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Evidence Guide

Science

High School

v1.5

Gateway 1

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Gateway 1: Designed for NGSS

Criterion 1.1

Phenomena and Problems Drive Learning

Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.

What is the purpose of this Criterion?

A major goal for NGSS-designed science education is for "students to be able to explain real-world phenomena and to design solutions to problems using their understanding of the DCIs, CCCs, and SEPs. By doing so, students develop their understanding of the DCIs by engaging in the SEPs and applying the CCCs. These three dimensions are tools that students can acquire and use to answer questions about the world around them and to solve design problems." (2015 Achieve NGSS Innovations, p. 2)

This criterion

- supports the NGSS innovation related to using phenomena and problems to drive instruction.
- examines the materials to determine the extent that students are engaged in making sense of natural phenomena or solving design problems in meaningful ways.
- examines whether phenomena or problems are used as more than just an attention grabber or hook; the phenomenon or problem is what is used to drive instruction and connect student sensemaking to the three dimensions (DCIs, SEPs, CCCs) within and across lessons.

Research Connection

"... the goal of science is to develop a set of coherent and mutually consistent theoretical descriptions of the world that can provide explanations over a wide range of phenomena. For engineering, however, success is measured by the extent to which a human need or want has been addressed." (A Framework for K-12 Science Education, p. 48)

"Asking students to demonstrate their own understanding of the implications of a scientific idea by developing their own explanations of phenomena, whether based on observations they have made or models they have developed, engages them in an essential part of the process by which conceptual change can occur." (A Framework for K-12 Science Education, p. 68)

"Learning to explain phenomena and solve problems is the central reason students engage in the three dimensions of the NGSS. Students explain phenomena by developing and applying the Disciplinary Core Ideas (DCIs) and Crosscutting Concepts (CCCs) through use of the Science and Engineering Practices (SEPs)." (Using Phenomena in NGSS-Designed Lessons and Units)

Other resources to support the vision and criteria for using phenomena or problems to drive instruction of lessons or activities:

- Using Phenomena in NGSS-Designed Lessons and Units: a handout that describes how educators can use phenomena to drive three-dimensional teaching and learning, from NGSS.

- Criteria for Evaluating Phenomena: a tool used in NGSS@NSTA professional learning experiences.
- Qualities of a Good Anchor Phenomenon: a resource from the Research + Practice Collaboratory.

Scoring:		
Meets Expectations ● 10-12 points	Partially Meets Expectations ● 6-9 points	Does Not Meet Expectations ● <6 points

Gateway 1: Designed for NGSS

Criterion 1.1	Phenomena and Problems Drive Learning: Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.
Indicator 1a	Materials are designed to include both phenomena and problems.

Scoring: Narrative Evidence Only

Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator

- provides a narrative report of the presence, structure, function, and proportional number of phenomena and problems.
- sets the stage for review of indicators 1b, 1c, and 1d, as those indicators are dependent on identification of phenomena and/or problems.

Research or Standards connection:

Read information for Gateway 1, Criterion 1.

“CONCLUSION 2: Teachers can use students’ curiosity to motivate learning by choosing phenomena and design challenges that are interesting and engaging to students, including those that are locally and/or culturally relevant. Science investigation and engineering design give middle and high school students opportunities to engage in the wider world in new ways by providing agency for them to develop questions and establish the direction for their own learning experiences.” (Science and Engineering for Grades 6-12: Investigation and Design at the Center, p. 4)

Resources:

- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education
- Science and Engineering for Grades 6-12: Investigation and Design at the Center
- STEM Teaching Tools Practice Brief 71

Indicator 1a Guiding Question:

Are the materials designed to include both phenomena and problems?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Look for and record evidence to:

- Determine when and where the materials engage students in figuring out phenomena. Note the type of phenomenon used. This could include, but is not limited to, “contemporary scientific, everyday, culturally meaningful, globally significant, and justice-centered phenomena”. (STEM Teaching Tools Practice Brief 71)
- Determine the proportional amount of materials that engage students in understanding phenomena.
- Determine when and where the materials engage students in solving problems. Note how the ETS standards support student engagement in solving problems. Note if/how problems may relate to real world issues, whether global, regional, or local.
- Determine the proportional amount of materials that engage students in solving problems.
- Describe the specific examples of lessons or activities that include phenomena that students explain and/or problems that students solve.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- What proportion of the materials (and/or instructional time) engage students with figuring out phenomena?
- What types of phenomena are present in the materials?
- Which units, lessons, or activities engage students in figuring out phenomena?
- What proportion of the materials (and/or instructional time) engage students with defining and designing solutions to problems?
- Which problems focus on real world issues that are global, regional, and/or local?
- Which units, lessons, or activities engage students in defining and designing solutions to problems?

Gateway 1: Designed for NGSS

Criterion 1.1	Phenomena and Problems Drive Learning: Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.
Indicator 1b	Phenomena and/or problems require student use of grade-band Disciplinary Core Ideas.

Scoring:		
2 points • Materials consistently provide phenomena and problems that require student use of grade-band appropriate DCIs or their elements.	1 point • Few phenomena require student use of grade-band DCIs or their elements. OR • Few problems require student use of grade-band DCIs or their elements.	0 points • Phenomena are not present. OR • Problems are not present. OR • Phenomena do not require student use of grade-band DCIs or their elements. OR • Problems do not require student use of grade-band DCIs or their elements.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines whether phenomena or problems within the course connect student sensemaking to the DCIs.

Research or Standards connection:

Read information for Gateway 1, Criterion 1.

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- A Framework for K-12 Science Education

Indicator 1b Guiding Question:

Do the phenomena and/or problems require student use of grade-band Disciplinary Core Ideas (DCIs)?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine where phenomena and/or problems are used to connect student sensemaking to one or more grade-band DCIs (Physical, Life, and/or Earth/Space Sciences).
- Determine where learning objectives associated with the phenomena and/or problem are connected to the identified DCIs.
- Describe the specific examples throughout the course where students are using the DCIs as they engage with phenomena and/or problems.
- Describe the specific examples throughout the course that use phenomena and/or problems to develop and build understanding of DCIs.
- Describe the specific examples throughout the course where DCIs specific to the learning objectives are connected to the DCIs addressed in the phenomena and/or problem.
- Note any instances where phenomena and/or problems develop understanding of grade-band DCIs outside of the DCIs targeted by the learning objectives.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials engage all students in learning experiences about phenomena and/or problems that are not separated from the DCIs (Physical, Life, and/or Earth/Space Sciences)?
- Can the phenomena and/or problems in the series be explained through the application of targeted grade-band appropriate DCIs?
- Does student engagement of phenomena and/or problems develop understanding or require application of the DCIs?
- To what extent do the DCIs specific to the learning objectives connect to the DCIs addressed in the phenomena and/or problems?

Gateway 1: Designed for NGSS

Criterion 1.1	Phenomena and Problems Drive Learning: Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.
Indicator 1c	Phenomena and/or problems are presented to students as directly as possible.

Scoring:		
2 points • Materials consistently present phenomena and/or problems to students as directly as possible.	1 point • Materials present phenomena and/or problems to students as directly as possible in multiple instances.	0 points • Phenomena and/or problems are not presented to students as directly as possible.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine whether phenomena and/or problems in the course are presented to students as directly as possible.
- examines the materials for a common experience for all students from which knowledge can be built; it does not assume that all students have background knowledge and experience.

Research or Standards connection:

"...opportunities for students to engage in direct observations of phenomena illustrate the process of basic scientific research." (Taking Science to School, pp. 13-14)

"By using familiar materials and phenomena, students can more readily conjure up their own ideas and experiences and tap into these as they build explanations. This makes it possible for every student to participate in a more meaningful way." (Ready Set Science, p. 93)

Many phenomena can be observed first-hand by students, but some can't be due to scale (physical size or timeframe), geographic location, frequency of occurrence, safety, or a variety of other factors. This indicator is designed to determine if the materials present phenomena and/or problems as directly (or as close to first-hand) as possible.

Resources:

- Next Generation Science Standards (NGSS)
- Taking Science To School
- Ready Set SCIENCE!
- A Framework for K-12 Science Education

Indicator 1c Guiding Question:

Are phenomena and/or problems presented to students as directly as possible?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Look for and record evidence to:

- Determine how phenomena and/or problems are being presented to students. Are the phenomena and/or problems occurrences that require explanation and are these occurrences presented to students in a way that sets the stage for student questions, connections to experiences, and/or initial understanding?
- Describe the specific examples of lessons or activities that include phenomena and/or problems and how they are presented to students.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How do the materials present phenomena and/or problems to students (direct observation, observation by video or other multimedia, simulations, teacher demonstration, pictures, reading about them, etc.)?
- Would it be practical or reasonable to present the phenomenon and/or problem first hand?
- Are phenomena and/or problems that are not appropriate for first-hand observation presented using multimedia, simulations, or other rich resources as a way to provide students with a common entry point or experience with the phenomenon or problem?
- Are students observing or interacting with the phenomena and/or problems in ways other than being told about it or reading about it in text, that may lead to student opportunities to ask questions about the phenomena or problems and work towards their own explanations?
- Are phenomena and/or problems presented without extraneous or distracting information?

Gateway 1: Designed for NGSS

Criterion 1.1	Phenomena and Problems Drive Learning: Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.
Indicator 1d	Materials intentionally leverage students' prior knowledge and experiences related to phenomena or problems.

Scoring:		
2 points • Materials consistently elicit and leverage students' prior knowledge and experience related to phenomena and problems across the course.	1 point • Materials elicit and leverage students' prior knowledge and experience for a limited range of phenomena and problems across the course. AND/OR • Materials elicit but do not leverage students' prior knowledge and experience related to phenomena and problems across the course.	0 points • Materials do not address students' prior knowledge and experience related to phenomena and problems.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine if they are designed to leverage students' prior knowledge and experiences to support sensemaking when engaging with phenomena or solving problems.
- emphasizes the importance of student questions in driving learning.

Research or Standards connection:

"When people enter into the practices of science or engineering, they do not leave their cultural worldviews at the door. Instruction that fails to recognize this reality can adversely affect student engagement in science." (A Framework for K-12 Science Education, p. 284).

"Everyday experience provides a rich base of knowledge and experience to support conceptual changes in science. Students bring cultural funds of knowledge that can be leveraged, combined with other concepts, and transformed into scientific concepts over time. Everyday contexts and situations that are important in children's lives not only influence their repertoires of practice but also are likely to support their development of complex cognitive skills." (A Framework for K-12 Science Education, p. 284).

"To advance students' conceptual understanding, prior knowledge and questions should be evoked and linked

to experiences with experiments, data, and phenomena." (Taking Science to School, p. 251)

"As instruction taps their entering knowledge and skills, students must reconcile their prior knowledge and experiences with new, scientific meanings of concepts, terms, and practices." (Taking Science to School, p. 264)

"Children's understandings of the world sometimes contradict scientific explanations. These conceptions about the natural world can pose obstacles to learning science. However, their prior knowledge also offers leverage points that can be built on to develop their understanding of scientific concepts and their ability to engage in scientific investigations. Thus, children's prior knowledge must be taken into account in order to design instruction in strategic ways that capitalize on the leverage points and adequately address potential areas of misunderstanding." (Taking Science to School, pp. 337-338)

"Conclusion 4: Students' knowledge and experience play a critical role in their science learning, influencing all four strands of science understanding. Children's concepts can be both resources and barriers to emerging understanding. These concepts can be enriched and transformed by appropriate classroom experiences." Science learners require instructional support to engage in scientific practices and to interpret experience and experiments in terms of scientific ideas." (Taking Science to School, p. 337)

"A key, if not central, feature of scientific discourse is the role of questioning in eliciting explanations, postulating theories, evaluating evidence, justifying reasoning, and clarifying doubts. Put simply, the act of questioning encourages learners to engage in critical reasoning. Given that asking questions is fundamental to science and scientific inquiry, the development of students' abilities to ask questions, reason, problem-solve, and think critically should, likewise, become a central focus of current science education reform." (Students' questions: a potential resource for teaching and learning science, p.2)

Resources:

- Next Generation Science Standards (NGSS)
- Taking Science To School
- A Framework for K-12 Science Education
- STEM Teaching Tool 31: How to launch STEM investigations that build on student and community interests and expertise
- STEM Teaching Tool 58: How can science instruction leverage and develop student interests?
- Christine Chin & Jonathan Osborne (2008) Students' questions: a potential resource for teaching and learning science, Studies in Science Education, 44:1, 1-39, DOI: 10.1080/03057260701828101

Indicator 1d Guiding Question:

Do the materials intentionally leverage students' prior knowledge and experiences related to phenomena or problems?

Evidence Collection

Review the student and teacher materials across the course.

Review the course scope and sequence.

Look for and record evidence to:

- Determine where the materials elicit students' prior knowledge and experience about phenomena and/or problems. Note how the student opportunities, teacher supports, and time and space provided by the

materials support this.
- Determine where the materials explicitly leverage students' prior knowledge and experience to make sense of phenomena and/or solve problems. Note how the student opportunities, teacher supports, and time and space provided by the materials support this.
- Determine where the materials provide guidance to support and address how student questions and ideas are considered and used to drive outcomes.
- Describe specific examples of designed learning experiences that elicit and leverage students' prior knowledge and experience to make sense of phenomena and/or solve problems.
- Describe specific examples of designed learning experiences that elicit student questions and ideas to move them from wondering and/or initial understanding to use of SEPs and/or CCCs to achieve outcomes.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:
- Do the materials elicit students' prior knowledge and experiences to allow for meaningful learning of phenomena and/or solving problems in a way that allows them to make connections between what they are learning and their own knowledge and experience?
- Do the materials take into account the reality that students will bring both productive and unproductive ideas and questions related to their experience, and do the materials support teachers with time, space, and/or teacher guidance to build from what students bring to the table?
- Do the materials accommodate different entry points to the learning of phenomena and/or solving problems?
- Do the materials provide opportunities for students to utilize their own experiences or knowledge related to the phenomena or problem as they develop explanations or solutions?
- Do the materials provide support for teachers around inviting and utilizing student questions to drive learning of phenomena and/or solving problems?

