NCSM-NCTM-Curriculum Materials Analysis Tools

Tool 1: Content Analysis—What to Look For

Purpose:

- Analyze the extent to which the content (i.e., concepts, skills, applications) is treated in the materials as described in the standards.
- Determine the extent to which the standards are sequenced appropriately in the materials
- Determine the extent to which the materials provide a balanced treatment of the standards in terms of conceptual development and procedural fluency.

1A. Content Coverage/Treatment Rubric:	Key Evidence and Where to Find It!	Look Fors:
In the rubric below, "gap" refers to IF, WHERE, and HOW content is treated in the materials. Not Found (N) - The mathematics content was not found. Low (L) - Major gaps in the mathematics content were found. Marginal (M) - Gaps in the content, as described in the standards, were found and these gaps may not be easily filled. Acceptable (A) - Few gaps in the content, as described in the standards, were found and these gaps may be easily filled. High (H) - The content was fully formed as described in the standards	• Base this analysis on lessons as presented in the student and teachers' editions, since these determine students' core instructional experiences. • This analysis addresses IF, WHERE, and HOW content is treated in the materials. Examining whether content is included is insufficient to determine whether students will have the opportunity to learn content as specified in the standards. • This analysis must be done not only within grades, but across grades to determine whether the materials adequately address and connect the mathematical ideas as they develop within and across grades, as described in the standards. (The complete *CCSS Curriculum Materials Analysis Toolkit* contains grade-band analysis sheets for specific CCSS content domains. These should be adapted as needed for your standards.) • For High School – If the high school standards are not organized into courses, reviewers will need to explore and understand the author's rationale for distributing content into and cross the three HS courses. Note particularly *focus* - extensive course level experiences without re-teaching, and *coherence* - building on prior knowledge from within and across courses.	Content development is focused, coherent, and rigorous: 1. Content: Content standards for the grade range are thoroughly developed. 2. Focus: Content present respects the foci and learning progressions built into grade level standards, so that the content present outside this is limited to: connecting to prior knowledge without re-teaching, and previewing future content without expecting proficiency. 3. Mathematical Range: In major topics, lessons pursue conceptual understanding, procedural skill, and fluency, and application. 4. Representations: Types and range of representations, sequence of representations, and the use of critical representations as identified in the standards. 5. Connections: Degree to which lessons support students in making connections among related mathematical concepts and algorithms as described in the standards. (E.g., In CCSSM, content cluster heads that begin with "Extend and apply . . . . ")

Summary Questions—Content Coverage/Treatment

1. Have you identified gaps within this domain? What are they? If so, can these gaps be realistically addressed through supplementation?
2. Within grade levels, do the curriculum materials provide sufficient experiences to support student learning within this standard?
3. Within this domain, is the treatment of the content across grade levels consistent with the progression within the standards?

Tool 1: Content Analysis—What to Look For

1B. Balance of Mathematical Understanding & Procedural Skills Rubric	Key Evidence and Where to Find It!	Look Fors:
Not Found (N) - The content was not found. Low (L) - The content was not developed or developed superficially. Marginal (M) - The content was found and focused primarily on procedural skills and minimally on mathematical understanding, or ignored procedural skills. Acceptable (A) - The content was developed with a balance of mathematical understanding and procedural skills consistent with the standards, but the connections between the two were not developed. High (H)-The content was developed with a balance of mathematical understanding and procedural skills consistent with the standards, and the connections between the two were developed.	*Conceptual Understanding* – comprehension of mathematical concepts, operations, and relations. "*Understand"* means that students can explain the concept with mathematical reasoning including concrete illustrations, mathematical representations, and example applications. *Procedural Fluency* – skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.	1. Procedures from Concepts: Activities designed to develop conceptual understanding are leveraged and explicitly connected to the development of related procedures and algorithms 2. Task Range: Tasks are designed and sequenced so that students are asked to work across the full range of cognitive demand levels Opportunities for students to: 3. Model: Use concepts to make sense of and explain quantitative situations ("Model with mathematics") 4. Reason: Incorporate concepts into their own arguments and use them to evaluate the arguments of others (see "Construct viable arguments and critique the reasoning of others") 5. Solve Problems: Bring them to bear on the solutions to problems (see "Make sense of problems and persevere in solving them") 6. Connect: Make connections between related concepts

