publishers and manufacturers of instructional materials shall provide electronic access to sample copies to the Department and each state instructional materials reviewer and subsequent district reviewer, per section 1006.38(2), Florida Statutes. Only the student and teacher editions of the major tool, in electronic or digital format as defined in Section 1006.29 (3), Florida Statutes, will be reviewed for adoption. Publishers are strongly encouraged to develop samples which are easily accessible and navigable by reviewers. Difficulty in accessing or navigating the samples may be taken into consideration by reviewers when making their recommendation for or against adoption.

Furthermore, samples which have recurrent problems or issues which hinder or prevent reviewers from accessing the materials may be disqualified from the bid process. The Department expects samples and materials developed for adoption to be thoroughly tested and ready for review. Samples with issues which delay or prevent evaluation may be deemed as deficient, and therefore, not acceptable as the basis of review for adoption.

2013-14 Mathematics Course Call

Florida will only accept bids for materials designed to serve as the major tool of instruction (along with ancillary materials) for the courses listed in Table 1 below.

Table 1. 2013-14 Mathematics Materials Called for Adoption

Course Number	Grade Level	Course Category	Course Title	Course Version
1205010	6 - 8	General Mathematics	M/J Mathematics 1	2014- and Beyond
1205020	6 - 8	General Mathematics	M/J Mathematics 1, Advanced	2014- and Beyond
1205040	6 - 8	General Mathematics	M/J Mathematics 2	2014- and Beyond
1205050	6 - 8	General Mathematics	M/J Mathematics 2, Advanced	2014- and Beyond
1205070	6 - 8	General Mathematics	M/J Pre Algebra	2014- and Beyond
1200500	9 - 12	Algebra	Advanced Algebra with Financial Applications	2013- and Beyond
1200310	9 - 12	Algebra	Algebra 1	2014- and Beyond
1200320	9 - 12	Algebra	Algebra 1 Honors	2014- and Beyond
1200330	9 - 12	Algebra	Algebra 2	2014- and Beyond
1200340	9 - 12	Algebra	Algebra 2 Honors	2013- and Beyond
1200300	9 - 12	Algebra	Basic Mathematics Skills	2013- and Beyond
1200700	9 - 12	Algebra	Mathematics for College Readiness	2012- and Beyond
1200410	9 - 12	Algebra	Mathematics for College Success	2012- and Beyond
1202300	9 - 12	Calculus	Calculus Honors	2013- and Beyond
1202340	9 - 12	Calculus	Pre-Calculus Honors	2013- and Beyond
1205370	9 - 12	General Mathematics	Consumer Mathematics	2013- and Beyond
1205500	9 - 12	General Mathematics	Explorations in Mathematics 1	2013- and Beyond
1205510	9 - 12	General Mathematics	Explorations in Mathematics 2	2013- and Beyond
1206330	9 - 12	Geometry	Analytic Geometry Honors	2012- and Beyond
1206310	9 - 12	Geometry	Geometry	2014- and Beyond
1206320	9 - 12	Geometry	Geometry Honors	2014- and Beyond
1298310	9 - 12	Liberal Arts Mathematics	Advanced Topics in Mathematics	2013- and Beyond
1208300	9 - 12	Liberal Arts Mathematics	Liberal Arts Mathematics	2012- and Beyond
1201310	9 - 12	Mathematical Analysis	Analysis of Functions Honors	2013- and Beyond
1201300	9 - 12	Mathematical Analysis	Mathematical Analysis Honors	2013- and Beyond
1210300	9 - 12	Probability and Statistics	Probability & Statistics with Applications Honors	2013- and Beyond
1211300	9 - 12	Trigonometry	Trigonometry Honors	2013- and Beyond

Major Priorities for Instructional Materials - Content, Presentation, Learning

The priorities as described in this specification document were developed from research findings about what makes instructional materials effective. These priorities have undergone review by individuals who have served on state and district committees, by curriculum specialists, by instructional designers, by evaluation specialists, and by administrators of the statewide adoption system.

Instructional materials must be effective in three major priority areas: content, presentation, and learning. The following sections describe essential features for each of these priority areas. These features generally apply to all formats of instructional materials, whether print or other media/multiple media formats.

Content

Some features of content coverage have received progressively more attention over the past decade. These features include:

A. ALIGNMENT WITH CURRICULUM REQUIREMENTS
B. LEVEL OF TREATMENT OF CONTENT
C. EXPERTISE FOR CONTENT DEVELOPMENT
D. ACCURACY OF CONTENT
E. CURRENTNESS OF CONTENT
F. AUTHENTICITY OF CONTENT
G. MULTICULTURAL REPRESENTATION
H. HUMANITY AND COMPASSION

The following sections describe the content features expected for each of these priority areas.

A. ALIGNMENT WITH CURRICULUM REQUIREMENTS

Content must align with the state's standards for the subject, grade level, and learning outcomes. See Sections 1006.34(2)(b); 1006.38(3)(b); 1006.31(2), Florida Statutes.

Correlations: Publishers are expected to provide correlation reports in the provided form to show exactly where and to what extent (mentioned or in-depth) the instructional materials cover each required Common Core State Standards and/or Course Descriptions for **Mathematics.**

Scope: The content should address Florida's required curriculum standards for the subject, grade level, and learning outcomes, including thinking and learning skills.

Completeness: The content of the major tool should be complete enough to stand on its own. To be useful for classroom instruction, instructional materials must be adaptable to the instructional goals and course outlines for individual school districts, as well as the state standards. Content should have no major omissions in the required content coverage and be free of unrelated facts and information that would detract from achievement of Florida's specified Common Core State Standards in Mathematics.

B. LEVEL OF TREATMENT OF CONTENT

The level of complexity or difficulty of content must be appropriate for the standards, student abilities and grade level, and time periods allowed for teaching. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

Objectives: Content should be simple, complex, technical, or nontechnical enough for the intended objectives.

Students: Content should be developmentally appropriate for the age and maturity level of the intended students. It should contain sufficient details for students to understand the significance of the information presented and to engage in reflection and discussion.

Time: The level of complexity or difficulty of content also should allow for its coverage during the time periods available for teaching the subject.

C. EXPERTISE FOR CONTENT DEVELOPMENT

Expertise in the content area and in education of the intended students must be reflected in the authors, reviewers, and sources that contributed to the development of the materials. See Section 1006.38(14), Florida Statutes.

Authorship: The authors, consultants, and reviewers must have actually contributed to the development of the instructional materials and should have credentials that reflect expertise in the subject area, course, course category, grade level, pedagogy, education, teaching, or classroom instruction. Qualifications may include expertise in educational psychology or instructional design.

Sources: Primary and secondary sources should reflect expert information for the subject, such as relevant data from research journals, and other recognized scientific sources. The type of sources considered appropriate will vary with the particular subject area.

In the subject area of MATHEMATICS, expertise is expected to include authors commonly accepted in the field of mathematics education research, curriculum development, assessment, and staff development.

D. ACCURACY OF CONTENT

Content must be accurate in historical context and contemporary facts and concepts. See Sections 1006.38(8); 1006.31(2)(e); 1006.35, Florida Statutes.

Objectivity: Content that is included in the materials should accurately represent the domain of knowledge and events. It should be factual and objective. It should be free of mistakes, errors, inconsistencies, contradictions within itself, and biases of interpretation. It should be free of the biased selection of information. Materials should distinguish between facts and possible interpretations or opinions expressed about factual information. Visuals or other elements of instruction should contribute to the accuracy of text or narrative.

Representativeness: The selection of content should not misrepresent the domain of knowledge and events. It should include the generally accepted and prevalent theories, major concepts, laws, standards, and models used within the discipline of the subject area.

Correctness: Presentation of content should be free of typographical and visual errors. It should include correct grammar, spelling, linguistics, terminology, definitions, descriptions, visuals, graphs, sounds, videos, and all other components of the instructional materials.

For the subject area of MATHEMATICS, publishers must submit materials that connect mathematics with a variety of subject areas. Regardless of the particular topic, the information presented must be accurate in historical context and contemporary facts and concepts.

E. CURRENTNESS OF CONTENT

Content must be up-to-date for the academic discipline and the context in which the content is presented. See Sections 1006.38(8); 1006.31(2)(e), Florida Statutes.

Dates or editions: Copyright dates for photographs and other materials and editions should suggest sufficient currentness of content. Copyright dates and editions serve as indicators about currentness. However, neither the copyright date nor the edition guarantees currentness. Subsequent editions should reflect more up-to-date information than earlier editions.

Informed examination of the text, narrative, and visuals contained in the materials provides the most direct information about currentness of the materials.

Context. Text or narrative, visuals, photographs, and other features should reflect the time periods appropriate for the objectives and the intended learners.

- Sometimes context should be current. For example, a photograph used to show stages of human growth and development will be more relevant when the clothing, hairstyles, and activities reflect present-day styles.
- Sometimes context should be historical. For example, illustrations and photographs of historical events should reflect the historical time period.
- Sometimes context should be both current and historical. For example, historic images alongside modern ones would convey changes in styles over time.
- At all times the context should be relevant to the learner, to the Curriculum Frameworks, and to the concept presented.

F. AUTHENTICITY OF CONTENT

Content should include problem-centered connections to life in a context that is meaningful to students. See Sections 1006.31(2)(e); 1006.34(2)(b); 1003.42, Florida Statutes.

Life connections: Instructional materials should include connections to the student's life situations in order to make the content meaningful. Students might be expected to deal with time constraints, consider risks and trade-offs in decision-making, and work with teams. Connections may be made to situations of daily home life, careers, vocation, community events and services, and leisure or recreation.

Interdisciplinary treatment: Instructional materials also should include interdisciplinary connections in order to make content meaningful. Examples of situations that connect a variety of subject areas include building projects, playing sports, retrieving information or objects, balancing budgets, creating products, and researching information. In addition to subject area connections, instructional materials should connect the course or course category to other disciplines. Examples of approaches to interdisciplinary connections include: explanations and activities for using skills and knowledge from other academic disciplines; assignments that require students to relate learning from other disciplines rather than to isolate knowledge or skills; the focus on common themes across several subject areas (infusion, parallel, transdisciplinary, or multidisciplinary instruction).

In the subject area of MATHEMATICS, publishers must integrate materials to all appropriate content areas and should refer to Common Core State Standards for the content areas.

G. MULTICULTURAL REPRESENTATION

Portrayal of gender, ethnicity, age, work situations, and various social groups must include multicultural fairness and advocacy. See Sections 1003.42; 1006.31(2)(a); 1006.34(2)(b), Florida Statutes.

Multicultural fairness: Through balanced representation of cultures and groups in multiple settings, occupations, careers, and lifestyles, the materials should support equal opportunity without regard for age, color, gender, disability, national origin, race, or religion. It is not the number of pages devoted to diversity, equity, or work roles, but the substance of what is stated and portrayed that matters most. For this reason, it can be misleading to count the number of pages or illustrations devoted to a social issue or group. It is more important to focus on the integration of social diversity throughout a set of instructional materials.

In addition to balanced representations, the portrayal of individuals and situations must exclude biases and stereotypes. These portrayals must promote an understanding and appreciation of the importance and contributions of diverse cultures and heritage.

Multicultural advocacy: The understanding and appreciation of multiple cultures extends beyond fair representation. It involves embracing a multicultural context, not just through pictures, but through information about ways to honor differences and deal with conflicts, promote a positive self-image for members of all groups, and provide for the development of healthy attitudes and values.

Effective treatment of multicultural issues requires consideration of the age and ability levels of students and whether or not it is appropriate to include multicultural issues in the study of a particular topic, such as the memorization of a formula or equation. Overall, however, materials should reflect both multicultural fairness and advocacy.

In the subject are of MATHEMATICS, contributions of various cultures to the development of mathematics throughout the history should be included in the introduction of concepts, whenever appropriate. Multicultural representation also includes consideration of different learner types such as visual, auditory, kinesthetic, etc.

H. HUMANITY AND COMPASSION

Portrayal of the appropriate care and treatment of people and animals must include compassion, sympathy, and consideration of their needs and values and exclude hard-core pornography and inhumane treatment. See Sections 1003.42; 1006.31(2)(c); 1006.34(2)(b), Florida Statutes.