Gateway 1: Designed for NGSS

Criterion 1.1	Phenomena and Problems Drive Learning: Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.
Indicator 1e	Phenomena and/or problems drive individual lessons or activities using key elements of all three dimensions (also see indicator 1f).

Scoring:		
2 points • Materials consistently provide lessons or activities within the course that use phenomena or problems to drive student learning. AND • Materials consistently provide lessons or activities within the course that use phenomena or problems to engage with all three dimensions.	1 point • Materials provide multiple lessons or activities within the course that use phenomena or problems to drive student learning. AND • Materials provide multiple lessons or activities within the course that use phenomena or problems to engage with all three dimensions.	0 points • Materials provide no or few lessons or activities within the course that use phenomena or problems to drive student learning. OR • Materials provide no or few lessons or activities within the course that use phenomena or problems to engage with all three dimensions.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine if individual lessons or activities are designed to engage students in making sense of natural phenomena or solving design problems in meaningful ways.
- examines whether lessons and activities use phenomena or problems to drive instruction for the lesson or activity and connect student sensemaking to the three dimensions (DCIs, SEPs, CCCs).

Research or Standards connection:

Read information for Gateway 1, Criterion 1.

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts
- A Framework for K-12 Science Education

Indicator 1e Guiding Question:

Do phenomena and/or problems drive individual lessons or activities using key elements of all three dimensions?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine where phenomena and/or problems serve as a central component of the lesson or activity and are used to drive three-dimensional student learning.
- Describe the specific examples of lessons or activities that use phenomena and/or problems to drive student learning.
- Note any instances where phenomena and/or problems develop understanding of grade-band elements outside of those targeted by the lesson or activity objective(s).

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials include phenomena and problems at the lesson or activity level?
- Do the phenomena and/or problems in the lessons or activities serve as a central component (drive student learning) of learning and do students explain them through the application of targeted grade-appropriate SEPs, CCCs, and DCIs?
- Do the materials engage all students in learning experiences that connect phenomena and/or problems with the three dimensions and are not separated from the DCIs in earth/space, life, and/or physical science?
- Does student engagement of phenomena and/or problems develop understanding of just the DCIs, or does it also develop understanding and use of the CCC and SEP elements?
- Do the phenomena and/or problems engage students with elements identified in the learning objectives for the lesson or activity?

Gateway 1: Designed for NGSS

Criterion 1.1	Phenomena and Problems Drive Learning: Materials leverage science phenomena and engineering problems in the context of driving learning and student performance.
Indicator 1f	Materials embed phenomena or problems across multiple lessons for students to use and build knowledge of all three dimensions (also see indicator 1e).

Scoring:		
4 points • Materials consistently provide units, chapters, or learning modules across the course that use phenomena or problems to drive student learning across multiple lessons. AND • Materials consistently provide units, chapters, or learning modules across the course that use phenomena or problems to engage with all three dimensions across multiple lessons. AND • Materials consistently provide discourse opportunities for students to develop, evaluate, and revise their thinking as they figure out phenomena and define/solve problems.	2 points • Materials provide units, chapters, or learning modules across the course that use phenomena or problems to drive student learning across multiple lessons, but not consistently. AND • Materials provide units, chapters, or learning modules across the course that use phenomena or problems to engage with all three dimensions across multiple lessons, but not consistently. AND • Materials provide discourse opportunities for students to develop, evaluate, and revise their thinking as they figure out phenomena and define/solve problems, but not consistently.	0 points • Materials provide no or few units, chapters, or learning modules across the course that use phenomena or problems to drive student learning across multiple lessons. OR • Materials provide no or few units, chapters, or learning modules across the course that use phenomena or problems to engage with all three dimensions across multiple lessons. OR • Materials do not provide discourse opportunities for students to develop, evaluate, and revise their thinking as they figure out phenomena and define/solve problems.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine if units, chapters, or learning modules are designed to engage students in making sense of phenomena or solving design problems in meaningful ways, across multiple lessons.

- examines whether units, chapters, or learning modules containing multiple lessons use phenomena or problems to drive instruction for the unit and connect student sensemaking to the three dimensions (DCIs, SEPs, CCCs).
- examines the materials to determine if units, chapters, or learning modules provide discourse opportunities for students to develop, evaluate, and revise their thinking over time as they figure out phenomena and define/solve problems.

Research or Standards connection:

Read information for Gateway 1, Criterion 1.

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts
- A Framework for K-12 Science Education

Indicator 1f Guiding Question:

Do the materials embed phenomena or problems across multiple lessons for students to use and build knowledge of all three dimensions?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine where phenomena and/or problems are used in multiple lessons to drive three-dimensional student learning.
- Determine where the materials provide opportunities for students to develop, evaluate, and revise their thinking as they figure out phenomena and define/solve problems and whether these opportunities involve student discourse.
- Describe the specific examples of units, chapters, or learning modules that include phenomena and/or problems.
- Describe the specific examples of opportunities for students to engage in discourse to develop, evaluate, and revise their thinking across multiple lessons.
- Note any instances where phenomena and/or problems develop understanding of grade-band elements outside of those targeted by the unit or lesson objective(s).

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials include phenomena and problems at the unit, chapter, or learning module level?

- Do the phenomena and/or problems set out for the learning sequences serve as a central component (drive student learning) of learning across multiple lessons and/or activities and can they be explained through the application of targeted grade-band appropriate SEPs, CCCs, and DCIs?
- Do the materials engage all students in learning experiences that connect phenomena and/or problems with the three dimensions and are not separated from the DCIs in earth/space, life, and/or physical science?
- Does student engagement of phenomena and/or problems develop knowledge and use of just the DCIs, or does it also develop knowledge and use of CCC and SEP elements?
- Do the materials provide opportunities for students to engage in discourse as they develop, evaluate, and revise their thinking over time as they figure out phenomena and define/solve problems?
- Do the phenomena and/or problems engage students with elements identified in the learning objectives for the unit or lessons?

Gateway 1: Designed for NGSS

Criterion 1.2

Three-Dimensional Learning

Materials are designed for three-dimensional learning and assessment.

What is the purpose of this Criterion?

This criterion focuses on the three dimensions being integrated into learning experiences and also assessment tasks. For assessment tasks, one purpose is to see if and how assessments are designed to determine what students have achieved and the other is to determine if and how assessments are designed to guide the instructional process. It is important to note that prior knowledge and experience are related topics that are covered in indicators 1c and 1h. Further, there is a category around general assessment in Gateway 3, Criterion 2: Assessment that focuses on supports and design of materials for using assessments, scoring, and ensuring equity. Three-dimensional learning is also examined in Gateway 1, Criterion 1 and Gateway 2, Criterion 1.

This criterion

- supports the NGSS innovation related to integration of the three dimensions in learning experiences for students.
- examines the materials for clear and accurate learning objectives related to three-dimensional instruction and assessment.
- examines the materials to determine if assessments integrate the three dimensions.
- examines the materials to determine how assessments are structured (formative/summative).

Research Connection

See the individual indicators for relevant research connections.

Scoring:

Meets Expectations	Partially Meets Expectations	Does Not Meet Expectations
• 17-20 points	• 10-16 points	• <10 points

Gateway 1: Designed for NGSS

Criterion 1.2	Three-Dimensional Learning: Materials are designed for three-dimensional learning and assessment.
Indicator 1g	Materials are designed to integrate the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs) into student learning. 1g.i. Materials consistently integrate the three dimensions in student learning opportunities. 1g.ii. Materials consistently support meaningful student sensemaking with the three dimensions. 1g.iii. Materials clearly represent three-dimensional learning objectives within the learning sequences.

1g.i Scoring:		
4 points • Throughout the course, learning sequences consistently include three dimensions and consistently integrate SEPs, CCCs, and DCIs in student learning opportunities.	2 points • Throughout the course, some learning sequences include three dimensions and consistently integrate SEPs, CCCs, and DCIs in student learning opportunities.	0 points • Throughout the course, few to no learning sequences include three dimensions and consistently integrate SEPs, CCCs, and DCIs in student learning opportunities.
1g.ii Scoring:		
4 points • Materials are designed for SEPs and CCCs to meaningfully support student sensemaking with the other dimensions in nearly all learning sequences.	2 points • Materials are designed for SEPs or CCCs to meaningfully support student sensemaking with the other dimensions in nearly all learning sequences. OR • Materials are designed for SEPs and CCCs to meaningfully support sensemaking with the other dimensions, but not consistently.	0 points • Materials are designed for SEPs and/or CCCs to meaningfully support student sensemaking with the other dimensions in few to no instances.
1g.iii Scoring:		

4 points	2 points	0 points
• Throughout the course, the materials consistently provide element-level three-dimensional learning objectives and consistently provide opportunities for students to use and develop the respective three dimensions.	• Throughout the course, the materials consistently provide element-level three-dimensional learning objectives and provide opportunities for students to use and develop the respective three dimensions, but not consistently. OR • Throughout the course, the materials provide three-dimensional learning objectives that are not consistently at the element level and provide opportunities for students to use and develop the respective three dimensions, but not consistently.	• Throughout the course, three dimensional learning objectives are not present. OR • Throughout the course, the materials provide three-dimensional learning objectives and provide few to no opportunities for students to use and develop the respective three dimensions.

About this indicator:

What is the purpose of this Indicator?

This indicator

- supports the Next Generation Science Standards (NGSS) innovation related to integration of the three dimensions in learning experiences for students.
- examines the materials to determine if individual lessons or activities are designed including the three dimensions.
- examines the materials to determine if learning sequences (collections of lessons or activities) are designed to integrate the three dimensions.
- examines the materials to determine if learning sequences are designed to support student sensemaking of the three dimensions.
- examines the materials to determine if there is a clear connection between the three dimensional learning objectives and the learning sequences.
- does not look for exact matches of designed learning experiences to the performance expectations.

Research or Standards connection:

“Each NGSS standard integrates one specific SEP, CCC, and DCI into a performance expectation that details what students should be proficient in by the end of instruction. In past standards the separation of skills and knowledge often led to an emphasis (in both instruction and assessment) on science concepts and an omission of inquiry and practices. It is important to note that the NGSS performance expectations do not specify or limit the intersection of the three dimensions in classroom instruction. Multiple SEPs, CCCs, and DCIs that blend and work together in several contexts will be needed to help students build toward competency in the targeted performance expectations. For example, if the end goal (the performance expectation) for students is to plan an

investigation to determine the causes and effects of plant growth (2-LS2-1), they can build toward this goal through asking good questions about patterns that they have seen in plant growth and engaging in argument about what kinds of data would be important to collect in an investigation to answer these questions.

It should also be noted that one performance expectation should not be equated to one lesson. Performance expectations define the three-dimensional learning expectations for students, and it is unlikely that a single lesson would provide adequate opportunities for a student to demonstrate proficiency in every dimension of a performance expectation. A series of high-quality lessons or a unit in a program are more likely to provide these opportunities." (2015 Achieve NGSS Innovations, pp. 1-2)

"The performance expectations in the NGSS are targets for assessment. For students to achieve such performances, they will need regular opportunities to engage in learning that blend all three dimensions of the standards throughout their classroom experiences, from kindergarten through high school (K-12)." (Guide to Implementing the Next Generation Science Standards, p. 25)

"To capture the vision in the Framework, students should be assessed on the extent to which they have achieved a coherent scientific worldview by recognizing similarities among core ideas in science or engineering that may at first seem very different, but are united through crosscutting concepts." (NGSS Appendix G: Crosscutting Concepts, p. 3)

"...the framework and its resulting standards have a number of implications for implementation, one of which involves the need for curricular and instructional materials that embody all three dimensions: scientific and engineering practices, crosscutting concepts, and disciplinary core ideas." (A Framework for K-12 Science Education, p. 316)

"...learning about science and engineering involves integration of the knowledge of scientific explanations (i.e., content knowledge) and the practices needed to engage in scientific inquiry and engineering design. Thus the framework seeks to illustrate how knowledge and practice must be intertwined in designing learning experiences in K–12 science education." (A Framework for K-12 Science Education, p. 11)

"The framework is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields." (A Framework for K-12 Science Education, p. 10)

"That is, during instruction, students' engagement in the practices should always occur in the context of a core idea and, when possible, should also connect to crosscutting concepts. Both practices and crosscutting ideas are viewed as tools for addressing new problems as well as topics for learning in themselves. Students need to experience the use of these tools in multiple contexts in order to develop the capacity to wield them flexibly and effectively in new problem contexts—an important goal of science learning (National Research Council, 2000, 2007)." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 31)

"Curricula based on the framework and resulting standards should integrate the three dimensions—scientific and engineering practices, crosscutting concepts, and disciplinary core ideas—and follow the progressions articulated in this report." (A Framework for K-12 Science Education, p. 246)

"No matter the scope of the ultimate learning goals, it is important that they accurately indicate *what students actually learn* in the materials. This match allows teachers to have accurate expectations of student learning in each lesson as well as to be confident that the lesson will contribute to the overall program that gives students

sufficient opportunities to reach or exceed all parts of the standards." (Critical Features of Instructional Materials Design for Today's Science Standards, p. 6)

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts
- A Framework for K-12 Science Education
- Guide to Implementing the Next Generation Science Standards
- Developing Assessments for the Next Generation Science Standards, BOTA Report
- 2015 Achieve NGSS Innovations

Indicator 1g Guiding Question:

Are the materials designed to integrate the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs) into student learning?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

1g.i

- Determine where students "actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields." (A Framework for K-12 Science Education, p. 10)
  - within learning opportunities (individual lessons, activities, or investigations) throughout the course
  - within each learning sequence (multiple related lessons, activities) throughout the course
- Determine where meaningful and intentional presence of two-dimensional integration of SEPs and DCIs, CCCs and DCIs, or CCCs and SEPs occurs. Meaningful and intentional integration of SEPs are usually easier to find than CCCs and can often be found in singular lessons or activities. Sometimes the presence of a CCC doesn't arise until across multiple activities or lessons in a learning sequence.
- Describe the specific examples of units, learning sequences, and lessons or activities that include integrated dimensions, across the course, whether two-dimensional or three-dimensional.