Summary Questions: Balance between Mathematical Understanding and Procedural Skills:

1. Do the curriculum materials support the development of students' mathematical understanding?
2. Do the curriculum materials support the development of students' proficiency with procedural skills?
3. Do the curriculum materials assist students in building connections between mathematical understanding and procedural skills?
4. To what extent do the curriculum materials provide a balanced focus on mathematical understanding and procedural skills?
5. Do student activities build on each other within and across grades in a logical way that supports mathematical understanding and procedural skills?

Overall Impressions:

1. What are your overall impressions of the curriculum materials examined?
2. What are the strengths and weaknesses of the materials you examined?

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Tool 2: The Mathematical Practices Analysis—What to Look For

Purpose:

- Analyze the extent to which the Standards for Mathematical Practice are treated in the materials as described in CCSSM.
- Determine the extent to which the materials demand that students engage in the Standards for Mathematical Practice as the primary vehicle for learning the content standards.
- Determine the extent to which the materials provide opportunities for students to develop the Standards for Mathematical Practice as "habits of mind" throughout the development of the content standards.

2. The Practices Rubric:	Key Evidence and Where to Find It!	Look Fors:
Low – The Standards for Mathematical Practice are not addressed or are addressed superficially. Marginal - The Standards for Mathematical Practice are addressed, but not consistently in a way that is embedded in the development of the content standards. Acceptable – Attention to the Standards for Mathematical Practice is embedded throughout the curriculum materials in ways that may help students to develop them as habits of mind.	Lessons that address "content standards that explicitly refer to "understand" or "understanding" are especially good opportunities to connect the practices to the content." (CCSS, p. 8) *Instructional Tasks:* Examine the extent to which lessons consistently are built around tasks that promote problem solving, reasoning, and engagement in standards for mathematical practice. SMPs should be treated in two ways: 1. Students should engage in the SMPs as they work on tasks to learn specific content; and 2. Developing proficiency in the SMPs should be an explicit goal of lessons. Occasional opportunities—once a week; a few times a chapter—for students to engage in the SMPs are not sufficient. Explicitly labeling lessons or tasks with particular mathematical practices ("call-outs") is irrelevant. *Assessment:* Formal and informal assessments and classroom formative assessment opportunities should provide evidence about students' proficiency with the SMPs as well as the content standards. *Resources:* • The "Elaborations" on the Standards for Mathematical Practice for Grades K-5 and Grades 6-8 (Illustrative Mathematics) provide additional interpretation of the SMPs for these grade levels. — Grades K-5: http://commoncoretools.me/2014/02/12/k-5-elaborations-of-the-practice-standards/ — Grades 6-8: http://commoncoretools.me/2014/05/04/6-8-elaborations-of-the-practice-standards/ • "Model" and "modeling" are used in a variety of ways in mathematics education. See *Guidelines for Assessment & Instruction in Mathematical Modeling Education* (GAIMME), 2nd Ed. (COMAP & SIAM, 2019) for clarification of SMP 4. Modeling with mathematics.	Opportunities for students to: 1. Mathematical Practices → Content: To what extent do the materials demand that students engage in the Standards for Mathematical Practice as the primary vehicle for learning the content standards? 2. Content → Mathematical Practices: To what extent do the materials provide opportunities for students to develop the Standards for Mathematical Practice as "habits of mind" (ways of thinking about mathematics that are rich, challenging, and useful) throughout the development of the content standards? 3. Opportunities to Elicit Evidence of Student Thinking: To what extent do accompanying assessments of student learning (such as homework, observation checklists, portfolio recommendations, extended tasks, tests, and quizzes) provide evidence regarding students' proficiency with respect to the Standards for Mathematical Practice? 4. Teacher Support: What is the quality of the instructional support for students' development of the Standards for Mathematical Practice as habits of mind?