Inclusion of compassion: When providing examples in narrative or visuals, materials sometimes depict the care and treatment of people and animals. Generally, this means showing in some way a measure of compassion, sympathy, or consideration of their needs and feelings.

Exclusion of inhumanity: In the context of personal and family values, Florida expressly prohibits material containing *hard-core pornography*. In addition, although the definition of *inhumane treatment* can sometimes appear to be controversial, as in science research, there is general agreement that instructional materials should not advocate any form of inhumane treatment.

As with the evaluation of multicultural representation, it is important to consider the context of the subject and the age and abilities of the students.

Presentation

Features of presentation affect the practical usefulness of materials and the ease of finding and understanding content. These features include:

A. COMPREHENSIVENESS OF STUDENT AND TEACHER RESOURCES
B. ALIGNMENT OF INSTRUCTIONAL COMPONENTS
C. ORGANIZATION OF INSTRUCTIONAL MATERIALS
D, READABILITY OF INSTRUCTIONAL MATERIALS
E. PACING OF CONTENT
F. EASE OF USE OF MATERIALS

The following sections describe the presentation features expected for each of these areas.

A. COMPREHENSIVENESS OF STUDENT AND TEACHER RESOURCES

Resources must be complete enough to address the targeted learning outcomes without requiring the teacher to prepare additional teaching materials for the course. See Sections 1006.29(2); 1006.34(2)(b), Florida Statutes.

Materials should contain support for students in completing instructional activities and assessments and for teachers in implementing all of the instructional elements. A variety of components can accomplish this purpose. Typically, materials will include test items, study guides, outlines and strategies for teaching, media supplements, learning activities, and projects.

The major components generally expected for student and teacher resources are listed below.

Student resources: Student materials typically include the major resource or program with text or narration, visuals, assignments, and assessments. Formats may include print, audio, visual, computer, or other media like CDs, DVDs, PPTs, or software adaptable for Smart Boards.

Effective instructional materials generally integrate the use of reference aids (e.g., index, glossary, maps, bibliography, graphic organizers, and pictures) with the topic being studied. Items that guide students through materials might include clearly labeled materials, directions and explanations, and assignments with menus of choices.

Review and practice activities might include participation activities such as digital simulations, role-playing situations, investigations, and hands-on practice assignments. Review activities might include self-checks or quizzes. Formats might include digital education games, student tutorials, worksheets, workbooks, journals, lab books, lab logs, charts, or maps. Feedback might be in the form of answer keys in student materials or in teacher materials.

Review works best as a logical extension of content, goals, objectives, and lessons, with increased similarity to real-life situations. Review activities should require students to recall or apply previously taught knowledge and skills. Frequent short reviews over time or space improve learning more than a concentrated review. Assignments and stages of small practice improve speed and accuracy.

Other components might include enrichment and remediation activities, additional resources, and tests and assessment tools either in the student materials or in the teacher's guide or edition.

In the subject area of MATHEMATICS, publishers must provide enrichment and remediation activities to the students and teachers in electronic format.

Teacher resources: Teacher materials typically include a teacher's edition with the annotated student text and copies of supplementary materials (print or digital) with answer keys, worksheets, tests, diagrams, etc., so that the teacher has to use only one guide. In-service training, workshops, and consulting services should be made available by publishers to support teachers in implementing instructional materials. Professional development is essential to the success of any program, especially when a program contains non-traditional elements. Publishers should clearly indicate the recommended amount and types of professional development that they will provide, and they should work with districts and schools to ensure that teachers receive the support that they need. The materials for the teacher should support continued teacher learning.

Support, guidelines, resources, or features such as the ones described below should be available to help teachers effectively implement materials in classroom and school settings.

(1) **Components and materials are easy to use:** Examples include clearance, license, or agreement for copying and use of materials; clear description and accurate directions for use of required equipment, facilities, resources, and environment; clearly labeled grade, lesson, content, and other information to identify components; and correct specifications for making instructional media and electronic programs work effectively.

(2) **Materials support lesson planning, teaching, and learning:** Examples include overview of components and objectives; background for lectures and discussions; technical terminology, and reinforcement and review strategies; scope and sequence chart for activities and planning; sample lesson plans; suggestions for individualized study, small-group and large-group presentations and discussions, school-to-work activities, field or laboratory experiences, safety procedures, and other extension activities; suggestions for integrating themes across the subject area or course curriculum and forming connections to other disciplines; and suggestions for parental and community involvement.

(3) **Suggestions are provided for adapting instruction for varying needs:** Examples include alternative approaches to teaching, pacing, and options for varied delivery of instruction such as media, tools, equipment, and emerging technology; strategies for engaging all students, such as open-ended questions to stimulate thinking, journals, hands-on investigations, explorations, and multisensory approaches; suggestions for addressing common student difficulties or adapting to multiple learning styles; and alternative reteaching, enrichment, and remediation strategies.

(4) **Guidelines and resources are provided on how to implement and evaluate instruction:** Examples include answers to work assignments, practice activities, and tests; sample projects or research results; suggestions for using learning tasks for classroom assessment; and guidelines for alternative assessments, such as sample checklists, rubrics, peer or performance assessments, and portfolios.

(5) Resources are provided to use in classroom activities: Examples include technology resources; lists of resources and references, reading strategies, materials to use for displays or photocopies ,classroom management strategies and documentation on how to manage the entire instructional program; and in-service workshops or consultation support from the publisher.

B. ALIGNMENT OF INSTRUCTIONAL COMPONENTS

All components of an instructional package must align with each other, as well as with the curriculum. See Sections 1006.34(2)(b), Florida Statutes.

All components of an instructional package—teacher's edition and materials, student's edition and materials, workbook, supplementary materials, and others—must be integrated and interdependent and must correspond with each other. For example, support materials in the teacher's edition should align with student activities or assignments. They must match in content and progression of instructional activities.

C. ORGANIZATION OF INSTRUCTIONAL MATERIALS

The structure and format of materials must have enough order and clarity to allow students and teachers to access content and explicitly identify ideas and sequences. See Sections 1006.34(2)(a); 1006.34(2)(b), Florida Statutes.

Providing an explicit and teachable structure can double the amount of information remembered. Clear organization allows students and teachers to discriminate important pieces of information through skimming, reading, or browsing. Clear organization may be accomplished through a combination of features, but generally not through one feature alone.

Access to content: Some features help in searching and locating information, such as a table of contents; pull-down menu or sitemap of content; directions on how to locate information or complete assignments; an index for quick reference; goals and/or objectives, outlines, lists, or checklists for major sections; bibliographies and lists of resources; glossaries for quick access to major terms; and introductions, key concepts and themes, visual cues, illustrations, labeled examples, and labeled reviews or summaries.

Visible structure and format: At-a-glance features should signal the organization of content. The following features are desirable:

- Chapter or unit titles and/or frames;
- Headings and subheadings;
- Typographic cues such as bold, italics, or changes in size of type;
- Divisions of content such as borders, boxes, circles, highlighting, visual signposts, icons, or color cues;
- Diagrams, labels, and visuals placed near the related content; and numbering of pages and other components.

Objectives or a content outline may serve a similar purpose by introducing main ideas, providing guideposts to use in searching for key information, or serving as a checklist for self-assessment. Certain types of brief narrative sections also contribute to clear organization. For example, the statement of a clear purpose with content organized around main ideas, principles, concepts, and logical relationships supports the unity and flow of information. Introductions also play a major role when they include anchoring ideas, a list of key points, or conceptual schemes such as metaphors. Summaries also can assist students in understanding the logical order of topics presented.

Logical organization: The pattern of organization of the content should be consistent and logical for the type of subject or topic. Patterns of organization may include comparison and contrast, time sequence, cause-effect or problem-solution-effect, concrete to abstract, introduction-review-extension (spiral structure), simple-to-complex, whole-part or part-whole, generalization-examples-review-practice, and conflict-inside view-structure.

D. READABILITY OF INSTRUCTIONAL MATERIALS

Narrative and visuals should engage students in reading or listening as well as in understanding of the content at a level appropriate to the students' abilities. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

Language style: Language style and visual features can influence the readability of materials. Yet, a popular tool for assessing readability has been the use of a *readability formula* of one type or another. These formulas tend to focus only on a few *countable* characteristics of language style such as the length of words, sentences, and/or paragraphs.

Other features are more important in establishing the readability of instructional materials, such as: organized, coherent text language and concepts familiar to the student; language that clarifies, simplifies, and explains information; transition words such as "yet," "also," "next," "for example," "moreover," or "however;" other phrases that create logical connections; words with concrete and specific images; active rather than passive voice; varied sentence structures and avoid both choppy sentences and unnecessary words; and specific questions or directions to guide student attention to visuals or key information.

Visual features: Visual features that improve readability include print that is dark and clear, with good contrast paper with clean-cut edges without glare, or computer screens without glare margins wide enough on a page or screen to allow easy viewing of the text chunking (sentence ends on same page as it begins); visuals that are relevant, clear, vivid, and simple enough for students to understand quantity of visuals suitable for the intended students—both lower ability students and higher ability students tend to require more visuals; unjustified text (ragged on the right) rather than justified (lined up on the right); visuals that contain information in a form different from the text; graphs, charts, maps, and other visual representations integrated at their point of use; and colors, size of print, spacing, quantity, and type of visuals suitable for the abilities and needs of the intended students.

E. PACING OF CONTENT

The amount of content presented at one time or the pace at which it is presented must be of a size or rate that allows students to perceive and understand it. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

It is important that materials contain “bite-size” chunks or blocks of information. The chunks should not be so large, nor the pacing so fast, as to overwhelm students. Neither should the chunks be so small, nor the pacing so slow, as to bore them.

F. EASE OF USE OF MATERIALS

Both print and other media formats of instructional materials must be easy to use and replace and be durable enough for multiple uses over time. See Sections 1006.29(4); 1006.38(3)(a); 1006.34(2)(b); 1006.38(5); 1006.38(6)(7)(8)(9), Florida Statutes.

Warranty: The actual physical and technical qualities of materials should match the description contained in the publisher’s warranty.

Use: Materials must be designed for practical use in the classroom and school environments. They must be easy to identify and store. Teachers and students must be able to access and use the materials. Some of the factors influencing their ease of use include number of components, size of components, packaging, quality of materials, equipment requirements, and cost to purchase or replace components.

The best choice about weight, size, and number of volumes depends on several factors, such as the organization of the content, how well separate volumes may fit time periods for instruction, and the ages of students. Technical production requirements, such as page limits or different types of bindings, may lead to multiple volumes.

Examples of classroom use include repeated copying of consumable materials and repeated use of other materials by students over time. Students should be able to easily use the materials and take home, in a convenient form, most of the material they need to learn for the course.

Technology-rich resources should work properly without the purchase of additional software and run without error. Electronic media for student use should be encoded to prevent accidental or intentional erasure or modification. As with textbooks, electronic media should allow students to easily access and interact with them without extensive supervision or special assistance.

The physical and technical qualities of materials should match with the resources of the schools. Materials such as videos, software, CDs, Internet sites, and transparencies may serve instructional purposes well but have little value unless they can be implemented with the school’s equipment. Publishers should include training, in-service, and consultation to help in effective use of the materials.

Durability: Students and teachers should be able to have materials that will be durable under conditions of expected use. For example, boxes, books, or other materials should not fall apart after normal classroom use. The packaging and form of materials should be flexible and durable enough for multiple uses over time. Durability includes considerations such as high-quality paper, ink, binding, and cover back, joints, body block and individual pages; worry-free technology that runs properly, with easy to hear, see, and control audio and visuals; and the publisher’s guarantee for replacement conditions and agreements for reproduction needed to effectively use the materials.

Cost: *Florida’s Commissioner of Education will consider the impact of cost in making final decisions.* Cost, while not a direct factor in ease of use, influences the ease with which materials can be obtained or replaced. The impact of cost can be complex to estimate. It requires considering the number of materials available at no additional cost with the purchase of the major program or text, the cost over the adoption period of several years, and the number of free materials to support implementation. Attractive features such as higher quality paper and visuals and greater use of color may escalate cost, without enhancing learning effectiveness.