1g.ii

- Determine where meaningful and intentional use of three-dimensional integration of SEPs, CCCs, and DCIs occurs and where all three dimensions support student sensemaking.
- Provide a summary of how the students engage in the three dimensions and whether the three dimensions are meaningfully integrated to support student sensemaking; reference the unit, lesson or activity.

1g.iii

- Determine where there is a match between the learning goals and what students are actually asked to do in learning activities and sequences.

- Describe the specific examples of learning objectives that show the three dimensions and if and how element-level specificity is present.
- Describe the specific examples of clear connections of learning objectives to specific learning sequences; reference the lessons or activities that illustrate student opportunity to use all three dimensions.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

1g.i

- Do the materials engage all students in learning opportunities (at least one per learning sequence) that integrate all three dimensions in meaningful ways?
- Which SEP elements are present and focal? Are students actually engaging with the SEP element?
- Which CCC elements are present and focal? Are students actually engaging with the CCC element?
- Which DCI elements are present and focal? Are students actually engaging with the DCI element?
- To what degree of frequency does the course focus on integration of three dimensions, and at what level (unit, learning sequence, and/or lesson/activity)?
- Are the materials designed for students to actively engage in the SEPs and CCCs to deepen understanding and use of DCIs?

1g.ii

- Do the materials support students' intentional and meaningful use of all three dimensions to support sensemaking?
- Which SEP elements are present and how do students apply/use them to build and use DCIs and/or CCCs?
- Which CCC elements are present and how do students apply/use them to build and use DCIs and/or SEPs?

1g.iii

- Are three-dimensional learning objectives present? If so, do they detail element-level specificity?
- To what degree is there a clear connection between the three-dimensional learning objectives and what students are actually asked to do in learning sequences?

Gateway 1: Designed for NGSS

Criterion 1.2	Three-Dimensional Learning: Materials are designed for three-dimensional learning and assessment.
Indicator 1h	Materials are designed to elicit direct, observable evidence for three-dimensional learning.

Scoring:

4 points	2 points	0 points
• Materials consistently provide three-dimensional learning objectives at the lesson level that build toward the three-dimensional objectives of the larger learning sequence. AND • Lessons and units have assessment tasks that are consistently designed to reveal student knowledge and use of the three dimensions to support the targeted three-dimensional learning objectives. AND • Lessons and units consistently incorporate tasks for purposes of supporting the instructional process.	• Materials consistently provide three-dimensional learning objectives at the lesson level that build toward the three-dimensional objectives of the larger learning sequence. AND • Lessons and units have assessment tasks that are designed to reveal student knowledge and use of the three dimensions to support the targeted three-dimensional learning objectives, but not consistently. AND • Lessons and units incorporate tasks for purposes of supporting the instructional process, but not consistently.	• Materials provide few or no three-dimensional learning objectives at the lesson level that build toward the three-dimensional objectives of the larger learning sequence. OR • Few or no lessons and units have assessment tasks that are designed to reveal student knowledge and use of the three dimensions to support the targeted three-dimensional learning objectives. OR • No lessons and units incorporate tasks for purposes of supporting the instructional process.

About this indicator:

What is the purpose of this Indicator?

This indicator
- examines whether the materials elicit evidence for students' three-dimensional learning of the targeted three-dimensional learning objectives.
- elicits student understanding of the three dimensions to guide the instructional process.

Boundaries with other indicators:

- Gateway 3, Criterion 2: Assessment is a criterion focused around assessment supports, like scoring and interpreting assessment information. Indicator 1h does not address how materials are designed to support interpretation of student responses.
- Indicators 1d & 1h: Prior knowledge and experience are related topics that are covered in indicator 1d which targets leveraging students' prior knowledge and experience. Indicator 1h addresses whether the materials are designed to support instructional response to evidence collected through the formative process, but does not evaluate the quality of those supports.
- Indicators 1i & 1h: Indicator 1i deals with three-dimensional summative assessment. Indicator 1h focuses on aspects of three-dimensional formative assessment.

Research or Standards connection:

"Assessments used for formative purposes occur during the course of a unit of instruction and may involve both formal tests and informal activities conducted as part of a lesson. They may be used to identify students' strengths and weaknesses, assist educators in planning subsequent instruction, assist students in guiding their own learning by evaluating and revising their own work, and foster students' sense of autonomy and responsibility for their own learning (Andrade and Cizek, 2010, p. 4)." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 84)

"Assessment tasks, in turn, have to be designed to provide evidence of students' ability to use the practices, to apply their understanding of the crosscutting concepts, and to draw on their understanding of specific disciplinary ideas, all in the context of addressing specific problems." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 32)

"Assessment designers are faced with the challenge of finding a balance among three competing priorities: (1) using assessment as a tool for supporting and promoting an ambitious vision for all students, (2) obtaining accurate measures of what students have actually learned, and (3) supporting equity of opportunity for disadvantaged students." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 27)

"The key difference between assessments used for formative purposes and those used for summative purposes is in how the information they provide is to be used: to guide and advance learning (usually while instruction is under way) or to obtain evidence of what students have learned for use beyond the classroom (usually at the conclusion of some defined period of instruction). Whether intended for formative or summative purposes, evidence gathered in the classroom should be closely linked to the curriculum being taught. This does not mean that the assessment must use the formats or exactly the same material that was presented in instruction, but rather that the assessment task should directly address the concepts and practices to which the students have been exposed." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 85)

"CONCLUSION 2-1 Measuring the three-dimensional science learning called for in the Framework and the Next Generation Science Standards requires assessment tasks that examine students' performance of scientific and engineering practices in the context of crosscutting concepts and disciplinary core ideas. To adequately cover the three dimensions, assessment tasks will generally need to contain multiple components (e.g., a set of interrelated questions). It may be useful to focus on individual practices, core ideas, or crosscutting concepts in the various components of an assessment task, but, together, the components need to support inferences about students' three-dimensional science learning as described in a given performance expectation." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 44)

"CONCLUSION 2-4 Effective evaluation of three-dimensional science learning requires more than a one-to-one mapping between the Next Generation Science Standards (NGSS) performance expectations and assessment

tasks. More than one assessment task may be needed to adequately assess students' mastery of some performance expectations, and any given assessment task may assess aspects of more than one performance expectation. In addition, to assess both understanding of core knowledge and facility with a practice, assessments may need to probe students' use of a given practice in more than one disciplinary context. Assessment tasks that attempt to test practices in strict isolation from one another may not be meaningful as assessments of the three-dimensional science learning called for by the NGSS." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 46)

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts
- A Framework for K-12 Science Education
- Developing Assessments for the Next Generation Science Standards, BOTA Report

Indicator 1h Guiding Question:

Are the materials designed to elicit direct, observable evidence for three-dimensional learning?

Evidence Collection

Review the units, chapters, and lessons and associated formative assessment tasks in both student and teacher materials across the course.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine whether the materials provide learning objectives at the lesson level and whether the objectives build towards three-dimensional objectives for the larger learning sequence.
- Determine whether the assessments obtain accurate measures of what students are learning to guide the instructional process.
  - Compare to the instructional objective and the associated three dimensions.
- Determine how the formative assessment process is included to provide diagnostic feedback to teachers and students during the course of instruction.
- Document when and how formative assessment processes contain multiple-component tasks (e.g., a set of interrelated questions) incorporating three dimensions.
  - Individual SEPs, DCIs, or CCCs may individually be present in each of the various components of an assessment task within the formative process, but, together, they help diagnose what students know and can do at the intersection of the three dimensions, related to the targeted learning objective.
  - Do not look only at single items, but at the collection of formative processes and tasks throughout each learning sequence. Evidence should characterize the larger picture and focus on the formative assessment tasks across the sequence, not just evaluating single tasks.

Note:

- Do not focus on supports for interpreting assessments or for informing instruction, as these are covered in the examination of the assessment system in Gateway 3, Criterion 2.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials provide learning objectives at the lesson level?
- Are the lesson objectives three-dimensional? Do they build to three-dimensional objectives for the larger learning sequence?
- Which types of assessments are used to support the formative process? Where are they present? Are they always consistent in form and function, or do they vary?
- Are the assessment tasks within the formative process designed with the three dimensions included within and across multiple components?
- Are the assessment tasks within the formative process connected to the learning objectives for the unit?
- How does the formative assessment process provide diagnostic feedback to teachers and students during the course of instruction? What guidance is provided to support the instructional process?

Gateway 1: Designed for NGSS

Criterion 1.2	Three-Dimensional Learning: Materials are designed for three-dimensional learning and assessment.
Indicator 1i	Materials are designed to elicit direct, observable evidence of three-dimensional learning. 1i.i. Materials are designed to elicit direct, observable evidence of three-dimensional learning. 1i.ii. Materials are designed to incorporate three-dimensional performance tasks.

1i.i Scoring:		
2 points • Materials consistently provide three-dimensional learning objectives for the learning sequence. AND • Summative tasks are consistently designed to measure student achievement of the targeted three-dimensional learning objectives.	1 point • Materials consistently provide three-dimensional learning objectives for the learning sequence. AND • Summative tasks are designed to measure student achievement of the targeted three-dimensional learning objectives, but not consistently.	0 points • Materials provide three-dimensional learning objectives for the learning sequence, but not consistently. OR • Few to no summative assessment tasks are three-dimensional in design. OR • Few to no summative assessment tasks connect to the targeted three-dimensional learning objectives.
1i.ii Scoring:		
2 points • Materials consistently provide performance tasks that are focused on figuring out uncertain phenomena or problems. AND • Tasks are two- or three-dimensional in nature.	1 point • Materials provide performance tasks that are focused on figuring out uncertain phenomena or problems, but not consistently. AND • Tasks are two- or three-dimensional in nature.	0 points • Materials do not provide performance tasks that are focused on figuring out uncertain phenomena or problems.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines whether the materials are designed to elicit evidence of three-dimensional learning of the targeted three-dimensional learning objectives.
- determines the presence of three-dimensional performance tasks that are connected to the three-dimensional learning objectives and support students in using prior learning experiences to figure out phenomena or problems.

Research or Standards connection:

“CONCLUSION 4-1 Tasks designed to assess the performance expectations in the Next Generation Science Standards will need to have the following characteristics:

- multiple components that reflect the connected use of different scientific practices in the context of interconnected disciplinary ideas and crosscutting concepts;” (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 130)

“RECOMMENDATION 4-2 Curriculum developers, assessment developers, and others who create resource materials aligned to the science framework and the Next Generation Science Standards should ensure that assessment activities included in such materials (such as mid- and end-of-chapter activities, suggested tasks for unit assessment, and online activities) require students to engage in practices that demonstrate their understanding of core ideas and crosscutting concepts.” (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 131)

“The goal of learning goes beyond student performance in the classroom. Students need opportunities to build proficiencies that will serve as tools to help them solve problems in the real world and make sense of phenomena in everyday life. These tools are most effective when students know about them explicitly. Therefore, one goal of high-quality materials is to help students build an explicit understanding of what they are learning and how it can be applied to other situations.” (Critical Features of Instructional Materials Design for Today’s Science Standards, p. 25)

“If students are asked to address the same (or highly similar) phenomena and problems repeatedly, over time the connections between ideas require less figuring out and become increasingly rote. Eventually, that whole experience becomes one that students can leverage as a schema or an understanding that they have figured out, and can connect with others to figure out new phenomena and problems.” (Task Annotation Project in Science: Sense-Making, p. 2)

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts
- A Framework for K-12 Science Education
- Developing Assessments for the Next Generation Science Standards, BOTA Report
- Critical Features of Instructional Materials Design for Today’s Science Standards
- Task Annotation Project in Science
- Science Assessment Task Screening Tools

Indicator 1i Guiding Question:

Are the materials designed to elicit direct, observable evidence of three-dimensional learning?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

1i.i

- Determine whether the materials provide learning objectives at the larger learning sequence or unit level and whether the objectives are three dimensional.
- Determine whether the summative assessment tasks obtain accurate measures of what students learned.
  - Compare to the objectives and the elements of the three dimensions within each objective.
  - Determine whether each claimed element in the assessment target is required to complete the task.
- Document when and how summative assessments contain multiple component tasks (e.g., a set of interrelated questions) incorporating three dimensions
  - Individual SEPs, DCIs, or CCCs may individually be present in each of the various components of an assessment task within the summative process, but together, they help assess what students know and can do at the intersection of the three dimensions, related to the targeted learning objective.
  - Do not look only at single items, but at the collection of summative processes and tasks throughout each unit. Evidence should characterize the larger picture and focus on the summative assessment tasks across the sequence, not just evaluating single tasks.

1i.ii

- Document when and how the materials include performance tasks as part of the summative assessment system.
- Document when and how the materials provide students the opportunity to apply their learning to an uncertain phenomenon or problem. “When considering whether the scenario creates a need to know for students, consider whether the scenario makes the uncertainty associated with explaining a phenomenon or solving a problem central, in ways that are likely to 1) connect with students’ own experiences or knowledge, and 2) connect to disciplinary core ideas (regardless of whether those ideas are explicitly named or required by the task).” (Achieve Task Screener, p. 4)
- Document when and how the materials support teachers and students in leveraging prior learning experiences, making thinking visible, and finding meaning in the task.