Tool 2: The Mathematical Practices Analysis—What to Look For

Summary Questions:

1. (Mathematical Practices → Content) To what extent do the materials demand that students engage in the Standards for Mathematical Practice as the primary vehicle for learning the content standards?
2. (Content → Mathematical Practices) To what extent do the materials provide opportunities for students to develop the Standards for Mathematical Practice as "habits of mind" (ways of thinking about mathematics that are rich, challenging, and useful) throughout the development of the content standards?
3. To what extent do accompanying assessments of student learning (such as homework, observation checklists, portfolio recommendations, extended tasks, tests, and quizzes) provide evidence regarding students' proficiency with respect to the Standards for Mathematical Practice?
4. What is the quality of the instructional support for students' development of the Standards for Mathematical Practice as habits of mind?

Tool #2
Connecting and Exploring:
SMPs, Task Demand, and Content Development

Task Number	Level of Task Demand	Standard for Mathematical Practice	Opportunity to Develop Proficiency with the SMPs Content ⇨ Practices	Opportunity to Learn Content through SMPs Practices ⇨ Content

Tool #2 Evidence Template

Standards for Mathematical Practice (Grouped)	Opportunities to Develop Proficiency with the SMP as a Habit of Mind Content ⇨ Practices	Mathematical Practices Used to Develop Content Practices ⇨ Content	Assessment of SMP and Teacher Support
Solve Problems & Persevere			
Attend to Precision			
Reason & Explain • Reason Abstractly and Quantitatively • Arguments and Reasoning of Others			
Model & Use Tools • Modeling with Mathematics • Use Tools Strategically			
See Structure and Generalize • Look For & Use Structure • Regularity & Repeated Reasoning			

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Tool 3: Equity, Assessment, & Technology Analyses—What to Look For

Purpose:

- Analyze the extent to which the materials reflect and support equitable practices to ensure maximum participation and success of each and every student, including those with special education needs.
- Determine the extent to which high quality and high cognitive formative and summative assessments are embedded in the materials
- Determine the extent to which the materials encourage the use of technology to assist teachers in teaching mathematics and enable students to explore and deepen their understanding of mathematical concepts and procedures, as well as improve their problem-solving and reasoning skills.

3A. Equity Rubric:	Key Evidence and Where to Find It!	Look Fors:
Not Found (N) - The curriculum materials do not support this element. Low (L) - The curriculum materials contain limited support for this element, but the support is not embedded or consistently present within or across grades. Medium (M) - The curriculum materials contain support for this element, but it is not always embedded or consistently present within or across grades. High (H) - The curriculum materials contain embedded support for this element so that it is consistently present within and across grades.	Base this analysis on lessons as presented in the student and teachers' editions, since these determine students' core instructional experiences. • Examine the extent to which lessons are consistently built around tasks that develop mathematical understanding through problem solving and reasoning. Well-designed tasks create opportunities to increase students' sense of mathematical identity. Limited or irregular opportunities are not sufficient to support a growth mindset for students and may suggest a counter-productive view of mathematics. • Examine the extent to which lessons are designed to give students opportunities to conjecture, explain, make mathematical arguments, and build on one another's ideas, in ways that will contribute to their development of agency (the capacity and willingness to engage mathematically) and authority (recognition for being mathematically solid), resulting in positive identities as doers of mathematics. • Examine the extent to which the teacher edition offers specific suggestions for teachers to effectively facilitate problem solving lessons in ways that support the development of deep understanding and strong mathematical identify for students, advancing both their sense of agency and authority.	Curriculum materials enable equitable practices with features that build students' identity, agency, and authority: 1. Opportunity to Learn - The core program is primarily devoted to developing new age/grade-level appropriate mathematical content. 2. Tasks and lessons are consistently built around problem solving and reasoning tasks needed to develop strong mathematical identity. 3. Tasks and lessons require students to read and write text, including specialized mathematical language, as an important part of learning mathematics. 4. Tasks and illustrations that present a broad and balanced range of demographic and cultural images and contexts. 5. Teacher Guides contains well developed suggestions for effective ways to facilitate learning using problem solving and reasoning tasks. This would include support for the effective use of: • discourse strategies to facilitate learning between teachers and students and among students • student's home or common language to develop meaning and build toward mathematically sophisticated language, • group sizes (individual, partner, small group, whole class, etc.) varied throughout the class period as needed,