Learning

The following features have been found to promote learning and apply to most types of learning outcomes.

A. MOTIVATIONAL STRATEGIES
B. TEACHING A FEW "BIG IDEAS"
C. EXPLICIT INSTRUCTION
D. GUIDANCE AND SUPPORT
E. ACTIVE PARTICIPATION
F. TARGETED INSTRUCTIONAL STRATEGIES
G. TARGETED ASSESSMENT STRATEGIES

The following sections describe the learning features expected for each of these priority areas.

A. MOTIVATIONAL STRATEGIES

Instructional materials must include features to maintain learner motivation. See Sections 1006.31(2)(e); 1006.34(2)(b); 1006.38(4), Florida Statutes.

Expectations: Materials should positively influence the expectations of students. Examples include: positive expectations for success; novel tasks or other approaches to stimulate intellectual curiosity; meaningful tasks related to student interests, cultural backgrounds, and developmental levels; activities with relevance to the student's life; thought-provoking challenges such as paradoxes, dilemmas, problems, controversies, and questioning of traditional ways of thinking; challenges that are neither too difficult to achieve nor so easy that students become bored; hands-on tasks in a concrete context, and images, sounds, analogies, metaphors, or humorous anecdotes; and variety, including the opportunity for students to ask their own questions, set their own goals, and make other choices during learning.

Feedback: Materials should include informative and positive feedback on progress. Examples include: frequent checks on progress, including testing; explanatory feedback with information about correctness of responses, how to avoid or correct common mistakes, and/or different approaches to use; and varied forms of assessments (self-assessment, peer assessment, and some learning tasks without formal assessments).

Appearance: Materials should have an appearance generally considered attractive to the intended students.

B. TEACHING A FEW "BIG IDEAS"

Instructional materials should thoroughly teach a few important ideas, concepts, or themes. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

Focus: Thoroughly teaching a few big ideas provides focus for the learner's attention. It provides an organizing framework for integrating new information.

Completeness: The thorough teaching of a few big ideas may focus on developing a deeper and more complete understanding of the major themes of a discipline, the content of the subject area, relationships to other disciplines, and the thinking and learning skills required for achieving the specified learning outcomes.

C. EXPLICIT INSTRUCTION

Instructional materials must contain clear statements of information and outcomes. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

Clarity of directions and explanations: To support success in learning, instructional materials should include clear presentation and explanations of purposes, goals and expected outcomes, concepts, rules, information and terms, models, examples, questions, and feedback.

For example, development of specific thinking skills requires an explicit statement of the particular *thinking skills* to be learned, along with the *strategies* or *steps to follow*. Explicit instruction for thinking skills might also involve showing *examples* of successful thinking contrasted with examples of poor thinking processes.

Similarly, the development of learning skills requires explicit directions about *when* and *how* to do activities such as note taking, outlining, paraphrasing, abstracting and analyzing, summarizing, self-coaching, memory strategies, persistence, preview and questioning, reading and listening, reflecting, and reciting.

Exclusion of ambiguity: Instructional materials should avoid terms and phrases with ambiguous meanings, confusing directions or descriptions, and inadequate explanations.

D. GUIDANCE AND SUPPORT

Instructional materials must include guidance and support to help students safely and successfully become more independent learners and thinkers. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

Level: The type of guidance and support that helps students to become more independent learners and thinkers is sometimes referred to as *scaffolding.* Scaffolding is a solid structure of support that can be removed after a job has been completed. As students gain proficiency, support can diminish, and students can encounter more complex, life-centered problems. Information and activities should provide guidance and support at the level that is needed—no more and no less. Too much support can squelch student interest and too little can lead to failure.

Guidance and support can be accomplished by a combination of the following features: organized routines; advance organizers or models such as condensed outlines or overviews, simplified views of information, visual representations of new information during initial instruction, sample problems, questions to focus on key ideas or important features; examples of solved problems; explanations of how the problems were solved; examples of finished products or sample performances; analogies, metaphors, or associations to compare one idea to another; prompts or hints during initial practice; step-by-step instructions; immediate and corrective feedback on the accuracy of performance of each step or task, on how to learn from mistakes, and on how to reach the correct answer; simulations with features for realistic practice; and opportunities for students to do research; and to organize and communicate results.

Adaptability: Guidance and support must be adaptable to developmental differences and various learning styles. For example, young children tend to understand concepts in concrete terms and over-generalize new concepts. Some students need more time, some tend to be more impulsive than reflective, some have trouble distinguishing relevant from irrelevant information, and some have better written than spoken language skills.

Approaches for developmental differences and learning styles of students include a variety of *activities* such as structured and unstructured activities; independent and group work, teacher-directed and discovery learning, visual and narrative instruction, hands-on activities, open-ended activities, practice without extrinsic rewards or grades; simple, complex, concrete, and abstract examples; variable pacing or visual breaks; and a variety of *modalities* for the various learning styles of students, such as linguistic-verbal, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, and naturalist.

E. ACTIVE PARTICIPATION OF STUDENTS

Instructional materials must engage the physical and mental activity of students during the learning process. See Sections 1006.31(2)(e); 1006.34(2)(b), Florida Statutes.

Assignments: Instructional materials should include organized activities of periodic, frequent, short assignments that are logical extensions of content, goals, and objectives.

Student responses: Assignments should include questions and application activities during learning that give students opportunities to respond. Active participation of students can be accomplished in a variety of ways. For example, information and activities might require students to accomplish types of activities that include: respond orally or in writing; create visual representations (charts, graphs, diagrams, and illustrations); generate products; generate their own questions or examples; think of new situations for applying or extending what they learn; complete discovery activities; add details to big ideas or concepts from prior knowledge; form their own analogies and metaphors; practice lesson-related tasks, procedures, behaviors, or skills; and/or choose from a variety of activities.

F. TARGETED INSTRUCTIONAL STRATEGIES

Instructional materials should include the strategies known to be successful for teaching the learning outcomes targeted in the curriculum requirements. See Sections 1006.31(2)(e); 1006.34(2)(b); 1003.42, Florida Statutes.

Alignment: Research has documented the strategies that effectively teach different types of learning outcomes. The learning strategies included in instructional materials should match the findings of research for the targeted learning outcomes. Different types of learning outcomes require different strategies. For example, a strategy for memorizing verbal information might be helpful, but it would not align with the strategies required for learning a concept or for learning how to solve a problem.

Completeness: Not only should strategies be aligned, they also should be complete enough to effectively teach the targeted outcomes. For example, while the explanation of a problem-solving method or model would be appropriate, other strategies also would be necessary in order for students to learn how to resolve different types of problems.

Research summary: Researchers sometimes use different terms for some similar outcomes. For example, *thinking skills* and *metacognition* refer to some of the same types of skills. The following alphabetical list includes terms as they appeared in research, even though some terms clearly overlap with each other.

- attitudes
- cognitive strategies
- comprehension/ understanding
- concepts
- creativity
- critical thinking
- insight
- metacognition
- motor skills
- multiple intelligences
- problem solving
- procedural knowledge, principles, and rules
- scientific inquiry
- thinking skills
- verbal information, knowledge, or facts

The following section summarizes the research findings for each of these types of learning outcomes.

Effective Teaching Strategies

- **Teach *Attitudes***
  - Explain and show consequences of choices, actions, or behaviors.
  - Provide relevant human or social models that portray the desired choices, actions, or behaviors.
- **Teach *Reading***
  - Monitor and reflect upon the effectiveness of the reading process used.
  - Provide appropriate reading strategies.
  - Link instruction to effective reading.
- **Teach *Cognitive Strategies***
  - Monitor and reflect upon the effectiveness of the reading process used.
  - Encourage and/or teach:
    - Organizing and summarizing information;
    - Self-questioning, self-reflection, and self-evaluation;
    - Reference skills; and
    - When and how to use these different skills.

- **Teach *Comprehension/Understanding***
  - Outline, explain, or visually show what will be read/learned in a simple form.
  - Explain with concrete examples, metaphors, questions, or visual representations.
  - Require students to relate new readings to previously learned information.
  - Require students to paraphrase or summarize new information as it is read.
  - Require students to construct a visual representation of main ideas (map, table, graphs, Venn diagram, etc.).
  - Give students opportunities to add details, explanations, or examples to basic information.
  - Require application of knowledge or information.
- **Teach *Concepts***
  - Provide clear understanding of each concept.
  - Point out important and features or ideas.
  - Point out examples of the concept, showing similarities and differences.
  - Include practice in organizing and classifying concepts.
  - Include a wide range of examples in a progressive presentation from simple to more complex examples.
  - Emphasize relationships between concepts.
- **Teach *Creativity***
  - Provide examples of creativity.
  - Include models, metaphors, and analogies.
  - Encourage novel approaches to situations and problems.
  - Show and provide practice in turning a problem upside down or inside out or by changing perceptions.
  - Encourage brainstorming.
  - Include open-ended questions and problems.
  - Provide opportunities of ungraded, unevaluated creative performance and behavior.
- **Teach *Critical Thinking***
  - Create conflict or perplexity by using paradoxes, dilemmas, or other situations to challenge concepts, beliefs, ideas, and attitudes.
  - Focus on how to recognize and generate proof, logic, argument, and criteria for judgments.
  - Include practice in detecting mistakes, false analogies, relevant vs. irrelevant issues, contradictions, discrepant events, and predictions.
  - Provide practice in drawing inferences from observations and making predictions from limited information.
  - Explain and provide practice in recognizing factors or biases that may influence choice and interpretations such as culture, experience, preferences, desires, interests, and passions, as well as systematic thinking.
  - Require students to explain how they form new conclusions and how and why present conclusions may differ from previous ones.

- **Teach *Inquiry***
  - Emphasize technological design as inquiry and include discovery activities.
  - Provide opportunities for experimental design.
  - Provide opportunities for critical thinking.
  - Facilitate the collection, display, and interpretation of data.
  - Promote careful observation, analysis, description, and definition.
- **Teach *Metacognition***
  - Explain different types of thinking strategies and when to use them.
  - Encourage self-evaluation and reflection.
  - Include questions that challenge students to wonder why they are doing what they are doing.
  - Guide students in how to do systematic inquiry, detect flaws in thinking, and adjust patterns of thinking.
- **Teach *Technology***
  - Provide a mental and physical model of desired performance.
  - Describe steps in the performance.
  - Provide practice with kinesthetic and corrective feedback (coaching).
- **Teach *Multiple Intelligences/Learning Modalities***
  - Visual learning modality focuses on seeing, watching and looking.
  - Auditory learning modality focuses on hearing and responding to verbal information and instructions.
  - Motor/kinesthetic learning modality focuses on active involvement and hands-on activities.
  - Verbal-linguistic dimension focuses on reasoning with language, rhythms, and inflections, such as determining meaning and order of words (stories, readings, humor, rhyme, and song).
  - Logical-mathematical dimension focuses on reasoning with patterns and strings of symbols (pattern blocks, activities to form numbers and letters).
  - Musical dimension focuses on appreciation and production of musical pitch, melody, and tone.
  - Spatial dimension focuses on activities of perceiving and transforming perceptions.
  - Bodily kinesthetic dimension focuses on use and control of body and objects.
  - Interpersonal dimension focuses on sensing needs, thoughts, and feelings of others.
  - Intrapersonal dimension focuses on recognizing and responding to one’s own needs, thoughts, and feelings.
  - Naturalist dimension focuses on appreciation of nature and the environment and on comparing, contrasting, and classifying attributes.
- **Teach *Problem Solving***
  - Assure student readiness by diagnosing and strengthening related concept, rule, and decision-making skills.
  - Provide broad problem-solving methods and models.
  - Include practice in solving different types of problems.
  - Begin with highly structured problems and then gradually move to less structured ones.
  - Use questions to guide thinking about problem components, goals, and issues.

- Provide guidance in observing and gathering information, asking appropriate questions, and generating solutions.
- Include practice in finding trouble, inequities, contradictions, or difficulties and in reframing problems.