Note:

- Do not pull evidence for items addressing objectives outside of the grade-band three dimensions.
- Do not focus on supports for interpreting assessments, as these are covered in the examination of the assessment system in Gateway 3, Criterion 2.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

1i.i

- Are unit objectives present and three dimensional? Which elements are targeted in each objective?

- Which types of summative assessments are used to determine student achievement (performance tasks, multiple choice questions, written/constructed responses, etc.)? Where are they present? Are they always consistent in form and function or do they vary?
- Are the individual SEPs, DCIs, and CCCs present in the summative assessment task(s)?
- Are the summative assessments designed with the three dimensions included within and across multiple components?
- Are the summative assessment tasks connected to the learning objectives for the unit? Do the summative tasks assess all of the elements within the unit objectives?
- Are summative assessment tasks present that are designed to integrate the three dimensions for specific performance expectations (PEs) or objectives?
- Do summative assessments directly assess the PEs/objectives or are grade-band elements of each dimension assessed independently of the PE/objective throughout the course?

1i.ii

- Which assessments contain performance tasks? In which units are they located?
- Of the performance tasks identified, how many are two- or three-dimensional?
- Of the performance tasks identified, how many support students to figure out a phenomenon or problem?
- Across the performance tasks identified, how do they provide opportunities for students to make their thinking visible and leverage prior learning?

Gateway 2: Coherence & Scope

Criterion 2.1

Coherence and Full Scope of the Three Dimensions

Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.

What is the purpose of this Criterion?

"The Framework's vision is that students will acquire knowledge and skill in science and engineering through a carefully designed sequence of learning experiences. Each stage in the sequence will develop students' understanding of particular scientific and engineering practices, crosscutting concepts, and disciplinary core ideas while also deepening their insights into the ways in which people from all backgrounds engage in scientific and engineering work to satisfy their curiosity, seek explanations about the world, and improve the built world." (A Framework for K-12 Science Education, p. 247)

"Students also develop their understanding of the DCIs by engaging in the SEPs and applying the CCCs. These three dimensions are tools that students can acquire and use to answer questions about the world around them and to solve design problems." (2015 Achieve NGSS Innovations, p. 2)

The NGSS were designed in a coherent manner with progressions for each dimension building from grades K-12. The progressions for the DCIs, CCCs, and SEPs are displayed in separate appendices for the NGSS (appendices E, F, and G, respectively). The progressions appendices for high school showcase the end of grade-band expectation for each dimension. Since the progressions are grade-banded, materials can be developed in a variety of ways including a range of learning progressions that can occur in various grades/courses that may or may not build toward the end of grade-band expectation. Therefore, it is important for a review to examine how materials are designed to purposefully build student's knowledge and use of each dimension for a single grade/course to support districts in their standards alignment examination across grades/courses. This is an important consideration as school districts work towards ensuring all students have the opportunity to learn all standards.

This criterion

- examines the materials to determine the extent that students are engaged in learning coherent, accurate, and grade-band appropriate science.
- examines the materials to determine the extent that the claimed disciplinary core ideas are included within the course.
- examines the materials to determine the extent that the claimed science and engineering practices are included within the course.
- examines the materials to determine the extent that the claimed crosscutting concepts are included within the course.

Research Connection

"To develop a thorough understanding of scientific explanations of the world, students need sustained opportunities to work with and develop the underlying ideas and to appreciate those ideas' interconnections

over a period of years rather than weeks or months... This sense of development has been conceptualized in the idea of learning progressions... If mastery of a core idea in a science discipline is the ultimate educational destination, then well-designed learning progressions provide a map of the routes that can be taken to reach that destination. Such progressions describe both how students' understanding of the idea matures over time and the instructional supports and experiences that are needed for them to make progress. Learning progressions may extend all the way from preschool to 12th grade and beyond—indeed, people can continue learning about scientific core ideas their entire lives. Because learning progressions extend over multiple years, they can prompt educators to consider how topics are presented at each grade level so that they build on prior understanding and can support increasingly sophisticated learning. Hence, core ideas and their related learning progressions are key organizing principles for the design of the framework." (A Framework for K-12 Science Education, p. 28)

"The NGSS provide for sustained opportunities from elementary through high school for students to engage in and develop a progressively deeper understanding of each of the three dimensions. Students require coherent learning progressions both within a grade level and across grade levels so they can continually build on and revise their knowledge to expand their understanding of each of the three dimensions by grade 12." (2015 Achieve NGSS Innovations, p. 3)

"...K-12 science and engineering education should focus on a limited number of disciplinary core ideas and crosscutting concepts, be designed so that students continually build on and revise their knowledge and abilities over
multiple years, and support the integration of such knowledge and abilities with the practices needed to engage in scientific inquiry and engineering design." (A Framework for K-12 Science Education, p. 2)

"A coherent and consistent approach throughout grades K-12 is key to realizing the vision for science and engineering education embodied in the Framework: that students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of each field's disciplinary core ideas." (A Framework for K-12 Science Education, p. 2)

"Every science unit or engineering design project must have as one of its goals the development of student understanding of at least one disciplinary core idea. In addition, explicit reference to each crosscutting concept will recur frequently and in varied contexts across disciplines and grades. These concepts need to become part of the language of science that students use when framing questions or developing ways to observe, describe, and explain the world." (A Framework for K-12 Science Education, p. 247)

Scoring:

Meets Expectations	Partially Meets Expectations	Does Not Meet Expectations
• 28-32 points	• 16-27 points	• <16 points

Gateway 2: Coherence & Scope

Criterion 2.1	Coherence and Full Scope of the Three Dimensions: Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.
Indicator 2a	Materials provide opportunities for students to fully learn and develop all claimed grade-band Disciplinary Core Ideas.

Scoring:		
8 points • Materials provide opportunities for students to fully learn and develop nearly all claimed grade-band DCI elements.	4 points • Materials provide opportunities for students to fully learn and develop most of the claimed grade-band DCI elements.	0 points • Materials provide opportunities for students to learn and develop few to none of the claimed grade-band DCI elements.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine if all claimed grade-band DCIs and their elements are included in the course.

Research or Standards connection:

"Conclusion 5: Proficiency in science involves having knowledge of facts and concepts as well as how these ideas and concepts are related to each other. Thus, to become more expert in science, students need to learn key ideas and concepts, how they are related to each other, and their implications and applications within the discipline. This entails a process of conceptual development that in some cases involves large-scale reorganization of knowledge and is not a simple accumulation of information. " (Taking Science to School pp. 338-339)

“An education focused on a limited set of ideas and practices in science and engineering should enable students to evaluate and select reliable sources of scientific information and allow them to continue their development well beyond their K-12 school years as science learners, users of scientific knowledge, and perhaps also as producers of such knowledge.” (A Framework for K-12 Science Education, p. 31)

“In organizing Dimension 3, we grouped disciplinary ideas into four major domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology, and applications of science. At the same time, true to Dimension 2, we acknowledge the multiple connections among domains. Indeed, more and more frequently, scientists work in interdisciplinary teams that blur traditional boundaries. As a consequence, in some instances core ideas, or elements of core ideas, appear in several disciplines (e.g., energy, human impact on the planet).” (A Framework for K-12 Science Education, p. 31).

"...by building a strong base of core knowledge and competencies, understood in sufficient depth to be used, students will leave school better grounded in scientific knowledge and practices—and with greater interest in further learning in science—than when instruction "covers" multiple disconnected pieces of information that are memorized and soon forgotten once the test is over." (A Framework for K-12 Science Education, pp. 32-33)

Resources:

- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education
- Taking Science To School
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix I: Engineering Design in the NGSS
- NGSS Appendix J: Science, Technology, Society, and the Environment

Indicator 2a Guiding Question:

Do the materials provide opportunities for students to fully learn and develop all claimed grade-band Disciplinary Core Ideas (DCIs)?

Evidence Collection

Review the units, chapters and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine where claims are located within the materials and how close they are to element-level claims (document whether full or partial elements). If claims are made above the element level, all elements for that target (PE, component, sub-idea, etc.) are claimed.
- Determine where students develop grade-band understanding of each of the claimed DCIs and their components (PS, LS, ESS and/or ETS DCIs). Note if the claim is fully met, partially met, or not met by the materials.
- Determine where DCIs connect across lessons and units in a way that allows students to use and build DCI-related knowledge to reach grade-band expectations.
- Describe the specific examples of lessons or activities that include each claimed DCI and associated elements.

Cluster Meeting

Discuss and answer the following question to support consensus scoring conversations:

- Do the materials incorporate all of the claimed grade-band DCI elements?

Gateway 2: Coherence & Scope

Criterion 2.1	Coherence and Full Scope of the Three Dimensions: Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.
Indicator 2b	Materials provide opportunities for students to fully learn and develop all claimed grade-band Science and Engineering Practices.

Scoring:		
8 points • Materials provide opportunities for students to fully learn and develop nearly all claimed grade-band SEP elements. AND • Materials provide multiple and repeated opportunities for students to use claimed grade-band appropriate SEPs across various contexts throughout the course.	4 points • Materials provide opportunities for students to fully learn and develop most of the claimed grade-band SEP elements. AND • Materials provide multiple and repeated opportunities for students to use claimed grade-band appropriate SEPs across various contexts throughout the course.	0 points • Materials provide opportunities for students to learn and develop few to none of the claimed grade-band SEP elements. OR • Materials include numerous elements of SEPs from below the grade-band without connecting to the grade-band appropriate claimed SEPs.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine if the claimed grade-band appropriate SEPs and their associated elements are included in the course.
  - Asking questions and defining problems
  - Developing and using models
  - Planning and carrying out investigations
  - Analyzing and interpreting data
  - Using mathematics and computational thinking
  - Constructing explanations and designing solutions
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Connections to Nature of Science associated with the SEPs
- examines the materials to determine if multiple and repeated opportunities with the claimed grade-band SEPs are provided.
- examines the materials to determine if SEPs from outside of the grade-band are included within the course.

Research or Standards connection:

“Engaging in the practices of science helps students understand how scientific knowledge develops; such direct involvement gives them an appreciation of the wide range of approaches that are used to investigate, model, and explain the world. Engaging in the practices of engineering likewise helps students understand the work of engineers, as well as the links between engineering and science. Participation in these practices also helps students form an understanding of the crosscutting concepts and disciplinary ideas of science and engineering; moreover, it makes students’ knowledge more meaningful and embeds it more deeply into their worldview.” (A Framework for K-12 Science Education, p. 42)

“Although not every such practice will occur in every context, the curriculum should provide repeated opportunities across various contexts for students to develop their facility with these practices and use them as a support for developing deep understanding of the concepts in question and of the nature of science and of engineering.” (A Framework for K-12 Science Education, p. 247)

“Students in grades K-12 should engage in all eight practices over each grade band. All eight practices are accessible at some level to young children; students’ abilities to use the practices grow over time. However, the NGSS only identifies the capabilities students are expected to acquire by the end of each grade band (K-2, 3-5, 6-8, and 9-12). Curriculum developers and teachers determine strategies that advance students’ abilities to use the practices.” (NGSS Appendix F, p. 2)

“Additionally, eight understandings with appropriate grade-level outcomes are included as extensions of the science and engineering practices and crosscutting concepts, not as a fourth dimension of standards.” (NGSS Appendix H, p. 1)

“There is a broad consensus that these two core ideas belong in the NGSS but a majority of state teams recommended that these ideas could best be illustrated through their connections to the natural science disciplines. There are a number of performance expectations that require students to demonstrate not only their understanding of a core idea in natural science, but also how that idea is supported by evidence derived from certain technological advances. The connection between these core ideas and specific performance expectations is shown in the crosscutting concept foundation box.” (NGSS Appendix J, p. 3)

Resources:

- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education
- Codes for NGSS Elements
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix H: Nature of Science
- NGSS Appendix J: Science, Technology, Society, and the Environment

Indicator 2b Guiding Question:

Do the materials provide opportunities for students to fully learn and develop all claimed grade-band Science and Engineering Practices (SEPs)?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine where claims are located within the materials and how close they are to element-level claims (document whether full or partial elements). If claims are made above the element level, all elements for that target (PE, component, sub-idea, etc.) are claimed.
- Determine when and where students develop and use claimed grade-band appropriate SEPs and their elements, including Nature of Science topics connected to the SEPs. Note if the claim is fully met, partially met, or not met by the materials.
- Describe the specific examples of lessons or activities across the course to detail incorporation of all claimed grade-band SEPs and associated elements, including Nature of Science topics connected to the SEPs.
- Determine how students repeatedly use grade-band appropriate SEPs across various contexts within the course.
- Detail how the claimed SEPs are organized. Note how the SEPs build and connect across the course (to support the narrative report).

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials incorporate the claimed grade-band appropriate SEPs, including Nature of Science topics connected to the SEPs?
- Do the materials provide repeated opportunities for students to use the claimed grade-band SEPs across various contexts throughout the course?
- To what extent do the materials incorporate SEP elements from below the grade-band?

Gateway 2: Coherence & Scope

Criterion 2.1	Coherence and Full Scope of the Three Dimensions: Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.
Indicator 2c	Materials provide opportunities for students to fully learn and develop all claimed grade-band Crosscutting Concepts.

Scoring:		
8 points ● Materials provide opportunities for students to fully learn and develop nearly all claimed grade-band CCC elements. AND ● Materials provide multiple and repeated opportunities for students to use claimed grade-band appropriate CCCs across various contexts throughout the course.	4 points ● Materials provide opportunities for students to fully learn and develop most of the claimed grade-band CCC elements. AND ● Materials provide multiple and repeated opportunities for students to use claimed grade-band appropriate CCCs across various contexts throughout the course.	0 points ● Materials provide opportunities for students to learn and develop few to none of the claimed grade-band CCC elements. OR ● Materials include numerous elements of CCCs from below the grade-band without connecting to the grade-band appropriate claimed CCCs.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines the materials to determine if the claimed grade-band appropriate CCCs and their associated elements are included in the course.
  - Patterns
  - Cause and effect: Mechanism and explanation
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter
  - Structure and function
  - Stability and change
  - Connections to Nature of Science associated with the CCCs
  - Connections to Science, Technology, Society, and the Environment (STSE) associated with the CCCs
- examines the materials to determine if multiple and repeated opportunities with the claimed grade-band CCCs are provided.
- examines the materials to determine if CCCs from outside of the grade band are included within the course.