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3A. Equity Rubric:	Key Evidence and Where to Find It!	Look Fors:
	• Examine the extent to which the program provides opportunities for differentiation that support achievement for each and every student utilizing strategies that do not undermine or limit learning core content. Mathematical Identity: Is the degree to which students see themselves as doers of mathematics and the degree to which they are seen by others as doers of mathematics. Both a student's sense of mathematical agency (their capacity and willingness to engage mathematically) and authority (recognition of others (teacher and students) for being mathematically solid) contribute to their positive identity as a successful doer of mathematics.	• formative assessment strategies to inform ongoing instructional decisions, • student-generated solutions and questions to advance learning, • student errors and misconceptions to advance learning, • multiple solution strategies to advance and deepen learning, • multiple representations and connections among representations to develop understanding, • strategies to support a range of learners such as encouraging use of English Language Learners strategies and avoiding use of separate assignments, • strategies to support students learning to read, write, and make sense of text in the mathematics classroom, • scaffolding strategies to support struggling learners without undermining task demand or taking over the work, • cognitively demanding tasks with multiple entry-points are capable of drawing on multiple competencies, and • strategies to affirm positive student identities in mathematics.

Summary Questions—Equity, within and across grades

1. To what extent are the lessons designed effectively enable students' growth in mathematical understanding and mathematical identity?
2. To what extent do the materials provide effective support for teachers to use problem solving and reasoning tasks with a wide range of students to develop their mathematical understanding and mathematical identity?

Tool 3: Equity, Assessment, & Technology Analyses—What to Look For

3B. Assessment Rubric:	Key Evidence and Where to Find It!	Look Fors:
Not Found (N) - The curriculum materials do not support this element. Low (L) - The curriculum materials contain limited support for this element, but the support is not embedded or consistently present within or across grades. Medium (M) - The curriculum materials contain support for this element, but it is not always embedded or consistently present within or across grades. High (H) - The curriculum materials contain embedded support for this element so that it is consistently present within and across grades.	Base this analysis on summative assessments included in the student and teachers' editions and other program materials and formative assessment opportunities and support embedded in lessons in the student and teachers' editions. • Examine the extent to which summative assessments consistently provide evidence of proficiency with all components of students' mathematics learning: conceptual understanding, procedural fluency and mathematical practices/habits of mind, e.g., problem solving, reasoning, communication, etc. Well-designed assessments provide information to support students' learning, including revealing common misconceptions. • Examine the extent to which lessons consistently contain tasks, activities and questions that elicit evidence of students' thinking, i.e., support the use of formative assessment as a process that occurs during instruction. • Examine the extent to which the teacher edition offers explicit suggestions for eliciting evidence of, and interpreting, and responding to students' thinking to advance learning. • Examine the extent to which the materials promote and support students as peer and self-assessors. This includes consistent opportunities and/or routines asking students to reflect on mistakes and misconceptions to improve their learning, and helping them to assess and monitor their own progress toward mathematics learning goals and identify areas in which they need to improve. • Examine the extent to which the materials embed ongoing review and practice of previously taught content. Research shows that such review increases retention of previously learned materials and students' ability to apply specific concepts and procedures appropriately.	Curriculum materials consistently support high quality formative and summative assessment that advances students' learning. 1. Quality of lesson/unit goals, including sequence—well-defined, clearly articulated, realistic short- and long-term goals based on a clear (sound? evidence-based?) learning progression that provide a solid foundation for formative assessment strategies and summative assessments. 2. Summative assessment quality—assess full range of expectations, conceptual understanding, procedural fluency, and proficiency in the mathematical practices. (See Tool 1A) 3. Variety of assessment formats, e.g., formal or informal observations, interviews, surveys, performance assessments including short- and longer-term tasks and tasks appropriate for individual, partner, and group work. 4. Formative assessment quality: This includes on-going support for eliciting and using evidence of students' learning to informs next instructional decisions *during* the lesson, e.g., • Provides tasks and questioning strategies with the potential to elicit evidence of student learning, including prior knowledge. • Provides suggestions for responding to students' thinking to advance learning. • Provides suggestions for giving descriptive feedback (vs grades or points). • Provides strategies for extending thinking during discourse. • Provides questions and strategies to identify common errors and misconceptions.