- **Teach *Procedural Knowledge, Principles, and Rules***
  - Define context, problems, situations, or goals and appropriate procedures.
  - Explain reasons that procedures work for different types of situations.
  - Define procedures—procedures include rules, principles, and/or steps.
  - Provide vocabulary and concepts related to procedures.
  - Demonstrate step-by-step application of procedures.
  - Explain steps as they are applied.
  - Include practice in applying procedures.
- **Teach *Scientific Inquiry***
  - Explain process and methods of scientific inquiry.
  - Explain and provide examples of (a) hypotheses formation, (b) valid procedures, (c) isolating variables, (d) interpretation of data, and (e) reporting findings.
  - Encourage independent thinking and avoidance of dead ends or simplistic answers.
  - Require students to explain, verify, challenge, and critique the results of their inquiry.
- **Teach *Thinking Skills***
  - Introduce different types of thinking strategies.
  - Explain context or conditions of applying different strategies.
  - Provide definitions, steps, and lists to use in strategies.
  - Include examples of different types of thinking strategies, including how to think with open-mindedness, responsibility, and accuracy.
  - Emphasize persisting when answers are not apparent.
  - Provide practice in applying, transferring, and elaborating on thinking strategies.
  - Integrate metacognitive, critical, and creative-thinking skills.
- **Teach *Verbal Information, Knowledge, or Facts***
  - Provide a meaningful context to link new information and past knowledge.
  - Organize information into coherent groups or themes.
  - Use devices to improve memory such as mnemonic patterns, maps, charts, comparisons, groupings, highlighting of key words or first letters, visual images, and rhymes.
  - Identify main ideas, patterns, or relationships within information or sets of facts.

G. TARGETED ASSESSMENT STRATEGIES

Instructional materials should include assessment strategies that are known to be successful in determining how well students have achieved the targeted learning outcomes. See Sections 1006.31(2)(e); 1006.34(2)(b); 1006.38(4), Florida Statutes.

Alignment: The assessment strategies should match the learner performance requirements for the types of learning outcomes that have been targeted for the subject matter, course, or course category.

Different strategies are appropriate for assessing different types of learning outcomes. For example, a strategy for testing the acquisition of verbal information would not match the requirements for testing whether or not a student has learned a concept or learned how to solve a problem.

The term "assessment," as used in this section, refers to testing or other strategies that assess student progress as a result of learning activities. The results of such assessment provide information about where to strengthen instruction. But it is very important to ask the right questions. If the type of question matches the type of learning outcome, then students and teachers have relevant information about learning progress.

Completeness: In addition to including assessment strategies that align with the performance requirements of the targeted learning outcomes, the strategies should be complete enough to effectively assess the learner's performance with regard to the targeted outcome. For example, a test item that requires the student to state a rule does not assess whether or not the student knows how to *use* the rule.

Research summary: The research summary for effective assessment strategies for different types of learning outcomes follows the same alphabetical sequence as the previous section.

Effective Assessment Strategies

- **Assess *Attitudes*:**
    - Provide various situations.
    - Require choices about behaviors.
- **Assess *Cognitive Strategies*:**
    - Provide learning tasks.
    - Require students to choose good strategies for learning and/or to learn new materials without teacher guidance.
    - Require students to discuss and explain methods used for various learning tasks.
- **Assess *Comprehension/Understanding*:**
    - Provide topic.
    - Require summary or restatement of information.
    - Provide new context.
    - Require application of information.
    - Provide several statements using words different from the initial teaching.
    - Require identification of the correct meaning.
- **Assess *Concepts*:**
    - Provide new examples and non-examples.
    - Require identification or classification into the correct categories.
- **Assess *Creativity:***
    - Provide new problems to "turn upside down," study, or resolve—these could be performances, presentations, or products.
    - Require products or solutions to fit within the particular functions and resources.
    - Provide situations requiring novel approaches.

- **Assess *Critical Thinking*:**
    - Require students to evaluate information or results.
    - Require the use of analysis and research.
- **Assess *Insight:***
    - Provide situations for inquiry and discovery.
    - Provide situations for manipulation.
- **Assess *Metacognition***:
    - Provide different situations or problems.
    - Require students to identify types of thinking strategies to analyze and evaluate their own thinking.
- **Assess *Multiple Intelligences/Learning Modalities***:
    - Provide situations in the multiple intelligence/learning modalities that are targeted, e.g., verbal-linguistic, musical, or other learning modalities.
    - Provide situations in several multiple intelligence/learning modalities, to allow choice.
    - Require performance in the targeted or chosen multiple intelligence/learning modality.
- **Assess *Motor Skills***:
    - Provide situations and resources for performance of the skill.
    - Include checklist for evaluation.
- **Assess *Problem Solving***:
    - Require students to choose types of problem-solving strategies for different situations.
    - Require solutions to structured and unstructured, simple and complex problems.
- **Assess *Procedural Knowledge, Principles, and Rules***:
    - Provide situations that require students to recognize the correct use of procedures, principles, or rules with routine problems.
    - Require students to state procedures, principles, or rules.
    - Require students to choose which procedures, principles, or rules to apply in different situations.
    - Provide situations that require students to demonstrate the correct use of procedures, principles, or rules with routine problems.
- **Assess *Scientific Inquiry***:
    - Provide situations or problems that require speculation, inquiry, and hypothesis formation.
    - Provide research, hands-on activities, and conclusions.
- **Assess *Thinking Skills***:
    - Require students to summarize different types of thinking strategies.
    - Provide situations that require students to choose the best type of thinking strategy to use.
    - Require students to detect instances of open vs. closed-mindedness.
    - Require students to detect instances of responsible vs. irresponsible and accurate vs. inaccurate applications of thinking strategies.
    - Provide situations that require the student's persistence in order to discover or analyze information to obtain answers to specific questions.
    - Require students to apply specific thinking strategies to different real-world situations.

- **Assess *Verbal Information, Knowledge, or Facts:***
    - Require students to recall information.
    - Require students to restate information.
    - Require students to understand information.

In the subject area of MATHEMATICS, it is particularly important to frequently assess the progress of students. Student understanding of mathematical concepts proceed to increasing levels of complexity over time. Thus, students who miss the prerequisite knowledge have great difficulty in making progress in later grades. Early and frequent formative assessment of progress helps teachers in determining what activities or teaching methods may be appropriate for individual students or whole class instruction.

Federal Requirements for the National Instructional Materials Accessibility Standard (NIMAS)

National Instructional Materials Accessibility Standard (NIMAS) guides the production and electronic distribution of digital versions of textbooks and other instructional materials so they can be more easily converted to accessible formats, including Braille and text-to-speech. A National Instructional Materials Access Center (NIMAC) has been established to receive and catalog publishers' electronic files of print instructional materials in the NIMAS format.

These files will be used for the production of alternate formats as permitted under the law for students with print disabilities. Under these guidelines, "textbook" means the principal tool of instruction such as state-adopted instructional materials used in the classroom. It is a printed book or books that contain most, if not all, of the academic content a student needs to learn to meet the State or Local Education Agency's curriculum requirements for that subject area. "Related core materials" are printed materials, other than textbooks, designed for use by students in the classroom in conjunction with a textbook and which, together with the state adopted textbook, are necessary to meet the curriculum requirements for the intended course. The materials should be directly related to the textbook and wherever possible they should be published by the publisher of the textbook. Related core materials do not include materials that are not written and published primarily for use by students in the classroom (e.g., trade books not bundled with the textbook, newspapers, and reference works) or ancillary or supplemental materials that are not necessary to meet the curriculum requirements for the intended course. For purposes of these definitions, the term "curriculum requirements for the intended course" refers to relevant curriculum standards and requirements as established by a state educational agency or local educational agency.

The details of the metadata elements required as part of the NIMAS File set will be found at http://www.nimac.us/docs/Metadata0509.DOC. Please note that some elements are required, while others are optional. Some fields also allow for multiple entries (e.g., subject terms).

Complete information concerning NIMAS and NIMAC can be found at http://nimas.cast.org and http://www.nimac.us. (IDEA-2004).

Questions from publishers concerning electronic files in Florida can be directed to Leanne Grillot at Leanne.Grillot@fldoe.org.

Appendix A

K–8 Publishers' Criteria for the Common Core State Standards for Mathematics

> These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. … It is time to recognize that standards are not just promises to our children, but promises we intend to keep.
>
> –CCSSM, p. 5

The Common Core State Standards were developed through a state-led initiative that drew on the expertise of teachers, researchers and content experts from across the country. The Standards define a staircase to college and career readiness, building on the best of previous state standards and evidence from international comparisons and domestic reports and recommendations. Most states have now adopted the Standards to replace previous expectations in English language arts/literacy and mathematics.

Standards by themselves cannot raise achievement. Standards don't stay up late at night working on lesson plans, or stay after school making sure every student learns—it's teachers who do that. And standards don't implement themselves. Education leaders from the state board to the building principal must make the Standards a reality in schools. Publishers too have a crucial role to play in providing the tools that teachers and students need to meet higher standards. This document, developed by the CCSSM writing team, aims to support faithful CCSSM implementation by providing criteria for materials aligned to the Common Core State Standards for Mathematics.

How should alignment be judged? Traditionally, judging alignment has been approached as a crosswalking exercise. But crosswalking can result in large percentages of "aligned content" while obscuring the fact that the materials in question align not at all to the letter or the spirit of the standards being implemented. These criteria are an attempt to sharpen the alignment question and make alignment and misalignment more clearly visible.

These criteria were developed from the perspective that publishers and purchasers are equally responsible for a healthy materials market. Publishers cannot deliver focus to buyers who only ever complain about what has been left out, yet never complain about what has crept in. More generally, publishers cannot invest in quality if the market doesn't demand it of them nor reward them for producing it.

The document is structured as follows:

I. Focus, Coherence, and Rigor in the Common Core State Standards for Mathematics
II. Criteria for Materials and Tools Aligned to the Standards
III. Appendix: "The Structure is the Standards"

I. Focus, Coherence, and Rigor in the Common Core State Standards for Mathematics

> Less topic coverage can be associated with higher scores on those topics covered because students have more time to master the content that is taught.
>
> –Ginsburg et al., 2005, *Reassessing U.S. International Mathematics Performance: New Findings from the 2003 TIMSS and PISA*

> This finding that postsecondary instructors target fewer skills as being of high importance is consistent with recent policy statements and findings raising concerns that some states require too many standards to be taught and measured, rather than focusing on the most important state standards for students to attain. …
>
> Because the postsecondary survey results indicate that a more rigorous treatment of fundamental content knowledge and skills needed for credit-bearing college courses would better prepare students for postsecondary school and work, states would likely benefit from examining their state standards and, where necessary, reducing them to focus only on the knowledge and skills that research shows are essential to college and career readiness and postsecondary success. …
>
> —*ACT National Curriculum Survey 2009*

> Because the mathematics concepts in [U.S.] textbooks are often weak, the presentation becomes more mechanical than is ideal. We looked at both traditional and non-traditional textbooks used in the U.S. and found conceptual weakness in both.
>
> —Ginsburg et al., 2005, cited in CCSSM, p. 3

> …[B]ecause conventional textbook coverage is so fractured, unfocused, superficial, and unprioritized, there is no guarantee that most students will come out knowing the essential concepts of algebra.
>
> —Wiggins, 2012[1]

For years national reports have called for greater focus in U.S. mathematics education. TIMSS and other international studies have concluded that mathematics education in the United States is a mile wide and an inch deep. In high-performing countries, strong foundations are laid and then further knowledge is built on them; the design principle in those countries is focus with coherent progressions. The U.S. has lacked such discipline.

There is evidence that state standards have become somewhat more focused over the past decade. But in the absence of standards shared across states, instructional materials have not followed suit. Moreover, prior to the Common Core, state standards were making little progress in terms of coherence: states were not fueling achievement by organizing math so that the subject makes sense.