Research or Standards connection:

"...[Crosscutting concepts] bridge disciplinary boundaries, having explanatory value throughout much of science and engineering. These crosscutting concepts were selected for their value across the sciences and in engineering. These concepts help provide students with an organizational framework for connecting knowledge from the various disciplines into a coherent and scientifically based view of the world." (A Framework for K-12 Science Education, p. 83)

"Additionally, eight understandings with appropriate grade-level outcomes are included as extensions of the science and engineering practices and crosscutting concepts, not as a fourth dimension of standards." (NGSS Appendix H, p. 1)

"There is a broad consensus that these two core ideas belong in the NGSS but a majority of state teams recommended that these ideas could best be illustrated through their connections to the natural science disciplines. There are a number of performance expectations that require students to demonstrate not only their understanding of a core idea in natural science, but also how that idea is supported by evidence derived from certain technological advances. The connection between these core ideas and specific performance expectations is shown in the crosscutting concept foundation box." (NGSS Appendix J, p. 3)

Resources:

- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education
- Codes for NGSS Elements
- NGSS Appendix G: Crosscutting Concepts
- NGSS Appendix H: Nature of Science
- NGSS Appendix J: Science, Technology, Society, and the Environment

Indicator 2c Guiding Question:

Do the materials provide opportunities for students to fully learn and develop all claimed grade-band Crosscutting Concepts (CCCs)?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine where claims are located within the materials and how close they are to element-level claims (document whether full or partial elements). If claims are made above the element level, all elements for that target (PE, component, sub-idea, etc.) are claimed.
- Determine when and where students develop and use claimed grade-band appropriate CCCs and their elements, including Nature of Science and STCE topics connected to the CCCs. Note if the claim is fully met, partially met, or not met by the materials.

- Describe the specific examples of lessons or activities across the course to detail incorporation of all claimed grade-band CCCs and associated elements, including Nature of Science and STSE topics connected to the CCCs.
- Determine how students repeatedly use claimed grade-band appropriate CCCs across various contexts within the course.
- Detail how the CCCs are organized. Note how the CCCs build and connect across the course (to support the narrative report).

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials incorporate the claimed grade-band appropriate CCCs, including Nature of Science and STSE topics connected to the CCCs?
- Do the materials provide repeated opportunities for students to use the claimed grade-band CCCs across various contexts throughout the course?
- To what extent do the materials incorporate CCC elements from below the grade-band?

Gateway 2: Coherence & Scope

Criterion 2.1	Coherence and Full Scope of the Three Dimensions: Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.
Indicator 2d	Materials present Disciplinary Core Ideas (DCIs), Science and Engineering Practices (SEPs), and Crosscutting Concepts (CCCs) in a way that is scientifically accurate.*

Scoring:

* NOTE: This indicator is non-negotiable; materials being reviewed must score above zero points to have an opportunity to advance past Gateway 2.

2 points	1 point	0 points
• Materials consistently present all three dimensions in a scientifically accurate manner. AND • Assessments consistently present all DCIs, SEPs, and CCCs in a scientifically accurate manner.	• Materials and assessments consistently present all DCIs in a scientifically accurate manner. AND • Materials contain a few minor errors (not fully accurate) when presenting SEPs or CCCs. AND/OR • Assessments contain a few minor errors (not fully accurate) when assessing SEPs or CCCs.	• Materials contain numerous minor errors (not fully accurate) in presenting any of the dimensions. OR • Materials present any of the dimensions in a scientifically inaccurate manner. OR • Assessments present any of the dimensions in a scientifically inaccurate manner.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines whether materials present DCIs, SEPs, and CCCs in a scientifically accurate manner within and across activities, lessons, and units.
- examines whether materials present DCIs, SEPs, and CCCs in a scientifically accurate manner within assessments.

Research or Standards connection:

Scientific rigor and accuracy of what students learn is paramount; the materials need to accurately communicate important DCIs, SEPs, and CCCs.

"...science content standards should be clear, detailed, and complete; reasonable in scope; rigorously and scientifically correct; and based on sound models of student learning." (A Framework for K-12 Science Education, p. 298)

Resources:

- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts

Indicator 2d Guiding Question:

Do the materials present Disciplinary Core Ideas (DCIs), Science and Engineering Practices (SEPs), and Crosscutting Concepts (CCCs) in a manner that is scientifically accurate?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine whether the materials present DCIs and associated elements in a scientifically accurate manner.
- Determine whether the materials present SEPs and associated elements in a scientifically accurate manner.
- Determine whether the materials present CCCs and associated elements in a scientifically accurate manner.
- Determine whether the materials combine dimensions for two-dimensional and three-dimensional learning in a scientifically accurate manner.
- Describe evidence that assessments present DCIs, SEPs, and CCCs in a scientifically accurate manner.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials present each dimension and its elements in a scientifically accurate manner?
- Do the materials combine dimensions for two-dimensional and three-dimensional learning in a scientifically accurate manner?
- Do the assessments present DCI, SEP, and CCC elements in a scientifically accurate manner?

Gateway 2: Coherence & Scope

Criterion 2.1	Coherence and Full Scope of the Three Dimensions: Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.
Indicator 2e	Materials do not inappropriately include scientific content and ideas outside of the grade-band Disciplinary Core Ideas.*

Scoring:

* NOTE: This indicator is non-negotiable; materials being reviewed must score above zero points to have an opportunity to advance past Gateway 2.

2 points	1 point	0 points
• Materials contain no instances where non-scientific content or ideas (e.g., moral, societal, aesthetic, religious, existential) are included as science ideas. AND • Materials contain few instances where scientific content or ideas are included without meaningful connections to grade-band DCIs. AND • Materials contain no instances of DCIs from below the grade-band that are included without meaningful connections made to the grade-band DCIs. AND • Materials contain no instances of content from beyond the grade-band DCIs that are included without meaningful connections made to the grade-band DCIs.	• Materials contain no instances where non-scientific content or ideas (e.g., moral, societal, aesthetic, religious, existential) are included as science ideas. AND • Materials contain few instances where scientific content or ideas are included without meaningful connections to grade-band DCIs. AND/OR • Materials contain few instances of DCIs from below the grade-band that are inappropriately included with no meaningful connections to the grade-band DCIs. AND/OR • Materials contain few instances of DCIs from beyond the grade-band that are inappropriately included with no meaningful connections to the grade-band DCIs.	• Materials contain multiple instances where non-scientific content or ideas (e.g., moral, societal, aesthetic, religious, existential) are included as science ideas. OR • Materials contain multiple instances where scientific content or ideas are included without meaningful connections to grade-band DCIs. OR • Materials contain multiple instances of DCIs from below the grade-band that are inappropriately included with no meaningful connections to the grade-band DCIs. OR • Materials contain multiple instances of DCIs from beyond the grade-band that are inappropriately included with no meaningful connections to the grade-band DCIs.

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines whether materials inappropriately include non-scientific content or ideas (e.g., moral, societal, aesthetic, religious, existential) as science ideas.
- examines whether materials inappropriately include scientific content or ideas outside of the DCIs as DCIs in science.
- examines whether materials inappropriately include DCIs from below the grade-band with no meaningful connections to the grade-band DCIs.
- examines whether materials inappropriately include content from beyond the grade-band DCIs with no meaningful connections to the grade-band DCIs.
- examines whether materials inappropriately portray the scientific enterprise leading to lost student opportunity to engage in authentic science work.

Research or Standards connection:

“Science is both a body of knowledge that represents current understanding of natural systems and the process whereby that body of knowledge has been established and is being continually extended, refined, and revised. Both elements are essential: one cannot make progress in science without an understanding of both. Likewise, in learning science one must come to understand both the body of knowledge and the process by which this knowledge is established, extended, refined, and revised.” (Taking Science to School, p. 27)

“...through discussion and reflection, students can come to realize that scientific inquiry embodies a set of values. These values include respect for the importance of logical thinking, precision, open-mindedness, objectivity, skepticism, and a requirement for transparent research procedures and honest reporting of findings.” (A Framework for K-12 Science Education, p. 248)

“The continuing expansion of scientific knowledge makes it impossible to teach all the ideas related to a given discipline in exhaustive detail during the K-12 years. But given the cornucopia of information available today virtually at a touch— people live, after all, in an information age—an important role of science education is not to teach “all the facts” but rather to prepare students with sufficient core knowledge so that they can later acquire additional information on their own.” (A Framework for K-12 Science Education, pp. 31-32)

Resources:

- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education
- Taking Science To School
- Codes for NGSS Elements
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts

Indicator 2e Guiding Question:

Do the materials inappropriately include scientific content and ideas outside of the grade-band Disciplinary Core Ideas (DCIs)?

Evidence Collection

Review the units, chapters, and lessons in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

- Determine whether the materials include non-scientific content or ideas (e.g., moral, societal, aesthetic, religious, existential) as science ideas.
- Determine whether the materials inappropriately include scientific content or ideas outside of the DCIs.
- Determine whether the materials inappropriately include DCIs from below the grade-band with no meaningful connections to the grade-band DCIs.
- Determine whether the materials inappropriately include content from beyond the grade-band DCIs with no meaningful connections to the grade-band DCIs.
- Determine whether materials inappropriately portray the scientific enterprise leading to lost student opportunity to engage in authentic science work.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials include non-scientific content or ideas (e.g., moral, societal, aesthetic, religious, existential) as science ideas?
- Do the materials inappropriately include scientific content or ideas outside of the DCIs?
- Do the materials inappropriately include DCIs from below the grade-band with no meaningful connections to the grade-band DCIs?
- Do the materials inappropriately include content from beyond the grade-band DCIs with no meaningful connections to the grade-band DCIs? (Note: CCCs and SEPs are addressed in indicator 2f)
- Do the materials inappropriately portray the scientific enterprise leading to lost student opportunity to engage in authentic science work?

Gateway 2: Coherence & Scope

Criterion 2.1	Coherence and Full Scope of the Three Dimensions: Materials are coherent in design, scientifically accurate, and support claims made for all three dimensions.
Indicator 2f	Materials are designed for students to build and connect their knowledge and use of the three dimensions across the course. 2f.i. Materials support understanding of how the dimensions connect within and across units. 2f.ii. Materials have an intentional sequence where student tasks increase in sophistication.

2f.i Scoring:

2 points	1 point	0 points
• Materials consistently demonstrate how the dimensions connect within a unit by describing connections for students AND/OR providing support for teachers to help students understand connections. AND • Materials demonstrate how the dimensions connect across units by describing connections for students AND/OR providing support for teachers to help students understand connections, but not consistently.	• Materials demonstrate how the dimensions connect within a unit by describing connections for students AND/OR providing support for teachers to help students understand connections, but not consistently. AND • Materials demonstrate how the dimensions connect across units by describing connections for students AND/OR providing support for teachers to help students understand connections, but not consistently.	• Materials do not demonstrate how the dimensions connect within a unit.

2f.ii Scoring:

2 points	1 point	0 points
• Materials are designed with an intentional or suggested sequence and student tasks related to explaining phenomena and/or solving problems increase in	• Materials are designed with an intentional or suggested sequence but student tasks related to explaining phenomena and/or solving problems do not increase in	• Materials are not designed with an intentional sequence, nor do they provide a suggested sequence.

sophistication across the course.	sophistication across the course.	

About this indicator:

What is the purpose of this Indicator?

This indicator

- examines whether the materials connect student learning and use of the three dimensions within and across units within a course.
- examines whether materials are designed with an intentional sequence or suggested sequence and/or guidance on how to intentionally sequence (when modular in design).

Research or Standards connection:

“The Framework’s vision is that students will acquire knowledge and skill in science and engineering through a carefully designed sequence of learning experiences. Each stage in the sequence will develop students’ understanding of particular scientific and engineering practices, crosscutting concepts, and disciplinary core ideas while also deepening their insights into the ways in which people from all backgrounds engage in scientific and engineering work to satisfy their curiosity, seek explanations about the world, and improve the built world.” (A Framework for K-12 Science Education, p. 247)

“Science concepts build coherently across K–12. The emphasis of the NGSS is a focused and coherent progression of knowledge from grade band to grade band, allowing for a dynamic process of building knowledge throughout a student’s entire K–12 science education.” (The Next Generation Science Standards, p. xiii)

"Conclusion 5: Proficiency in science involves having knowledge of facts and concepts as well as how these ideas and concepts are related to each other. Thus, to become more expert in science, students need to learn key ideas and concepts, how they are related to each other, and their implications and applications within the discipline. This entails a process of conceptual development that in some cases involves large-scale reorganization of knowledge and is not a simple accumulation of information." (Taking Science to School, pp. 338-339)

“Curriculum units need to be sequenced across a year so that students can build ideas across time in coherent learning progressions, in which questions or challenges, gaps in models, and new phenomena motivate developing deeper disciplinary core and crosscutting ideas.” (Guide to Implementing the Next Generation Science Standards, p. 53)

“Across units, students encounter the different dimensions of a core idea within different science and engineering practices, and they encounter crosscutting concepts across investigations of different core ideas. Over time, moreover, students’ understanding of core ideas and crosscutting concepts develops so that they can be presented with more complex phenomena and design challenges, and their increasing grasp of practice supports their ability to engage with these phenomena and challenges.” (Designing NGSS-Aligned Curriculum Materials, p. 11)

Resources:

- Next Generation Science Standards (NGSS)
- Codes for NGSS Elements

- A Framework for K-12 Science Education
- Designing NGSS-Aligned Curriculum Materials
- Guide to Implementing the Next Generation Science Standards
- NGSS Appendix E: Disciplinary Core Idea Progressions
- NGSS Appendix F: Science and Engineering Practices
- NGSS Appendix G: Crosscutting Concepts

Indicator 2f Guiding Question:

Are the materials designed for students to build and connect their knowledge and use of the three dimensions across the course?