Tool 3: Equity, Assessment, & Technology Analyses—What to Look For

3B. Assessment Rubric	Key Evidence and Where to Find It!	Look Fors:
		5. Encourages and supports students as self-assessors, providing clear success criteria and models of excellence, consistent opportunities and/or routines for students to reflect on their mistakes and misconceptions and analyze their progress toward mathematics learning goals. 6. Provides ongoing review and distributed practice of previously presented content, e.g., daily review problems as warm-ups, in homework, in quizzes and/or in lesson tasks.

Summary Questions—Assessment, within and across grades

1. To what extent do the materials contain summative assessments that provide evidence of proficiency with important mathematical content and practices and support students as self-assessors?
2. To what extent do the materials consistently support effective formative assessment activities and practices, i.e., lesson contain questions and tasks that elicit evidence of student thinking and support teachers in adjusting instruction in ways that support and extend learning?

Tool 3: Equity, Assessment, & Technology Analyses—What to Look For

3C. Technology Rubric:	Key Evidence and Where to Find It!	Look Fors:
Not Found (N) - The curriculum materials do not support this element. Low (L) - The curriculum materials contain limited support for this element, but the support is not embedded or consistently present within or across grades. Medium (M) - The curriculum materials contain support for this element, but it is not always embedded or consistently present within or across grades. High (H) - The curriculum materials contain embedded support for this element so that it is consistently present within and across grades.	Base this analysis on the student and teachers' editions and additional software, tools and/or technology resources that are viewed as integral "must use" or "will use" components of the materials. • Examine the extent to which technology resources are provided to assist students in visualizing, understanding, applying mathematical concepts, and developing procedural fluency. • Examine the extent to which technology tools, resources and/or activities engage students in the Mathematical Practices. • Examine the extent to which digital or blended lessons consistently contain tasks, activities, and questions that elicit evidence of students' thinking to support teachers' use of formative assessment and students' peer- and self-assessment. • Examine the extent to which the teacher edition and student editions offers explicit support and direction for the effective use of software, technological tools, and other digital resources to support learning. • Examine the extent to which technology provides opportunities for teachers and/or students to communicate with each other. • Examine the extent to which technology supports equity and access. (See 3A. Equity Look-Fors)	Digital or blended curriculum with core lessons featuring: 1. Tasks that engage students in building conceptual understanding through visualization and exploration. 2. Tasks that engage students in using the Mathematical Practices. 3. Tasks that develop students' procedural fluency. 4. Tasks, activities and questions that elicit evidence of students' thinking. 5. Opportunities and support for peer- and self-assessment. 6. Clear explicit guidance for students trying to use online lessons, websites, apps, and other digital resources (i.e., graphing tools, calculators, virtual manipulatives, sample data sets, random number generators, games, etc.). 7. Clear explicit guidance for teachers regarding the facilitation of online lessons such as how to: • encourage discussion among students working remotely, • encourage student collaboration, • assign students to work with other students individually, in small groups, or with a partner, • gather and use evidence of student thinking including strategies and possible misconceptions, • anticipate and support possible challenges for students, • effectively use apps, websites, and other digital resources (i.e., graphing tools, calculators, virtual manipulatives, sample data sets, random number generators, games etc.). • support a range of learners in the digital environment, • affirm positive student identities in a digital environment.

Tool 3: Equity, Assessment, & Technology Analyses—What to Look For

3C. Technology Rubric:	Key Evidence and Where to Find It!	Look Fors:
		In addition, digital or blended curriculum: 8. Allows for the **class to work and communicate** as a whole group, or for teachers to assign students to work individually, in small groups, or with a partner when working remotely or in a classroom. 9. Offers technology-based **supports for effective differentiation**, i.e., • scaffolding strategies to support struggling learners without undermining task demand or taking over the work, • for English-language learners, • strategies and tasks for advanced learners and students who want additional challenges.
Summary Question—Technology, within and across grades 1. To what extent do the materials consistently and effectively integrate the use of technology to enhance mathematics teaching, learning and assessment?		