With the advent of the Common Core, a decade's worth of recommendations for greater focus and coherence finally have a chance to bear fruit. Focus and coherence are the two major evidence-based design principles of the Common Core State Standards for Mathematics. These principles are meant to fuel greater achievement in a rigorous curriculum, in which

[1] From http://grantwiggins.wordpress.com/2012/02/01/a-postscript-to-my-comment-about-kids-having-trouble-with-the-distributive-property.

students acquire conceptual understanding, procedural skill and fluency, and the ability to apply mathematics to solve problems. Thus, the implications of the standards for mathematics education could be summarized briefly as follows:

Focus: focus strongly where the standards focus

Coherence: think across grades, and link to major topics in each grade

Rigor: in major topics, pursue with equal intensity

- conceptual understanding,
- procedural skill and fluency, and
- applications

Focus

Focus requires that we significantly narrow the scope of content in each grade so that students more deeply experience that which remains.

We have come to see "narrowing" as a bad word—and it is a bad word, if it means cutting arts programs and language programs. But math has swelled in this country. The Standards are telling us that math actually needs to lose a few pounds.

The overwhelming focus of the Standards in early grades is arithmetic along with the components of measurement that support it. That includes the concepts underlying arithmetic, the skills of arithmetic computation, and the ability to apply arithmetic to solve problems and put arithmetic to engaging uses. Arithmetic in the K–5 standards is an important life skill, as well as a thinking subject and a rehearsal for algebra in the middle grades.

Focus remains important through the middle and high school grades in order to prepare students for college and careers; surveys suggest that postsecondary instructors value greater mastery of prerequisites over shallow exposure to a wide array of topics with dubious relevance to postsecondary work.

During the writing of the Standards, the writing team often received feedback along these lines: "I love the focus of these standards! Now, if we could just add one or two more things…." But focus compromised is no longer focus at all. Faithfully implementing the Standards requires moving some topics traditionally taught in earlier grades up to higher grades entirely, sometimes to much higher grades. "Teaching less, learning more" can seem like hard medicine for an educational system addicted to coverage. But remember that the goal of focus is to make good on the ambitious promise the states have made to their students by adopting the Standards: greater achievement at the college- and career-ready level, greater depth of understanding of mathematics, and a rich classroom environment in which reasoning, sense-making, applications, and a range of mathematical practices all thrive. None of this is realistic in a mile-wide, inch-deep world.

Both of the assessment consortia have made the focus, coherence, and rigor of the Standards central to their assessment designs.[2] Choosing materials that also embody the Standards will be essential for giving teachers and students the tools they need to build a strong mathematical foundation and succeed on the coming aligned exams.

Coherence

Coherence is about making math make sense. Mathematics is not a list of disconnected tricks or mnemonics. It is an elegant subject in which powerful knowledge results from reasoning with a small number of principles such as place value and properties of operations.[3] The standards define progressions of learning that leverage these principles as they build knowledge over the grades.[4]

When people talk about coherence, they often talk about making connections between topics. The most important connections are vertical: the links from one grade to the next that allow students to progress in their mathematical education. That is why it is critical to think across grades and examine the progressions in the standards to see how major content develops over time.

Connections at a single grade level can be used to improve focus, by tightly linking secondary topics to the major work of the grade. For example, in grade 3, bar graphs are not "just another topic to cover." Rather, the standard about bar graphs asks students to use information presented in bar graphs to solve word problems using the four operations of arithmetic. Instead of allowing bar graphs to detract from the focus on arithmetic, the standards are showing how bar graphs can be positioned in support of the major work of the grade. In this way coherence can support focus.

Materials cannot match the contours of the Standards by approaching each individual content standard as a separate event. Nor can materials align to the Standards by approaching each individual grade as a separate event. From the Appendix: "The standards were not so much assembled out of topics as woven out of progressions. Maintaining these progressions in the implementation of the standards will be important for helping all students learn mathematics at a higher level. … For example, the properties of operations, learned first for simple whole numbers, then in later grades extended to fractions, play a central role in understanding operations with negative numbers, expressions with letters and later still the study of polynomials. As the application of the properties is extended over the grades, an understanding of how the properties of operations work together should deepen and develop into one of the most fundamental insights into algebra. The natural distribution of prior knowledge in classrooms should not prompt abandoning instruction in grade level content, but should prompt explicit attention to connecting grade level content to content from prior learning. To do this, instruction should reflect the progressions on which the CCSSM are built."

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[2] See the Smarter/Balanced content specification and item development specifications, and the PARCC Model Content Framework and item development ITN. Complete information about the consortia can be found at www.smarterbalanced.org and www.parcconline.org.

[3] For some remarks by Phil Daro on this theme, see the excerpt at http://vimeo.com/achievethecore/darofocus, and/or the full video available at http://commoncoretools.me/2012/05/21/phil-daro-on-learning-mathematics-through-problem-solving/.

[4] For more information on progressions in the Standards, see http://ime.math.arizona.edu/progressions.

Rigor

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).

To date, curricula have not always been balanced in their approach to these three aspects of rigor. Some curricula stress fluency in computation, without acknowledging the role of conceptual understanding in attaining fluency. Some stress conceptual understanding, without acknowledging that fluency requires separate classroom work of a different nature. Some stress pure mathematics, without acknowledging first of all that applications can be highly motivating for students, and moreover, that a mathematical education should make students fit for more than just their next mathematics course. At another extreme, some curricula focus on applications, without acknowledging that math doesn't teach itself.

The Standards do not take sides in these ways, but rather they set high expectations for all three components of rigor in the major work of each grade. Of course, that makes it necessary that we first follow through on the focus in the Standards—otherwise we are asking teachers and students to do more with less.

II. Criteria for Materials and Tools Aligned to the Standards

> The single most important flaw in United States mathematics instruction is that the curriculum is "a mile wide and an inch deep." This finding comes from research comparing the U.S. curriculum to high performing countries, surveys of college faculty and teachers, the National Math Panel, the Early Childhood Learning Report, and all the testimony the CCSS writers heard. The standards are meant to be a blueprint for math instruction that is more focused and coherent. … Crosswalks and alignments and pacing plans and such cannot be allowed to throw away the focus and coherence and regress to the mile-wide curriculum.
>
> —Daro, McCallum, and Zimba, 2012 (from the Appendix)

Using the criteria

One approach to developing a document such as this one would have been to develop a separate criterion for each mathematical topic approached in deeper ways in the Standards, a separate criterion for each of the Standards for Mathematical Practice, etc. It is indeed necessary for textbooks to align to the Standards in detailed ways. However, enumerating those details here would have led to a very large number of criteria. Instead, the criteria use the Standards' focus, coherence, and rigor as the main themes. In addition, this document includes a section on indicators of quality in materials and tools, as well as a criterion for the mathematics and statistics in instructional resources for science and technical subjects. Note that the criteria apply to materials and tools, not to teachers or teaching.

The criteria can be used in several ways:

- *Informing purchases and adoptions*. Schools or districts evaluating materials and tools for purchase can use the criteria to test claims of alignment. States reviewing materials and tools for adoption can incorporate these criteria into their rubrics. Publishers currently modifying their programs, or designing new materials and tools, can use the criteria to shape these projects.
- *Working with previously purchased materials*. Most existing materials and tools likely fail to meet one or more of these criteria, even in cases where alignment to the Standards is claimed. But the pattern of failure is likely to be informative. States and districts need not wait for “the perfect book” to arrive, but can use the criteria now to carry out a thoughtful plan to modify or combine existing resources in such a way that students’ actual learning experiences approach the focus, coherence, and rigor of the Standards. Publishers can develop innovative materials and tools specifically aimed at addressing identified weaknesses of widespread textbooks or programs.
- *Reviewing teacher-developed materials and guiding their development*. Publishers aren’t the only source of instructional materials; teachers also create materials and tools, ranging in length from an individual problem set or lesson up to an entire unit or longer. States, districts, schools, and teachers themselves can use the criteria to assess the alignment of teacher-developed materials to the Standards and guide the development of new materials aligned to the Standards.
- *Professional development.* The criteria can be used to support activities that help communicate the shifts in the Standards. For example, teachers can analyze existing materials to reveal how they treat the major work of the grade, or assess how well materials attend to the three aspects of rigor, or determine which problems are key to developing the ideas and skills of the grade.

In all these cases, it is recommended that the criteria for focus be attended to first. By attending first to focus, coherence and rigor may realistically develop. Failing to meet any single focus criterion is enough to show that the materials in question are not aligned to the Standards.

For the sake of brevity, the criteria sometimes refer to parts of the Standards using abbreviations such as 3.MD.7 (an individual content standard), MP.8 (a practice standard), 8.EE.B (a cluster heading), or 4.NBT (a domain heading). Readers of the document should have a copy of the Standards available in order to refer to the indicated text in each case.

These criteria were developed for materials and tools in grades K–8. Some of the criteria may also apply to materials developed for high school courses. Note that an update to this document is planned for early 2013 (it is anticipated that this update will also include high school).

The Standards do not dictate the acceptable forms of instructional resources—to the contrary, they are a historic opportunity to raise student achievement through innovation. Materials and tools of very different forms can meet the criteria that follow, including workbooks, multi-year programs, and targeted interventions. For example, materials and tools that treat a single important topic or domain might be valuable to consider.

This also includes digital or online materials and tools. Digital materials offer substantial promise for conveying mathematics in new and vivid ways and customizing learning. In a digital or online format, diving deeper and reaching back and forth across the grades is easy and often useful. Focus and coherence can be greatly enhanced through dynamic navigation—though, if such capabilities are used poorly, focus and coherence could also be greatly diminished.

As noted in the Standards (p. 4), "All students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-school lives. The Standards should be read as allowing for the widest possible range of students to participate fully from the outset, along with appropriate accommodations to ensure maximum participation of students with special education needs." Thus, **an over-arching criterion** for materials and tools is that they provide supports for special populations such as students with disabilities, English language learners,[5] and gifted students.

Criteria for Materials and Tools Aligned to the Standards

1. **Focus on Major Work: In any single grade, students and teachers using the materials as designed spend the large majority of their time, approximately three-quarters, on the major work of each grade**. In order to preserve the focus and coherence of the Standards, both assessment consortia have designated clusters as major, additional, or supporting,[6] with clusters designated as major comprising the major work of each grade. Materials are highly unlikely to be aligned to the Standards' focus unless students and teachers using them as designed spend the large majority of their time, approximately three-quarters,[7] on the major work of each grade. In addition, major work should especially predominate in the first half of the year (e.g., in grade 3 this is necessary so that students have sufficient time to build understanding and fluency with multiplication).

   Digital or online materials that allow navigation or have no fixed pacing plan are explicitly designed to ensure that students' time on task meets this criterion.

   Note that an important **subset** of the major work in grades K–8 is the progression that leads toward middle-school algebra (see Table 1, next page). Materials give especially careful treatment to these clusters and their interconnections.

[5] Slides from a brief and informal presentation by Phil Daro about mathematical language and English language learners can be found at http://db.tt/VARV3ebl.

[6] For cluster-level emphases at grades K–2, see http://www.achievethecore.org/downloads/Math%20Shifts%20and%20Major%20Work%20of%20Grade.pdf.

[7] Given the particular clusters that are designated major in grade 7, the criterion for that grade is approximately two-thirds, rather than approximately three-fourths.