Evidence Collection

Review the units in both student and teacher materials across the course.

Review the course scope and sequence.

Review NGSS progression documents and standards as needed. Use the following document:

- Codes for NGSS Elements

Look for and record evidence to:

2f.i

- Describe how the dimensions connect within and across units.
  - Describe or reference connections in the students materials.
  - Describe teacher supports that help students understand the connections within and across units.
  - Describe how the materials are designed to build and connect each dimension over time.
    - Focus on how the materials connect DCIs across units to help students build and connect knowledge.
    - Focus on how the materials connect SEPs across units to help students build and connect knowledge.
    - Focus on how the materials connect CCCs across units to help students build and connect knowledge.
- Describe how the materials make clear to students, not just teachers, how lessons flow into one another.
- Describe how support for teachers includes reminders to students that each new step in the unit is in response to their questions and ideas.
- Describe the specific examples that provide evidence of how each dimension connects or builds within and across units.

2f.ii

- Describe how the materials are designed with an intentional or suggested sequence.
- Describe evidence of student tasks related to explaining phenomena and/or solving problems that increase in sophistication across the course.
- Describe how the materials use middle school elements, if present, to support or are in service of the high school elements. Record specific examples and to what extent middle school elements are used.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

2f.i

- Do the materials provide information to help students understand how the dimensions connect within and across units?
  - Do the materials make clear (to the students) the connections of the three dimensions within and across units to connect prior, current, and future learning?
  - Do the materials provide teacher supports designed to help students understand the connections within and across units related to how the student ideas and questions are advancing the learning?
  - How do the materials connect DCIs, SEPs, and/or CCCs within and across units to help students build and connect knowledge?

2f.ii

- Are the materials designed with an intentional sequence?
  - If the materials are modular, do the materials provide a suggested sequence as enactment guidance?
  - Do student tasks related to explaining phenomena and/or solving problems increase in sophistication across the course?
  - Are the student tasks connected to middle school elements and if so, are those elements used in support of/in service of the high school elements; to what extent?
  - Do the student tasks change over time?
  - Do student tasks get more complex and involve deeper use of the SEPs as students explain phenomena or solve problems?
  - Do the explanations of phenomena or the solutions to problems increase in complexity across the course?

Gateway 3: Usability

Criterion 3.1

Teacher Supports

The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.

What is the purpose of this Criterion?

This criterion examines how the materials support teachers:

- in delivering the student and ancillary materials, especially as it relates to students figuring out phenomena and solving problems.
- in understanding the instructional approaches of the program and research-based strategies.
- in improving their own knowledge of the subject beyond the grade level.
- in making connections to college- and career-ready ELA and mathematics standards, and understanding the role of the standards in the context of the overall series.
- in planning for effective instruction that includes appropriate materials, safety precautions, and how caregivers can support student progress and achievement.

Research Connection

"Curricula based on the Framework and resulting standards should integrate the three dimensions—scientific and engineering practices, crosscutting concepts, and disciplinary core ideas—and follow the progressions articulated in this report. In order to support the vision of this Framework, standards-based curricula in science need to be developed to provide clear guidance that helps teachers support students engaging in scientific practices to develop explanations and models [5, 21-24]. In addition, curriculum materials need to be developed as a multiyear sequence that helps students develop increasingly sophisticated ideas across grades K-12 [5, 25, 26]." (A Framework for K-12 Science Education, p. 246)

Teacher materials can support teachers in understanding the connection between instructional activities and three-dimensional learning goals by highlighting how activities support the learning goals. (Guidelines for the Evaluation of Instructional Materials in Science, p. 21)

Materials should be evaluated by how well they help teachers see when and how activities or text contribute to the learning goals across instructional sequences or book chapters and supplemental resources (Guidelines for the Evaluation of Instructional Materials in Science, p. 21)

Scoring:

Meets Expectations	Partially Meets Expectations	Does Not Meet Expectations
• 9-10 points	• 6-8 points	• <6 points

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3a	Materials provide teacher guidance with useful annotations and suggestions for how to enact the student materials and ancillary materials, with specific attention to engaging students in figuring out phenomena and solving problems.

Scoring:

2 points	1 point	0 points
• Materials provide comprehensive guidance that will assist teachers in presenting the student and ancillary materials. AND • Materials include sufficient and useful annotations and suggestions that are presented within the context of the specific learning objectives.	• Materials provide guidance that will assist teachers in presenting the student and ancillary materials. OR • Materials include sufficient and useful annotations and suggestions that are presented within the context of the specific learning objectives.	• Materials do not provide guidance that will assist them in presenting the student and ancillary materials. AND • Materials do not include sufficient and useful annotations and suggestions that are presented within the context of the specific learning objectives.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine whether they contain teacher guidance with sufficient and useful annotations and suggestions for how to enact the student materials and ancillary materials.

Indicator 3a Guiding Question:

Do the materials provide teacher guidance with useful annotations and suggestions for how to enact the student materials and ancillary materials, with specific attention to engaging students in figuring out phenomena and solving problems?

Evidence Collection

Review the materials, both print and digital (if available), across the series.

Look for and record evidence to:

- Describe if and how the materials include overview sections, annotations, narrative information, or other documents that will assist the teacher in presenting the student material and/or ancillary materials.

- Describe how information and guidance provided by the materials is useful for planning instruction. Look for suggestions about instructional strategies and guidance for presenting the content (specifically how to support students in figuring out phenomena and/or solving problems), which could include identifying and addressing student naive conceptions. These are often in the planning sections as well as margin notes, but could also be in the front matter philosophy, professional development, or explanations of program components.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How are the materials structured to provide information that will assist the teacher in presenting the student material or ancillary materials?
- How do the materials provide specific guidance to plan instruction and support students in the content (specifically how to support students in figuring out phenomena and/or solving problems)?
- How do the materials support teachers in understanding what students should understand about the targeted phenomenon or problem?
- Where do the teacher materials explicitly state the phenomenon or problem that is the focus of the student learning?
- Where do the teacher materials provide explanations to the teacher for how the phenomenon or problem is connected to the dimensions (including engineering and nature of science elements) targeted in the instruction?
- How well do the materials support teachers in helping students make the connections between the phenomenon or problem, the instructional activities and the three dimensions?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3b	Materials contain adult-level explanations and examples of the more complex grade/course-level concepts and concepts beyond the current course so that teachers can improve their own knowledge of the subject.

Scoring:		
2 points • Materials contain adult-level explanations and examples of the more complex grade/course-level concepts so that teachers can improve their own knowledge of the subject. AND • Materials contain adult-level explanations and examples of concepts beyond the current course so that teachers can improve their own knowledge of the subject.	1 point • Materials contain adult-level explanations and examples of the more complex grade/course-level concepts so that teachers can improve their own knowledge of the subject. OR • Materials contain adult-level explanations and examples of concepts beyond the current course so that teachers can improve their own knowledge of the subject.	0 points • Materials do not contain adult-level explanations and examples of the more complex grade/course-level concepts so that teachers can improve their own knowledge of the subject. AND • Materials do not contain adult-level explanations and examples of concepts beyond the current course so that teachers can improve their own knowledge of the subject.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine whether they deepen teacher understanding of science and engineering ideas, concepts, and practices so that teachers can improve their own knowledge of the subject.

Indicator 3b Guiding Question:

Do the materials contain adult-level explanations and examples of the more complex grade/course-level concepts and concepts beyond the current course so that teachers can improve their own knowledge of the subject?

Evidence Collection

Review the materials, both print and digital (if available), across the series.

Look for and record evidence to:

- Describe if and how the materials provide complete adult-level explanations and examples that support the teacher in developing their own understanding of the content and expected student practices.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where do the teacher materials provide background content knowledge that is accurate, understandable, and gives true assistance to all educators using the materials?
- Where are supports provided for teachers to develop their own understanding of more advanced, grade-level concepts?
- Where are supports provided for teachers to develop their own understanding of concepts beyond the current course?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3c	Materials include standards correlation information, including connections to college- and career-ready ELA and mathematics standards, that explains the role of the standards in the context of the overall series.

Scoring:		
2 points • Correlation information is present for the science, ELA, and mathematics standards addressed throughout the grade level/series. AND • Explanations of the role of the specific grade-level/grade-band science, ELA, and mathematics are present in the context of the series.	1 point • Correlation information is present for the science standards addressed throughout the series, but ELA and/or mathematics standards correlation information is inconsistent or not present. OR • Explanations of the role of the specific grade-level/grade-band science are present in the context of the series, but ELA or mathematics explanations are inconsistent or not present.	0 points • Correlation information is not consistently present for the science standards addressed throughout the series. OR • Explanations of the role of the specific grade-level/grade-band science, ELA, or mathematics in the context of the series are not offered.

About this indicator:

What is the purpose of this Indicator?

This indicator examines whether materials provide documentation of how each lesson and unit correlate to the NGSS and Common Core State Standards for ELA and Mathematics and whether materials provide explanations of the role of the standards at each unit/module in the context of the overall series.

Research or Standards connection:

“Recommendation 12: The standards for the sciences and engineering should align coherently with those for other K-12 subjects. Alignment with the Common Core Standards in mathematics and English/language arts is especially important.“ (A Framework for K-12 Science Education, p. 306)

It is important to note that a focus on student discourse is covered in Indicator 3b. While lessons that are aligned to Common Core State Standards in English Language Arts might include student engagement in discourse, this indicator looks at whether the teacher materials document alignment to Common Core State Standards in English Language Arts and Mathematics.

Resources:

- Common Core State Standards - Mathematics
- Common Core State Standards - English Language Arts
- Next Generation Science Standards (NGSS)
- A Framework for K-12 Science Education

Indicator 3c Guiding Question:

Do the materials include standards correlation information, including connections to college- and career-ready ELA and mathematics standards, that explains the role of the standards in the context of the overall series?

Evidence Collection

Review the print and digital (if available) table of contents, pacing guides, scope and sequence, and other teacher materials.

Look for and record evidence to:

- Describe how and where teacher materials provide NGSS standards correlations for science. Note at what level (unit, lesson, activity) these correlations are provided.
- Describe how and where teacher materials provide an explanation for the role of these NGSS standards in the context of the overall series. Note at what level (unit, lesson, activity) these explanations are provided.
- Describe how and where teacher materials provide standards correlation information to applicable Common Core ELA and Mathematics Standards. Note at what level (unit, lesson, activity) these correlations are provided.
- Describe how and where teacher materials provide an explanation for the role of these Common Core ELA and Mathematics Standards in the context of the overall series. Note at what level (unit, lesson, activity) these explanations are provided.

Note:

- if standards correlation is inaccurate.
- if information is included to allow the teacher to make prior connections and teach for connections to future content.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do materials provide accurate documentation of how units, lessons, or activities align to NGSS standards?
- How and where do materials provide accurate documentation of how units, lessons, or activities align to applicable Common Core ELA and Mathematics standards?
- How and where do materials provide an explanation of the role identified standards play in the context of the overall series?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3d	Materials provide strategies for informing all stakeholders, including students, parents, or caregivers about the program and suggestions for how they can help support student progress and achievement.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the series to determine if the materials contain strategies for informing students, parents, or caregivers about the program, and it also examines the series to determine if the materials contain suggestions for how parents or caregivers can help support student progress and achievement.

Indicator 3d Guiding Question:

Do the materials provide strategies for informing all stakeholders, including students, parents, or caregivers about the program and suggestions for how they can help support student progress and achievement?

Evidence Collection

Look at both print and digital (if available) student materials and teacher materials, including beginning sections of the entire course, unit, chapter, or lesson that contains overview sections, teacher instruction pages, or ancillary supports for a narrative explanation of the content in each topic, paying attention to key instruction that will inform others that may be assisting the student's progress.

Look for and record evidence to:

- Describe where the materials contain strategies for informing students, parents, or caregivers about the science program. Look for forms of communication with parents and caregivers, including for families that may speak and read in a language other than English.
- Describe where the materials contain suggestions for how parents or caregivers can help support student progress and achievement. Look for any work that notes a school-to-home connection.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where do the materials contain overview sections, teacher instruction pages, or ancillary supports that contain strategies for informing students, parents, or caregivers about the science program, including for families that may speak and read a language other than English?

- Where do the materials contain overview sections, teacher instruction pages, or ancillary supports that contain suggestions for how parents or caregivers can help support student progress and achievement?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3e	Materials provide explanations of the instructional approaches of the program and identification of the research-based strategies.

Scoring:

2 points	1 point	0 points
• Materials explain the instructional approaches of the program. AND • Materials include and reference research-based strategies.	• Materials explain the instructional approaches of the program. OR • Materials include and reference research-based strategies.	• Materials do not explain the instructional approaches of the program. AND • Materials do not include and reference research-based strategies.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine whether they explain the instructional approaches of the program and whether they identify research-based strategies that have informed the design of the materials.

Indicator 3e Guiding Question:

Do the materials provide explanations of the instructional approaches of the program and identification of the research-based strategies?

Evidence Collection

Review the materials across the series.

Look for and record evidence to:
- Describe how and where the materials explain the instructional approaches of the program.
- Describe how and where the materials identify research-based strategies that are used in the design.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:
- Where and how well do the materials explain the instructional approaches of the program?
- Where and how well do the materials identify research-based strategies used in and throughout the program?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3f	Materials provide a comprehensive list of supplies needed to support instructional activities.