Table 1. Progress to Algebra in Grades K-8

K	1	2	3	4	5	6	7	8
Know the number names and the count sequence	Represent and solve problems involving addition and subtraction	Represent and solve problems involving addition and subtraction	Represent & solve problems involving multiplication and division	Use the four operations with whole numbers to solve problems	Understand the place value system	Apply and extend previous understandings of multiplication and division to divide fractions by fractions	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers	Work with radical and integer exponents
Count to tell the number of objects	Understanding and apply properties of operations and the relationship between addition and subtraction	Add and subtract within 20	Understand properties of multiplication and the relationship between multiplication and division	Generalize place value understanding for multi-digit whole numbers	Perform operations with multi-digit whole numbers and decimals to hundredths	Apply and extend previous understandings of numbers to the system of rational numbers	Analyze proportional relationships and use them to solve real-world and mathematical problems	Understand the connections between proportional relationships, lines, and linear equations
Compare numbers	Add and subtract within 20	Understand place value	Multiply & divide within 100	Use place value understanding and properties of operations to perform multi-digit arithmetic	Use equivalent fractions as a strategy to add and subtract fractions	Understand ratio concepts and use ratio reasoning to solve problems	Use properties of operations to generate equivalent expressions	Analyze and solve linear equations and pairs of simultaneous linear equations
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from	Work with addition and subtraction equations	Use place value understanding and properties of operations to add and subtract	Solve problems involving the four operations, and identify & explain patterns in arithmetic	Extend understanding of fraction equivalence and ordering	Apply and extend previous understandings of multiplication and division to multiply and divide fractions	Apply and extend previous understandings of arithmetic to algebraic expressions	Solve real-life and mathematical problems using numerical and algebraic expressions and equations	Define, evaluate, and compare functions
Work with numbers 11-19 to gain foundations for place value	Extend the counting sequence	Measure and estimate lengths in standard units	Develop understanding of fractions as numbers	Build fractions from unit fractions by applying and extending previous understandings of operations	Geometric measurement: understand concepts of volume and relate volume to multiplication and addition	Reason about and solve one-variable equations and inequalities		Use functions to model relationships between quantities*
	Understand place value	Relate addition and subtraction to length	Solve problems involving measurement and estimation of intervals of time, liquid volumes, & masses of objects	Understand decimal notation for fractions, and compare decimal fractions	Graph points in the coordinate plane to solve real-world and mathematical problems*	Represent and analyze quantitative relationships between dependent and independent variables		
	Use place value understanding and properties of operations to add and subtract		Geometric measurement: understand concepts of area and relate area to multiplication and to addition					
	Measure lengths indirectly and by iterating length units							

*indicates a cluster that is well thought of as part of a student's progress to algebra, but that is currently not designated as Major by one or both of the assessment consortia in their draft materials. Apart from the two asterisked exceptions, the clusters listed here are a subset of those designated as Major in both of the assessment consortia's draft documents.

2. **Focus in Early Grades: Materials do not assess any of the following topics before the grade level indicated.**

Table 2

Topic	Grade Introduced in the Standards
Probability, including chance, likely outcomes, probability models.	**7**
Statistical distributions, including center, variation, clumping, outliers, mean, median, mode, range, quartiles; and **statistical association or trends**, including two-way tables, bivariate measurement data, scatter plots, trend line, line of best fit, correlation.	**6**
Similarity, congruence, or geometric transformations.	**8**
Symmetry of shapes, including line/reflection symmetry, rotational symmetry.	**4**

Additionally, materials do not assess pattern problems in K–5 that do not support the focus on arithmetic, such as "find the next one" problems.

As Table 2 indicates, the Standards as a whole do include these topics—they are not being left out. However, in the coherent progression of the Standards, these topics first appear at later grades in order to establish focus. Thus, in aligned materials there are no chapter tests, unit tests, or other assessment components that make students or teachers responsible for any of the above topics before the grade in which they are introduced in the Standards. (One way to meet this criterion is for materials to omit these topics entirely prior to the indicated grades.)

3. **Focus and Coherence through Supporting Work: Supporting content does not detract from focus, but rather 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.[8] (This criterion does not apply in the case of targeted supplemental materials or other tools that do not include supporting content.)

4. **Rigor and Balance: Materials and tools reflect the balances in the Standards and help students meet the Standards' rigorous expectations, by (all of the following, in the case of comprehensive materials; at least one of the following for supplemental or targeted resources):**

   a. **Developing students' <u>conceptual understanding</u> of key mathematical concepts, where called for in specific content standards or cluster headings.** Materials amply feature

[8] For more information about this example, see Table 1 in the *Progression* for K-3 Categorical Data and 2-5 Measurement Data, http://commoncoretools.files.wordpress.com/2011/06/ccss_progression_md_k5_2011_06_20.pdf. More generally, the *PARCC Model Content Frameworks* give examples in each grade of how to improve focus and coherence by linking supporting topics to the major work.

high-quality conceptual problems and questions that can serve as fertile conversation-starters in a classroom if students are unable to answer them. This includes brief conceptual problems with low computational difficulty (e.g., ‘Find a number greater than 1/5 and less than 1/4’); brief conceptual questions (e.g., ‘If the divisor does not change and the dividend increases, what happens to the quotient?’); and problems that involve identifying correspondences across different mathematical representations of quantitative relationships.[9] In the materials, conceptual understanding is not a generalized imperative applied with a broad brush, but is attended to most thoroughly in those places in the content standards where explicit expectations are set for understanding or interpreting. Such problems and activities include fine-grained mathematical concepts, such as place value, the whole-number product $a \times b$, the fraction $^a/_b$, the fraction product $(^a/_b) \times q$, expressions as records of calculations, solving equations as a process of answering a question, etc. (Conceptual understanding of key mathematical concepts is thus distinct from applications or fluency work, and these three aspects of rigor must be balanced as indicated in the Standards.)

b. **Giving attention throughout the year to individual standards that set an expectation of <u>fluency</u>**. 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.2 and 3.OA.7). Progress toward these goals is interwoven with students’ developing conceptual understanding of the operations in question.[10] 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.[11] 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

[9] Note that for ELL students, multiple representations also serve as multiple access paths.

[10] For more about how students develop fluency in tandem with understanding, see the *Progressions* for Operations and Algebraic Thinking, http://commoncoretools.files.wordpress.com/2011/05/ccss_progression_cc_oa_k5_2011_05_302.pdf and for Number and Operations in Base Ten, http://commoncoretools.files.wordpress.com/2011/04/ccss_progression_nbt_2011_04_073.pdf.

[11] Non-mathematical approaches (such as the “butterfly method” of adding fractions) compromise focus and coherence and displace mathematics in the curriculum (cf. 5.NF.1). For additional background on this point, see the remarks by Phil Daro excerpted at http://vimeo.com/achievethecore/darofocus and/or the full video, available at http://commoncoretools.me/2012/05/21/phil-daro-on-learning-mathematics-through-problem-solving/.

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).

c. **Allowing teachers and students using the materials as designed to spend sufficient time working with engaging <u>applications</u>, without losing focus on the major work of each grade.** Materials in grades K–8 include an ample number of single-step and multi-step contextual problems that develop the mathematics of the grade, afford opportunities for practice, and engage students in problem solving. Materials for grades 6–8 also include problems in which students must make their own assumptions or simplifications in order to model a situation mathematically. Applications take the form of problems to be worked on individually as well as classroom activities centered on application scenarios. Materials attend thoroughly to those places in the content standards where expectations for multi-step and real-world problems are explicit. Applications in the materials draw only on content knowledge and skills specified in the content standards, with particular stress on applying major work, and a preference for the more fundamental techniques from additional and supporting work. Modeling builds slowly across K–8, and applications are relatively simple in earlier grades. Problems and activities are grade-level appropriate, with a sensible tradeoff between the sophistication of the problem and the difficulty or newness of the content knowledge the student is expected to bring to bear.[12]

Additional aspects of the Rigor and Balance Criterion:
(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.)

(3) Digital and online materials with no fixed lesson flow or pacing plan are not designed for superficial browsing but rather instantiate the Rigor and Balance criterion and promote depth and mastery.

5. **Consistent Progressions: Materials are consistent with the progressions in the Standards, by (all of the following):**

a. **Basing content progressions on the grade-by-grade progressions in the Standards.** Progressions in materials match closely with those in the Standards. This does not require the table of contents in a book to be a replica of the content standards; but the match between the Standards and what students are to learn should be close in each grade. Discrepancies are clearly aimed at helping students meet the Standards as

[12] Cf. CCSSM, p. 84. Also note that modeling is a mathematical practice in every grade, but in high school it is also a content category (CCSSM, pp. 72, 73); therefore, modeling is generally enhanced in high school materials, with more elements of the modeling cycle (CCSSM, p. 72).

written, rather than effectively rewriting the standards. Comprehensive materials do not introduce gaps in learning by omitting content that is specified in the Standards.

The basic model for grade-to-grade progression involves students making tangible progress during each given grade, as opposed to substantially reviewing then marginally extending from previous grades. Grade-level work begins during the first two to four weeks of instruction, rather than being deferred until later as previous years' content is reviewed. Remediation may be necessary, particularly during transition years, and resources for remediation may be provided, but review is clearly identified as such to the teacher, and teachers and students can see what their specific responsibility is for the current year.

Digital and online materials that allow students and/or teachers to navigate content across grade levels promote the Standards' coherence by tracking the structure and progressions in the Standards. For example, such materials might link problems and concepts so that teachers and students can browse a progression.

b. **Giving all students extensive work with grade-level problems.** Differentiation is sometimes necessary, but materials often manage unfinished learning from earlier grades inside grade-level work, rather than setting aside grade-level work to reteach earlier content. Unfinished learning from earlier grades is normal and prevalent; it should not be ignored nor used as an excuse for cancelling grade level work and retreating to below-grade work. (For example, the development of fluency with division using the standard algorithm in grade 6 is the occasion to surface and deal with unfinished learning about place value; this is more productive than setting aside division and backing up.) Likewise, students who are "ready for more" can be provided with problems that take grade-level work in deeper directions, not just exposed to later grades' topics.

c. **Relating grade level concepts explicitly to prior knowledge from earlier grades.** The materials are designed so that prior knowledge becomes reorganized and extended to accommodate the new knowledge. Grade-level problems in the materials often involve application of knowledge learned in earlier grades. Although students may well have learned this earlier content, they have not learned how it extends to new mathematical situations and applications. They learn basic ideas of place value, for example, and then extend them across the decimal point to tenths and beyond. They learn properties of operations with whole numbers, and then extend them to fractions, variables, and expressions. The materials make these extensions of prior knowledge explicit. Note that cluster headings in the Standards sometimes signal key moments where reorganizing and extending previous knowledge is important in order to accommodate new knowledge (e.g., see the cluster headings that use the phrase "Apply and extend previous understanding").

6. **Coherent Connections: Materials foster coherence through connections at a single grade, where appropriate and where required by the Standards, by (all of the following):**

a. **Including learning objectives that are visibly shaped by CCSSM cluster headings, with meaningful consequences for the associated problems and activities.** While some clusters are simply the sum of their individual standards (e.g., 8.EE.C), many are not (e.g., 8.EE.B). In the latter cases, cluster headings function like topic sentences in a paragraph in that they state the point of, and lend additional meaning to, the individual content standards that follow. Cluster headings can also signal multi-grade progressions, by using phrases such as “Apply and extend previous understandings of [X] to do [Y].” Hence an important criterion for coherence is that some or many of the learning objectives in the materials are visibly shaped by CCSSM cluster headings, with meaningful consequences for the associated problems and activities. Materials do not simply treat the Standards as a sum of individual content standards and individual practice standards.

b. **Including problems and activities that serve to connect two or more clusters in a domain, or two or more domains in a grade, in cases where these connections are natural and important**. If instruction only operates at the individual standard level, or even at the individual cluster level, then some important connections will be missed. For example, robust work in 4.NBT should sometimes or often synthesize across the clusters listed in that domain; robust work in grade 4 should sometimes or often involve students applying their developing computation NBT skills in the context of solving word problems detailed in OA. Materials do not invent connections not explicit in the standards without first attending thoroughly to the connections that are required explicitly in the Standards (e.g., 3.MD.7 connects area to multiplication, to addition, and to properties of operations; A-REI.11 connects functions to equations in a graphical context.) Not everything in the standards is naturally well connected or needs to be connected (e.g., Order of Operations has essentially nothing to do with the properties of operations, and connecting these two things in a lesson or unit title is actively misleading). Instead, connections in materials are mathematically natural and important (e.g., base-ten computation in the context of word problems with the four operations), reflecting plausible direct implications of what is written in the Standards without creating additional requirements.