Scoring:	
1 point ● Materials include a comprehensive list of supplies needed to support the instructional activities.	0 points ● Materials do not include a comprehensive list of supplies needed to support instructional activities.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the series to determine if the materials contain a comprehensive list of materials needed to support implementation.

Indicator 3f Guiding Question:

Do the materials provide a comprehensive list of supplies needed to support instructional activities?

Evidence Collection

Review the materials across the series.

Look for and record evidence to:

- Determine whether a comprehensive list of required materials is provided.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Does the series provide a comprehensive list of required materials? At what level(s) is the support provided (course, unit/module, lesson, etc.)?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3g	Materials provide clear science safety guidelines for teachers and students across the instructional materials.

Scoring:	
1 point ● Materials embed clear science safety guidelines for teachers and students across the instructional materials.	0 points ● Materials do not embed science safety guidelines for teachers and students across the instructional material.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the series to determine if the materials embed clear science safety guidelines for teacher and students across the instructional materials.

Research or Standards connection:

“Teachers also need opportunities to develop the knowledge and practices to support these investigations, including how to prepare, organize, and maintain materials; implement safety protocols; organize student groups; and guide students as they collect, represent, analyze, discuss data, argue from evidence, and draw conclusions [80].” (A Framework for K-12 Science Education, p. 258)

Resources:

- A Framework for K-12 Science Education

Indicator 3g Guiding Question:

Do the materials provide clear science safety guidelines for teachers and students across the instructional materials?

Evidence Collection

Review the materials across the series.

Look for and record evidence to:

- Describe how and where the materials embed clear science safety guidelines for teachers and students.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do the materials embed clear science safety guidelines for teachers and students?
- Are the guidelines present across the materials?

Gateway 3: Usability

Criterion 3.1	The program includes opportunities for teachers to effectively plan and utilize materials with integrity and to further develop their own understanding of the content.
Indicator 3h	Materials designated for each grade are feasible and flexible for one school year.

Scoring: Narrative Evidence Only

Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine if the amount of time suggested in the materials for each grade is appropriate for a school year, if the expectations of the materials are reasonable for both teachers and students to complete in the suggested timeframe, and if the materials provide guidance to adjust to fit a range of instructional times or different schedules.

Indicator 3h Guiding Question:

Are the materials designated for each grade feasible and flexible for one school year?

Evidence Collection

Review the materials across the series, including the table of contents, any pacing guides, and scope and sequence provided by the publisher.

Look for and record evidence to:

- Describe how the materials within each lesson or unit allow students to learn at an appropriate pace for the given grade level.
- Identify whether students should be able to master all the content designated for the grade level.
- (K-5 only) Describe how the materials provide guidance on adjustments to fit districts with different needs based on time restrictions, including rationale on what can be cut, including tradeoffs and how materials provide support for adjusting to fit different schedules and blocks available for teaching science.

Note: If the publishers do not provide recommended pacing or structure, assume ⅓ of the materials for a grade band constitute one year.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the materials within each lesson or unit allow students to learn at an appropriate pace for the given grade level?
- Will students be able to master all of the content designated for the grade level?
- Do the materials provide guidance to adjust for a range of district constraints (time and scheduling)?

Gateway 3: Usability

Criterion 3.2

Assessment

The program includes a system of assessments identifying how materials provide tools, guidance, and support for teachers to collect, interpret, and act on data about student progress towards the standards.

What is the purpose of this Criterion?

This criterion

- examines how the materials measure individual student progress towards the standards and elements over time.
- examines how the materials provide guidance to monitor and move student learning.
- examines how the materials indicate which standards are assessed and provide accommodations while still assessing the intent of the standards.

Research Connection

"Assessment activities will be critical supports for this instruction. Students will need guidance about what is expected of them and opportunities to reflect on their performance as they develop proficiencies. Teachers will need information about what students understand and can do so they can adapt their instruction. Instruction that is aligned with the framework and the NGSS will naturally provide many opportunities for teachers to observe and record evidence of students learning. The student activities that reflect such learning include developing and refining models; generating, discussing, and analyzing data; engaging in both spoken and written explanations and argumentation; and reflecting on their own understanding. Such opportunities are the basis for the development of assessments of three-dimensional science learning." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 5)

"...ensure that assessment activities included in such materials (such as mid- and end-of-chapter activities, suggested tasks for unit assessment, and online activities) require students to engage in practices that demonstrate their understanding of core ideas and crosscutting concepts. These materials should also attend to multiple dimensions of diversity (e.g., by connecting with students' cultural and linguistic resources)." (Developing Assessments for the Next Generation Science Standards, BOTA Report, pp. 5, 131-132)

"Students will likely need repeated exposure to investigations and tasks aligned to the framework and the NGSS performance expectations, guidance about what is expected of them, and opportunities for reflection on their performance to develop these proficiencies, as discussed in Chapter 2. The kind of instruction that will be effective in teaching science in the way the framework and the NGSS envision will require students to engage in science and engineering practices in the context of disciplinary core ideas—and to make connections across topics through the crosscutting ideas. Such instruction will include activities that provide many opportunities for teachers to observe and record evidence of student thinking, such as when students develop and refine models; generate, discuss, and

analyze data; engage in both spoken and written explanations and argumentation; and reflect on their own understanding of the core idea and the subtopic at hand (possibly in a personal science journal)." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 87)

Scoring:		
Meets Expectations ● 9-10 points	Partially Meets Expectations ● 7-8 points	Does Not Meet Expectations ● <7 points

Gateway 3: Usability

Criterion 3.2	The program includes a system of assessments identifying how materials provide tools, guidance, and support for teachers to collect, interpret, and act on data about student progress towards the standards.
Indicator 3i	Assessment information is included in the materials to indicate which standards are assessed.

Scoring:

2 points	1 point	0 points
• Materials consistently identify the standards (and their elements) assessed for formal assessments.	• Materials identify the standards (and their elements) assessed for some of the formal assessments. OR • Materials consistently identify the standards (and their elements) assessed for formal assessments, but do not include all standards for the grade level or band.	• Materials do not identify the standards (and their elements) assessed for formal assessments. OR • Materials identify the standards (and their elements) assessed for some of the formal assessments, but do not include all standards for the grade level or band.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the assessment materials to determine whether they identify the standards (performance expectations) being assessed for all formal assessment types. It is important to note that some assessments may be building toward the performance expectation(s) and not intended to measure full depth of the performance expectation(s); these assessments should identify which elements of the performance expectation(s) are being assessed and/or being built toward.

Formal assessments are determined by the publisher and could include all types: formative, summative, etc. Reviewers look for a list of standards assessed for the entire assessment and/or associated with each item/task. Reviewers look for evidence of identification only.

Resources:

- Developing Assessments for the Next Generation Science Standards, BOTA Report

Indicator 3i Guiding Question:

Does assessment information included in the materials indicate which standards are assessed?

Evidence Collection

Review assessments and corresponding assessment guidance across the series. *Note: this is not an item analysis.

Look for and record evidence to:

- Describe how and where assessments clearly identify which standards are being assessed. Include the level at which the assessment is given (unit, lesson, etc.) and the level at which standards are identified (assessment, task, item, etc.).
- Describe any instances where standards are listed incorrectly or are not from the appropriate grade level/band.
- In the event that the assessments build toward grade-level or grade-band performance expectations, describe whether the assessment information identifies which elements of the performance expectations are assessed. Also, describe how and where the materials include information that details how the assessments build toward the performance expectations for the grade level or band.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where and how do the materials clearly identify which standards are assessed?
- Do the standards correlations or assessment guidance documents indicate if all standards (performance expectations) for the grade level/band are assessed by the end of the grade level/band?
- If assessments are building towards the performance expectations, do the materials identify which elements of the performance expectations are being assessed and how these contribute to building toward grade-level/grade-band performance expectations?

Gateway 3: Usability

Criterion 3.2	The program includes a system of assessments identifying how materials provide tools, guidance, and support for teachers to collect, interpret, and act on data about student progress towards the standards.
Indicator 3j	Assessment system provides multiple opportunities throughout the grade, course, and/or series to determine students' learning and sufficient guidance to teachers for interpreting student performance and suggestions for follow-up.

Scoring:		
4 points • Assessment system provides multiple opportunities to determine students' learning and sufficient guidance to teachers for interpreting student performance. AND • Assessment system provides multiple opportunities to determine students' learning and suggestions to teachers for following-up with students.	2 points • Assessment system provides multiple opportunities to determine students' learning and sufficient guidance to teachers for interpreting student performance but does not provide suggestions for following-up with students. OR • Assessment system provides multiple opportunities to determine students' learning and suggestions to teachers for following-up with students but does not provide sufficient guidance for interpreting student performance.	0 points • Assessment system does not provide multiple opportunities to determine students' learning and sufficient guidance to teachers for interpreting student performance. AND • Assessment system does not provide multiple opportunities to determine students' learning and suggestions to teachers for following-up with students.

About this indicator:

What is the purpose of this Indicator?

This indicator examines assessments and corresponding assessment guidance across the series, including answer keys, rubrics, and other assessment scoring tools (e.g., sample student responses, scoring guidelines, and open-ended feedback), guidance for teachers to interpret student performance, and suggestions for follow-up based on student performance.

Research or Standards connection:

“It is possible to design assessment tasks and scoring rubrics that assess three-dimensional science learning. Such assessments provide evidence that informs teachers and students of the strengths and weaknesses of a student’s current understanding, which can guide further instruction and student learning and can also be used

to evaluate students' learning." (Developing Assessments for the Next Generation Science Standards, BOTA Report, conclusion 4-3, p. 130)

Resources:

- Developing Assessments for the Next Generation Science Standards, BOTA Report

Indicator 3j Guiding Question:

Does the assessment system provide multiple opportunities throughout the grade, course, and/or series to determine students' learning and sufficient guidance to teachers for interpreting student performance and suggestions for follow-up?

Evidence Collection

Review assessments and corresponding assessment guidance across the series, including answer keys, rubrics, and other assessment scoring tools.

Look for and record evidence to:

- Describe if and how assessments provide tools for scoring purposes (e.g., sample student responses, rubrics, scoring guidelines, and open-ended feedback).
- Describe whether guidance is provided to teachers to interpret student understanding. Look for task-specific scoring guidance to help determine if a student has met the expectations.
- Describe whether teachers are provided with guidance to respond to student needs elicited by the assessment. Record evidence about follow-up steps/suggestions provided for the teacher.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do the materials provide tools to score assessment items?
- Is guidance consistently provided to teachers to interpret student understandings?
- Are teachers consistently provided with guidance to respond to student needs elicited by the assessment?

Gateway 3: Usability

Criterion 3.2	The program includes a system of assessments identifying how materials provide tools, guidance, and support for teachers to collect, interpret, and act on data about student progress towards the standards.
Indicator 3k	Assessments include opportunities for students to demonstrate the full intent of grade-level/grade-band standards and elements across the series.

Scoring:		
4 points • Assessments include opportunities for students to demonstrate the full intent of grade-level/grade-band standards and elements across the series.	2 points • Assessments do not include opportunities for students to demonstrate the full intent of grade-level/grade-band standards across the series. OR • Assessments do not include opportunities for students to demonstrate the full intent of grade-level/grade-band elements across the series.	0 points • Assessments do not include opportunities for students to demonstrate the full intent of grade-level/grade-band standards and elements across the series.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the assessments within and across the materials to determine whether they include a variety of assessment types that are constructed in a manner that allows for the depth of the grade-level/grade-band standards and elements to be assessed.

Research or Standards connection:

“Because NGSS-aligned instruction will naturally involve a range of activities, classroom assessment that is integral to instruction will need to involve a corresponding variation in the types of evidence it provides about student learning.” (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 87)

“...designing multiple and varied forms of assessment is key to appropriately determining student proficiency in science and using assessments to improve instruction.” (STEM Teaching Tools, Brief 34)

Resources:

- Developing Assessments for the Next Generation Science Standards, BOTA Report
- STEM Teaching Tools 34: Designing an Assessment System that Measures Three-Dimensional Science Learning

Indicator 3k Guiding Question:

Do the assessments include opportunities for students to demonstrate the full intent of grade-level/grade-band standards and elements across the series?

Evidence Collection

Review assessments and corresponding assessment guidance across the series.

Look for and record evidence to:

- Describe the different types of modalities (e.g., writing, illustrating, demonstrating, modeling, oral presentations, and performance tasks) used for student assessments.
- Describe the different types of items used for student assessments and how they are used to measure student performance (e.g., performance tasks, discussion questions, constructed response questions, project- or problem-based tasks, portfolios, justified multiple choice).
- Describe whether assessment tasks incorporate sufficient complexity to assess the depth of the performance expectations.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do the assessments include a variety of modalities (e.g., writing, illustrating, demonstrating, modeling, oral presentations, and performance tasks) and how are they used across different assessments, grades/courses, and series?
- Do the assessments include a variety of item types (e.g., performance tasks, discussion questions, constructed response questions, project- or problem-based tasks, portfolios, justified multiple choice) and how are they used across different assessments, grades/courses, and series?
- Do assessment tasks incorporate sufficient complexity to assess the depth of the performance expectations?

Gateway 3: Usability

Criterion 3.2	The program includes a system of assessments identifying how materials provide tools, guidance, and support for teachers to collect, interpret, and act on data about student progress towards the standards.
Indicator 3l	Assessments offer accommodations that allow students to demonstrate their knowledge and skills without changing the content of the assessment.

Scoring: Narrative Evidence Only

Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the series' assessments and assessment guidance documentation to determine what accommodations are available.

Indicator 3l Guiding Question:

Do the assessments offer accommodations that allow students to demonstrate their knowledge and skills without changing the content of the assessment?

Evidence Collection

Review assessments and corresponding assessment guidance across the series.