7. **Practice-Content Connections: Materials meaningfully connect content standards and practice standards.** “Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.” (CCSSM, p. 8.) Over the course of any given year of instruction, each mathematical practice standard is meaningfully present in the form of activities or problems that stimulate students to develop the habits of mind described in the practice standards. These practices are well-grounded in the content standards. Materials are accompanied by an analysis, aimed at evaluators, of how the authors have approached each practice standard in relation to content within each applicable grade or grade band. Materials do not treat the practice standards as static across grades or grade bands, but instead tailor the connections to the content of the grade and to grade-level-appropriate student thinking. Materials also include teacher-directed materials that explain the role of the practice standards in the classroom and in students’ mathematical development.

8. **Focus and Coherence via Practice Standards: Materials promote focus and coherence by connecting practice standards with content that is emphasized in the Standards**. Content and practice standards are not connected mechanistically or randomly, but instead support focus and coherence. Examples: Materials connect looking for and making use of structure (MP.7) with structural themes emphasized in the Standards such as properties of operations, place value decompositions of numbers, numerators and denominators of fractions, numerical and algebraic expressions, etc; materials connect looking for and expressing regularity in repeated reasoning (MP.8) with major topics by using regularity in repetitive reasoning as a *tool* with which to explore major topics. (In K–5, materials might use regularity in repetitive reasoning to shed light on, e.g., the 10×10 addition table, the 10×10 multiplication table, the properties of operations, the relationship between addition and subtraction or multiplication and division, and the place value system; in 6–8, materials might use regularity in repetitive reasoning to shed light on proportional relationships and linear functions; in high school, materials might use regularity in repetitive reasoning to shed light on formal algebra as well as functions, particularly recursive definitions of functions.)

9. **Careful Attention to Each Practice Standard: Materials attend to the full meaning of each practice standard.** For example, MP.1 does not say, "Solve problems." Or "Make sense of problems." Or "Make sense of problems and solve them." It says "Make sense of problems and persevere in solving them." Thus, students using the materials as designed build their perseverance in grade-level-appropriate ways by occasionally solving problems that require them to persevere to a solution beyond the point when they would like to give up. MP.5 does not say, "Use tools." Or "Use appropriate tools." It says "Use appropriate tools strategically." Thus, materials include problems that reward students' strategic decisions about how to use tools, or about whether to use them at all. MP.8 does not say, "Extend patterns." Or "Engage in repetitive reasoning." It says "Look for and express regularity in repeated reasoning." Thus, it is not enough for students to extend patterns or perform repeated calculations. Those repeated calculations must lead to an insight (e.g., "When I add a multiple of 3 to another multiple of 3, then I get a multiple of 3."). The analysis for evaluators explains how the full meaning of each practice standard has been attended to in the materials.

10. **Emphasis on Mathematical Reasoning: Materials support the Standards' emphasis on mathematical reasoning, by (all of the following):**

    a. **Prompting students to construct viable arguments and critique the arguments of others concerning key grade-level mathematics that is detailed in the content standards (cf. MP.3).** Materials provide sufficient opportunities for students to reason mathematically in independent thinking and express reasoning through classroom discussion and written work. Reasoning is not confined to optional or avoidable sections of the materials but is inevitable when using the materials as designed. Materials do not approach reasoning as a generalized imperative, but instead create opportunities for students to reason *about* key mathematics detailed in the content standards for the grade. Materials thus attend first and most thoroughly to those places in the content standards setting explicit expectations for explaining, justifying, showing, or proving. Students are asked to critique given arguments, e.g., by explaining under what conditions, if any, a mathematical statement is valid. Materials develop students' capacity for mathematical reasoning in a grade-level appropriate way, with a reasonable progression of sophistication from early grades up through high school.[13] Teachers and students using the materials as designed spend from a quarter to a half of their classroom time communicating reasoning (by constructing viable arguments and explanations and critiquing those of others' concerning key grade-level mathematics)—recognizing that learning mathematics also involves time spent working on applications and practicing procedures. Materials provide examples of student explanations and arguments (e.g., fictitious student characters might be portrayed).

b. **Engaging students in problem solving as a form of argument**. Materials attend thoroughly to those places in the content standards that explicitly set expectations for multi-step problems; multi-step problems are not scarce in the materials. Some or many of these problems require students to devise a strategy autonomously. Sometimes the goal is the final answer alone (cf. MP.1); sometimes the goal is to show work and lay out the solution as a sequence of well justified steps. In the latter case, the solution to a problem takes the form of a cogent argument that can be verified and critiqued, instead of a jumble of disconnected steps with a scribbled answer indicated by drawing a circle around it (cf. MP.6). Problems and activities of this nature are grade-level appropriate, with a reasonable progression of sophistication from early grades up through high school.

c. **Explicitly attending to the specialized language of mathematics.** Mathematical reasoning involves specialized language. Therefore, materials and tools address the development of mathematical and academic language associated with the standards. The language of argument, problem solving and mathematical explanations are taught rather than assumed. Correspondences between language and multiple mathematical representations including diagrams, tables, graphs, and symbolic expressions are identified in material designed for language development. Note that variety in formats and types of representations—graphs, drawings, images, and tables in addition to text—can relieve some of the language demands that English language learners face when they have to show understanding in math.

   The text is considerate of English language learners, helping them to access challenging mathematics and helping them to develop grade level language. For example, materials might include annotations to help with comprehension of words, sentences and paragraphs, and give examples of the use of words in other situations. Modifications to language do not sacrifice the mathematics, nor do they put off necessary language development.

[13] As students progress through the grades, their production and comprehension of mathematical arguments evolves from informal and concrete toward more formal and abstract. In early grades students employ imprecise expressions which with practice over time become more precise and viable arguments in later grades. Indeed, the use of imprecise language is part of the process in learning how to make more precise arguments in mathematics. Ultimately, conversation about arguments helps students transform assumptions into explicit and precise claims.

A criterion for the mathematics and statistics in materials for science and technical subjects

Lack of alignment between mathematics and science or technical subjects could have the effect of compromising the focus and coherence of the mathematics Standards. Instead of reinforcing concepts and skills already carefully introduced in math class, teachers of science and technical subjects would have to teach this material in stopgap fashion. That wouldn't serve students well in any grade, and elementary teachers in particular would preside over a chaotic learning environment.

[S] **Consistency with CCSSM: Materials for science and technical subjects are consistent with CCSSM.** Materials for these subjects in K–8 do not subtract from the focus and coherence of the Standards by outpacing CCSSM math or data progressions in grades K–8 or misaligning to them. In grades 6–8 and high school, materials for these subjects also build coherence across the curriculum and support college and career readiness by integrating key mathematics into the disciplines, particularly simple algebra in the physical sciences and technical subjects, and basic statistics in the life sciences and technical subjects (see Table 3).

Table 3

Algebraic competencies integrated into materials for middle school and high school science and technical subjects	**Statistical competencies integrated into materials for middle school and high school science and technical subjects**
• Working with positive and negative numbers (including fractions) to solve problems • Using variables and writing and solving equations to solve problems • Recognizing and using proportional relationships to solve problems • Graphing proportional relationships and linear functions to solve problems	• Working with distributions and measures of center and variability • Working with simple probability and random sampling • Working with bivariate categorical data (e.g., two-way tables) • Working with bivariate measurement data (e.g., scatter plots) and linear models

Indicators of quality in instructional materials and tools for mathematics

The preceding criteria express important dimensions of alignment to the Standards. The following are some additional dimensions of quality that materials and tools should exhibit in order to give teachers and students the tools they need to meet the Standards:

- Problems in the materials are worth doing:
  - The underlying design of the materials distinguishes between *problems* and *exercises*. Whatever specific terms are used for these two types, in essence the difference is that in solving problems, students learn new mathematics, whereas in working exercises, students apply what they have already learned to build mastery. Problems are problems because students haven't yet learned how to solve them; students are learning from solving them. Materials use problems to teach mathematics. Lessons have a few well designed problems that progressively build and extend understanding. Practice exercises that build fluency are easy to recognize for their purpose. Other exercises require longer chains of reasoning.
  - Each problem or exercise has a purpose—whether to teach new knowledge, bring misconceptions to the surface, build skill or fluency, engage the student in one or several mathematical practices, or simply present the student with a fun puzzle.
  - Assignments aren't haphazardly designed. Exercises are given to students in intentional sequences—for example, a sequence leading from prior knowledge to new knowledge, or a sequence leading from concrete to abstract, or a sequence that leads students through a number of important cases, or a sequence that elicits new understanding by inviting students to see regularity in repeated reasoning. Lessons with too many problems make problems a commodity; they forbid concentration, and they make focus and coherence unlikely.
  - The language in which problems are posed is carefully considered. Note that mathematical problems posed using only ordinary language are a special genre of text that has conventions and structures needing to be learned. The language used to pose mathematical problems should evolve with the grade level and across mathematics content.

- There is variety in what students produce: Students are assigned to produce answers and solutions, but also arguments and explanations, diagrams, mathematical models, etc.

- There is variety in the pacing and grain size of content coverage.
  - Materials that devote roughly equal time to each content standard do not allow teachers and students to focus where necessary.
  - The Standards are not written at uniform grain size. Sometimes an individual content standard will require days of work, while other standards will be sufficiently addressed when grouped with other standards. For example, it isn't plausible that students will understand concepts of place value (e.g., 2.NBT.1) without substantial explicit instruction, problem solving, and exercises devoted to this particular point.

- There are separate teacher materials that support and reward teacher study, including:
  - Discussion of student ways of thinking with respect to important mathematical problems and concepts—especially anticipating the variety of student responses.
  - Guidance on interaction with students, mostly questions to prompt ways of thinking.
  - Guidance on lesson flow.
  - Discussion of desired mathematical behaviors being elicited among the students.

- The use of manipulatives follows best practices (see, e.g., *Adding It Up*, 2001):
  - *Manipulatives are faithful representations of the mathematical objects they represent*. For example, colored chips can be helpful in representing some features of rational numbers, but they do not provide particularly direct representations of all of the important mathematics. The opposite of the opposite of red isn't clearly blue, for example, and chips aren't particularly well suited as models for adding rational numbers that are not integers (for this, a number line model may be more appropriate).
  - *Manipulatives are closely connected to written methods*. "Research indicates that students' experiences using physical models to represent hundreds, tens, and ones can be effective *if* the materials help them think about how to combine quantities and, eventually, how these processes connect with written procedures." (*Adding It Up*, p. 198, emphasis in the original). For example, base-ten blocks are a reasonable *model* for adding within 1000, but not a reasonable *method* for doing so; nor are colored chips a reasonable *method* for adding integers. (Cf. standards 1.NBT.4, 1.NBT.6, 2.NBT.7, and 5.NBT.7; these are not the only places in the curriculum where connecting to a written method is important). The word "fluently" in particular as used in the Standards refers to fluency with a written or mental method, not a method using manipulatives or concrete representations.

- Materials are carefully reviewed by qualified individuals, whose names are listed, to ensure:
  - Freedom from mathematical errors[14]
  - Grade-level appropriateness
  - Freedom from bias (for example, problem contexts that use culture-specific background knowledge do not assume readers from all cultures have that knowledge; simple explanations or illustrations or hints scaffold comprehension).
  - Freedom from unnecessary language complexity.

- The visual design isn't distracting or chaotic, or aimed at adult purchasers, but instead serves only to support young students in engaging thoughtfully with the subject.

[14] Sometimes errors in materials are simple falsehoods, e.g., printing an incorrect answer to a problem; other errors are more subtle, e.g., asking students to explain why something is so when it has been defined to be so.

- Support for English language learners and members of other special populations is thoughtful and helps those learners to meet the same standards as all other students. Allowing English language learners to collaborate as they strive to learn and show understanding in an environment where English is used as the medium of instruction will give them the support they need to meet their academic goals. Materials can structure interactions in pairs, in small groups, and in the large group (or in any other group configuration), as some English language learners might be shy to share orally with the large group, but might not have problem sharing orally with a small group or in pairs. (In addition, when working in pairs, if English language leaners are paired up with a student who shares the same language, they might choose to think about and discuss the problems in their first language, and then worry about doing it in English.)

- (For paper-based materials.) A textbook that is focused is short. For example, by design Japanese textbooks have less than one page per lesson. Elementary textbooks should be less than 200 pages, middle and secondary less than 500 pages.

Appendix

The Structure is the Standards

Essay by Phil Daro, William McCallum, and Jason Zimba, February 16, 2012[15]

You have just purchased an expensive Grecian urn and asked the dealer to ship it to your house. He picks up a hammer, shatters it into pieces, and explains that he will send one piece a day in an envelope for the next year. You object; he says "don't worry, I'll make sure that you get every single piece, and the markings are clear, so you'll be able to glue them all back together. I've got it covered." Absurd, no? But this is the way many school systems require teachers to deliver mathematics to their students; one piece (i.e. one standard) at a time. They promise their customers (the taxpayers) that by the end of the year they will have "covered" the standards.

In the Common Core State Standards, individual statements of what students are expected to understand and be able to do are embedded within domain headings and cluster headings designed to convey the structure of the subject. "The Standards" refers to all elements of the design—the wording of domain headings, cluster headings, and individual statements; the text of the grade level introductions and high school category descriptions; the placement of the standards for mathematical practice at each grade level.

The pieces are designed to fit together, and the standards document fits them together, presenting a coherent whole where the connections within grades and the flows of ideas across grades are as visible as the story depicted on the urn.

The analogy with the urn only goes so far; the Standards are a policy document, after all, not a work of art. In common with the urn, however, the Standards were crafted to reward study on multiple levels: from close inspection of details, to a coherent grasp of the whole. Specific phrases in specific standards are worth study and can carry important meaning; yet this meaning is also importantly shaped by the cluster heading in which the standard is found. At higher levels, domain headings give structure to the subject matter of the discipline, and the practices' yearly refrain communicates the varieties of expertise which study of the discipline develops in an educated person.

Fragmenting the Standards into individual standards, or individual bits of standards, erases all these relationships and produces a sum of parts that is decidedly less than the whole. Arranging the Standards into new categories also breaks their structure. It constitutes a remixing of the Standards. There is meaning in the cluster headings and domain names that is not contained in the numbered statements beneath them. Remove or reword those headings and you have changed the meaning of the Standards; you now have different Standards; you have not adopted the Common Core.

Sometimes a remix is as good as or better than the original. Maybe there are 50 remixes, adapted to the preferences of each individual state (although we doubt there are 50 good ones). Be that as it may, a remix of a work is not the same as the original work, and with 50 remixes we would not have common standards; we would have the same situation we had before the Common Core.

[15] http://commoncoretools.me/2012/02/16/the-structure-is-the-standards/.

Why is paying attention to the structure important? Here is why: The single most important flaw in United States mathematics instruction is that the curriculum is “a mile wide and an inch deep.” This finding comes from research comparing the U.S. curriculum to high performing countries, surveys of college faculty and teachers, the National Math Panel, the Early Childhood Learning Report, and all the testimony the CCSS writers heard. The standards are meant to be a blueprint for math instruction that is more focused and coherent. The focus and coherence in this blueprint is largely in the way the standards progress from each other, coordinate with each other and most importantly cluster together into coherent bodies of knowledge. Crosswalks and alignments and pacing plans and such cannot be allowed to throw away the focus and coherence and regress to the mile-wide curriculum.

Another consequence of fragmenting the Standards is that it obscures the progressions in the standards. The standards were not so much assembled out of topics as woven out of progressions. Maintaining these progressions in the implementation of the standards will be important for helping all students learn mathematics at a higher level. Standards are a bit like the growth chart in a doctor’s office: they provide a reference point, but no child follows the chart exactly. By the same token, standards provide a chart against which to measure growth in children’s knowledge. Just as the growth chart moves ever upward, so standards are written as though students learned 100% of prior standards. In fact, all classrooms exhibit a wide variety of prior learning each day. For example, the properties of operations, learned first for simple whole numbers, then in later grades extended to fractions, play a central role in understanding operations with negative numbers, expressions with letters and later still the study of polynomials. As the application of the properties is extended over the grades, an understanding of how the properties of operations work together should deepen and develop into one of the most fundamental insights into algebra. The natural distribution of prior knowledge in classrooms should not prompt abandoning instruction in grade level content, but should prompt explicit attention to connecting grade level content to content from prior learning. To do this, instruction should reflect the progressions on which the CCSSM are built. For example, the development of fluency with division using the standard algorithm in grade 6 is the occasion to surface and deal with unfinished learning with respect to place value. Much unfinished learning from earlier grades can be managed best inside grade level work when the progressions are used to understand student thinking.

This is a basic condition of teaching and should not be ignored in the name of standards. Nearly every student has more to learn about the mathematics referenced by standards from earlier grades. Indeed, it is the nature of mathematics that much new learning is about extending knowledge from prior learning to new situations. For this reason, teachers need to understand the progressions in the standards so they can see where individual students and groups of students are coming from, and where they are heading. But progressions disappear when standards are torn out of context and taught as isolated events.

Sample Rubric. (In each case, the top-line criterion is shown. Refer to the additional text to inform judgment on each criterion.)

	Top-Line Criterion	Notes	Evaluation (check one)	
1. Focus on Major Work	In any single grade, students and teachers using the materials as designed spend the large majority of their time, approximately three-quarters,[16] on the major work of each grade.		Not Met ☐ Met ☐	
2. Focus in Early Grades	Materials do not assess any of the topics in Table 2 before the grade level indicated, or pattern problems in K–5 that do not support the focus on arithmetic, such as "find the next one" problems.		Not Met ☐ Met ☐	
3. Focus and Coherence through Supporting Work	Supporting content (where present) does not detract from focus, but rather enhances focus and coherence simultaneously by engaging students in the major work of the grade.		Not Met ☐ Met ☐	
4. Rigor and Balance Materials and tools reflect the balances in the Standards and help students meet the Standards' rigorous expectations, by (all of the following, in the case of comprehensive materials; at least one of the following for supplemental or targeted resources):	Developing students' conceptual understanding of key mathematical concepts, where called for in specific content standards or cluster headings.		Not Met ☐ Met ☐	Comprehensive programs meet all three; supplemental resources meet one or more.
	Giving attention throughout the year to individual standards that set an expectation of fluency.		Not Met ☐ Met ☐	
	Allowing teachers and students using the materials as designed to spend sufficient time working with engaging applications, without losing focus on the major work of each grade.		Not Met ☐ Met ☐	
Additional aspects of the Rigor and Balance criterion	(The three aspects of rigor—if all were checked above—are not always together, not always apart; digital tools are designed to support the rigor and balance criterion and promote depth and mastery.)		Not Met ☐ Met ☐	

[16] Given the particular clusters that are designated major in grade 7, the criterion for that grade is approximately two-thirds, rather than approximately three-fourths.

Sample Rubric. (In each case, the top-line criterion is shown. Refer to the additional text to inform judgment on each criterion.)

Top-Line Criterion		Notes	Evaluation (check one)
5. Consistent Progressions Materials are consistent with the progressions in the Standards, by (all of the following):	Basing content progressions on the grade-by-grade progressions in the Standards.		Not Met ☐ Met ☐
	Giving all students extensive work with grade-level problems.		Not Met ☐ Met ☐
	Relating grade level concepts explicitly to prior knowledge from earlier grades.		Not Met ☐ Met ☐
6. Coherent Connections Materials foster coherence through connections at a single grade, where appropriate and where required by the Standards, by (all of the following):	Including learning objectives that are visibly shaped by CCSSM cluster headings, with meaningful consequences for the associated problems and activities.		Not Met ☐ Met ☐
	Including problems and activities that serve to connect two or more clusters in a domain, or two or more domains in a grade, in cases where these connections are natural and important.		Not Met ☐ Met ☐
7. Practice-Content Connections	Materials meaningfully connect content standards and practice standards.		Not Met ☐ Met ☐

Sample Rubric. (In each case, the top-line criterion is shown. Refer to the additional text to inform judgment on each criterion.)

Top-Line Criterion		Notes	Evaluation (check one)
8. Focus and Coherence via Practice Standards	Materials promote focus and coherence by connecting practice standards with content that is emphasized in the Standards.		Not Met ☐ Met ☐
9. Careful Attention to Each Practice Standard	Materials attend to the full meaning of each practice standard.		Not Met ☐ Met ☐
10. Emphasis on Mathematical Reasoning Materials support the Standards' emphasis on mathematical reasoning, by (all of the following):	Prompting students to construct viable arguments and critique the arguments of others concerning key grade-level mathematics that is detailed in the content standards (cf. MP.3).		Not Met ☐ Met ☐
	Engaging students in problem solving as a form of argument.		Not Met ☐ Met ☐
	Explicitly attending to the specialized language of mathematics.		Not Met ☐ Met ☐
[S] Consistency with CCSSM	Materials for science and technical subjects are consistent with CCSSM.		Not Met ☐ Met ☐

Appendix B

PARCC Model Content Frameworks for Mathematics

Guidance Regarding the Use of Resources in Mathematics[1]
In the early phases of implementation, it is wise to consider the degree to which existing materials align to the standards. This is often done via “cross-walking” exercises. Such exercises are sometimes approached simplistically as a process of topic-matching. However, it is critical to note that individual content standards are carefully crafted statements — they do not simply name topics. Coverage of topics is therefore not a guarantee of alignment, and coverage may even affect alignment negatively when it is wide and/or shallow. Cluster headings often unify the standards in the cluster by communicating their joint intent. Aligning to the standards requires taking into account the guidance to be gained from cluster headings, grade-level introductions, indicators of opportunities for modeling or use of an applied approach, and so forth. In the context of a multigrade progression, alignment also means treating the content in ways that take into account the previous stage of the progression and anticipate the next. One purpose of the Model Content Frameworks for Mathematics is to provide educators with guidance on the implementation of the Common Core State Standards, particularly with respect to the needs of states and districts as they develop, obtain, or revise materials to meet the standards. Therefore, a number of important criteria are suggested for reviewing existing resources or for the development of additional curricular or instructional materials if needed. These are presented in the form of a list that could support “strongly agree” to “strongly disagree” responses in any given case:

- Materials help students meet the indicated Standards for Mathematical Content. Materials also equip teachers and students to develop the varieties of expertise described in the Standards for Mathematical Practice.

- Materials are mathematically correct.

- Materials are motivating to students. The beauty and applied power of the subject is evident. Materials are engaging for a diverse body of students. This engagement exists side by side with the practice and hard thinking that is often necessary for learning mathematics.

- Materials reflect the standards by connecting content and practices while demanding conceptual understanding, procedural skill and fluency, and application.

Specific aspects of achieving this balance include:

Balance of tasks and activities: Activities, tasks, and problems for students exhibit balance along various dimensions. For example, some activities and tasks target procedural skill and fluency alone; others target conceptual understanding; others application; and still others skill, understanding, and application in equal measure. Some exercises are brief practice exercises; others require longer chains of reasoning. Some are abstract; others are contextual. Well-chosen tasks demonstrate the importance of mathematics in daily living for students, including connecting to other areas of students’ interest, such as population growth and history, data and sports, and financial decision making.

Balance in how time is spent: There is time for whole-class or group discussion and debate, time for solitary problem solving and reflection, and time for thoughtful practice and routine skill building. Individual problem solving and explanation of mathematical thinking may be intertwined several times during a class.

Common sense in achieving balance: Not every task, activity, or workweek has to be balanced in these ways. It is reasonable to have phases of narrow intensity, during which tasks, activities, and time are concentrated in a single mode.

- Materials draw the teacher's attention explicitly to nuances in the content being addressed and to specific opportunities for teachers to foster mathematical practices in the study of that content.
- Materials give teachers workable strategies for helping students who have special needs, such as students with disabilities, English language learners, and gifted students.
- Materials give teachers strategies for involving students in reading, writing, speaking, and listening as necessary to meet the mathematics standards — for example, to understand the meanings of specialized vocabulary, symbols, units, and expressions to support students in attending to precision (MP.6) or to engage in mathematical discourse using both informal language and precise language to convey ideas, communicate solutions, and support arguments (MP.3).

[1] From the PARCC Model Content Frameworks for Mathematics Version 3.0 - November 2012