Look for and record evidence to:

- Describe where and how accommodations are offered that ensure all students can access the assessment,(e.g. text to speech, increased font size, etc.) without changing the content of the assessment.
- Describe any guidance for teachers on the use of provided accommodations.
- Describe whether any accommodations alter grade-level/course expectations or the content of the assessment for students.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where and how do the assessments provide accommodations for students?
- Where and how is guidance provided for teachers to use the accommodations?
- Do accommodations alter grade-level/course expectations for students?

Gateway 3: Usability

Criterion 3.3

Student Supports

The program includes materials designed for each student's regular and active participation in grade-level/grade-band/series content.

What is the purpose of this Criterion?

This criterion examines how the materials:

- leverage diverse cultural and social backgrounds of students.
- provide appropriate support, accommodations, and modifications for special populations that support regular and active participation in learning science and engineering.
- provide multiple access points for students at varying ability levels to make sense of phenomena and design solutions to problems.
- include multi-modal opportunities for students to share their thinking.
- represent people of various demographic and physical characteristics.
- provide opportunities for teachers to use a variety of grouping strategies.
- are made accessible by providing appropriate supports for different reading levels.

Research Connection

"Inclusive instructional strategies encompass a range of techniques and approaches that build on students' interests and backgrounds so as to engage them more meaningfully and support them in sustained learning. These strategies, which also have been shown to promote educational equity in learning science and engineering, must be attended to as standards are translated into curriculum, instruction, and assessment." (Framework, p. 283)

"...students learn science in large part through their active involvement in the practices of science. A classroom environment that provides opportunities for students to participate in scientific and engineering practices engages them in tasks that require social interaction, the use of scientific discourse (that leverages community discourse when possible), and the application of scientific representations and tools. SEPs can actually serve as productive entry points for students from diverse communities—including students from different social and linguistic traditions, particularly second-language learners." (Framework, p. 283)

"Everyday experience provides a rich base of knowledge and experience to support conceptual changes in science. Students bring cultural funds of knowledge that can be leveraged, combined with other concepts, and transformed into scientific concepts over time." (Framework, p. 283)

"Conclusion 6: Race/ethnicity, language, culture, gender, and socioeconomic status are among the factors that influence the knowledge and experience children bring to the classroom. This diversity offers richness and opportunities in the classroom, and it also affects the kinds of support children need to learn science." (Taking Science to School, p. 340)

Resources:

- NGSS Appendix D: All Standards, All Students

Scoring:		
Meets Expectations • 6 points	Partially Meets Expectations • 4-5 points (*with no 0s)	Does Not Meet Expectations • <4 points

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each student's regular and active participation in grade-level/grade-band/series content.
Indicator 3m	Materials provide strategies and supports for students in special populations to support their regular and active participation in learning grade-level/grade-band science and engineering.

Scoring:		
2 points • Materials regularly provide strategies, supports, and resources for students in special populations to support their regular and active participation and engagement in grade-level/grade-band science and engineering.	1 point • Materials do not regularly provide strategies, supports, and resources for students in special populations to support their regular and active participation and engagement in grade-level/grade-band science and engineering.	0 points • There are no strategies, supports, or resources for students in special populations to support their regular and active participation and engagement in grade-level/grade-band science and engineering.

About this indicator:

What is the purpose of this Indicator?

This indicator examines whether the materials provide strategies, supports, and resources for students in special populations to support their regular and active participation in grade-level/grade-band science and engineering.

Research or Standards connection:

For this indicator, special populations refers to students that must overcome barriers that may require special consideration and attention to ensure equal opportunity for success and in an educational setting.

Resources:

- NGSS Appendix D: All Standards, All Students
- Supporting Special Populations, Office of Elementary and Secondary Education

Indicator 3m Guiding Question:

What opportunities are there for students in special populations to engage with materials to support ongoing participation in grade-level/grade-band science and engineering content?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe where and how the materials provide specific strategies and supports for differentiating instruction to meet the needs of students in special populations.
- Identify whether the materials support students in special populations in regular and active participation in grade-level/grade-band science and engineering and include any instances where differentiation does not present opportunities to engage students in the work of the grade level/grade band.

Note - There must be more than a statement at the beginning of the chapter or lesson that is generic or states that the same strategy could be used with every lesson.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do materials provide appropriate differentiated strategies and supports for students in special populations?
- Do materials provide differentiation supports to sufficiently engage students in grade level/grade band science and engineering?
- Do the materials include overarching guidance on strategies and accommodations for special populations? Are these evident in lessons?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3n	Materials provide extensions and/or opportunities for students to engage in learning grade-level/grade-band science and engineering at greater depth.

Scoring:		
2 points • Materials provide multiple opportunities for advanced students to engage in grade-level/grade-band science at a higher level of complexity. AND • No instances of advanced students doing more assignments than their classmates.	1 point • Materials provide some opportunities for advanced students to engage in grade-level/grade-band science at a higher level of complexity. AND • There are few instances of advanced students doing more assignments than their classmates.	0 points • Materials provide few, if any, opportunities for advanced students to engage in grade-level/grade-band science at a higher level of complexity. OR • There are many instances of advanced students doing more assignments than their classmates.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine whether the materials provide opportunities for advanced students to engage in grade-level/grade-band science at a higher level of complexity.

Research or Standards connection:

"Arguably, the most pressing challenge facing U.S. education is to provide all students with a fair opportunity to learn." (A Framework for K-12 Science Education, p. 282)

"Science and engineering practices can actually serve as productive entry points for students from diverse communities..." (A Framework for K-12 Science Education, p. 283)

"When people enter into the practices of science or engineering, they do not leave their cultural worldviews at the door. Instruction that fails to recognize this reality can adversely affect student engagement in science. .... Everyday experience provides a rich base of knowledge and experience to support conceptual changes in science. Students bring cultural funds of knowledge that can be leveraged, combined with other concepts, and transformed into scientific concepts over time." (A Framework for K-12 Science Education, p. 284)

Resources:

- A Framework for K-12 Science Education

Indicator 3n Guiding Questions:

What opportunities are present for students to engage in learning with grade-level/grade-band science and engineering at higher levels of complexity?

Are the opportunities that are present purposeful investigations or extensions?

Do the opportunities extend learning of the grade-level content or topic?

Evidence Collection

Review the student materials across the series.

Look for and record evidence to:

- Describe how and where advanced students have opportunities to work at a higher level of complexity with the three dimensions to make sense of phenomena and design solutions to problems. Note - this is not students completing additional tasks or more work, but is an extension of their learning.
- Identify strategies and supports for advanced students to explore grade-level/grade-band content at higher level of complexity.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where and how do the materials present opportunities specific to extending students' learning of the grade-level/grade-band content?
- Where and how do the materials present opportunities to students to engage in grade-level/grade-band content at higher level of complexity?
- What opportunities do students have to develop and apply higher-level thinking?
- What strategies and supports are available for students to engage in grade-level/grade-band content at a higher level of complexity?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3o	Materials provide varied approaches to learning tasks over time and variety in how students are expected to demonstrate their learning with opportunities for students to monitor their learning.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials for a variety of approaches to learning tasks over the grade level and grade band, a variety of opportunities for students to demonstrate their learning over time, opportunities for students to receive oral and/or written peer or teacher feedback, and opportunities for students to monitor and move their learning.

Research or Standards connection:

"For students who need to take more time to express their understanding (e.g., if they learned English as their second language), opportunities to edit or to display their knowledge in less language-embedded tasks would help level the playing field." (A Framework for K-12 Science Education, p. 289)

"...developers should highlight how students can demonstrate competence through multiple means of expression and in multiple contexts." (A Framework for K-12 Science Education, p. 290)

"As students wrestle with meaningful scientific problems they (1) engage in social interaction, (2) appropriate the language of science, and (3) use scientific representations and tools. These are features that are central to scientific practice and require that teachers and instructional materials provide clear guidance and support for learners as they acquire these practices." (Taking Science to School, p. 265)

""... uncovering students' incomplete forms of practice and understanding is critical: NGSS-aligned assessments will need to clearly define the forms of evidence associated with beginning, intermediate, and sophisticated levels of knowledge and practice expected for a particular instructional sequence. A key goal of classroom assessments is to help teachers and students understand what has been learned and what areas will require further attention. NGSS-aligned assessments will also need to identify likely misunderstandings, productive ideas of students that can be built upon, and interim goals for learning." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 91)

"Classroom assessment probes will need to be designed to generate enough evidence about students' understandings so that their locations on the intended pathway can be reliably determined, and it is clear what

next steps instructional activities) are needed for them to continue to progress." (Developing Assessments for the Next Generation Science Standards, BOTA Report, p. 91)"

Resources:

- A Framework for K-12 Science Education
- Developing Assessments for the Next Generation Science Standards, BOTA Report
- Taking Science To School

Indicator 3o Guiding Question:

What approaches to presentation of material are provided?

What approaches are provided for students to demonstrate their learning?

Do the approaches to presentation and demonstration of learning vary over the course of the year?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe how and where the materials provide multi-modal opportunities for students to question, investigate, sense-make, and problem-solve using a variety of formats and methods.
- Describe how and where students have opportunities to share their thinking, to demonstrate changes in their thinking over time, and to apply their understanding in new contexts.
- Describe how the program leverages the use of a variety of formats and methods over time to deepen student understanding and ability to explain and apply science ideas.
- Describe if and how materials provide for ongoing review, practice, self-reflection, and feedback.
- Describe if and how materials provide multiple strategies, such as oral and/or written feedback, peer or teacher feedback, and self-reflection.
- Describe if and how materials provide a clear path for students to monitor and move their own learning.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do the materials provide multi-modal opportunities for students to share their thinking, ask questions, investigate, make sense of phenomena, and problem-solve using a variety of formats and methods?
- How and where do students have opportunities to share their thinking, to compare their thinking with other students or to new ideas presented in the learning opportunities, to demonstrate changes in their thinking over time, and to apply their understanding in new contexts?
- Where and how often do the materials provide for ongoing review, practice, self-reflection, and feedback?
- Where and how often do the materials provide guidance for multiple feedback strategies, such as oral and/or written feedback?
- Where and how often do the materials provide guidance for multiple strategies for peer or teacher feedback?
- Where and how often do the materials encourage students to monitor their own progress based on feedback and self-reflection?

- Where and how often do the materials provide a clear path for students to monitor and move their own learning?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3p	Materials provide opportunities for teachers to use a variety of grouping strategies.

Scoring: Narrative Evidence Only

Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine the types and frequency of grouping strategies for teachers to use and to determine if guidance is provided to teachers on how and when to use specific grouping strategies.

In addition to general grouping structures and strategies, note evidence for grouping strategies that account for special populations, advanced students, and English learners.

Indicator 3p Guiding Question:

Do the materials provide opportunities for teachers to use a variety of grouping strategies?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe how and where the materials provide grouping strategies for students.
- Describe how and where the materials provide for interaction among students and the types of interactions provided.
- Describe how and where the materials provide guidance for the teacher on grouping students in a variety of grouping formats.

Note: If you identify grouping strategies specifically targeted to differentiated populations, please assign that evidence to the associated indicators (special populations will be in 3m; advanced students in 3n; English learners in 3q).

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do materials provide different grouping strategies? How does this differ based on the needs of particular students?

- How and where do materials balance whole group, small group, and individual instruction to provide for interaction among students?
- How and where do the materials provide guidance for the teacher on how and when to use specific grouping strategies?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3q	Materials provide strategies and supports for students who read, write, and/or speak in a language other than English to regularly participate in learning grade-level/grade-band science and engineering.

Scoring:		
2 points • Materials consistently provide strategies and supports for students who read, write, and/or speak in a language other than English to meet or exceed grade-level standards through regular and active participation in grade-level/grade-band science and engineering.	1 point • Materials provide strategies and supports for students who read, write, and/or speak in a language other than English to meet or exceed grade-level standards through active participation in grade-level/grade-band science and engineering, but not consistently.	0 points • Materials do not provide strategies and supports for students who read, write, and/or speak in a language other than English to meet or exceed grade-level standards through regular and active participation in grade-level/grade-band science and engineering.

About this indicator:

What is the purpose of this Indicator?

This indicator examines whether teacher and student materials provide strategies, supports, and resources for students who read, write, and/or speak in a primary language other than English to support their regular and active participation in grade-level/grade-band science and engineering.

Research or Standards connection:

See Appendix D: All Standards, All Students

Resources:

- NGSS Appendix D: All Standards, All Students

Indicator 3q Guiding Question:

Do the materials provide strategies and supports for students who read, write, and/or speak in a language other than English to regularly participate in learning grade-level/grade-band science and engineering?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe how the materials frame their EL approach and supports throughout the program for the explicit purpose of ensuring they are able to meet the standards.
- Describe how the materials provide strategies, appropriate support, and accommodations, that will support EL students' regular and active participation. Include opportunities for speaking, listening, reading, and writing to develop practices and knowledge of the subject matter. This may include scaffolding, but should scaffold up towards grade-level work.
- Describe content-specific or lesson-specific strategies or materials provided for supporting all students in engaging in grade-level/grade-band instruction. There must be more than a statement at the beginning of the chapter or lesson that is generic or states that the same strategy could be used with every lesson, and there needs to be specific supports and/or routines that allow students to access grade-level instruction and content.
- Describe teacher guidance to support EL students and to utilize the strategies, supports, and/or accommodations found. Also, describe how the learning opportunities and assessments help teachers identify and follow-up on whether the student has success in content vs. language acquisition, as well as identify when students may have misconceptions with content vs. language demand, to ensure the two are not conflated.
- Describe how the materials incorporate varied approaches to learning tasks over time and variety in how students are expected to demonstrate their learning of grade-level content with opportunities for students to monitor their language development.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where do materials provide appropriate support, and accommodations for EL students that will support their regular and active participation in learning science and engineering?
- Where is there evidence of specific resources and strategies supporting all students?
- Where are differentiation supports present for EL students?
- What materials would help teachers provide lessons and concepts to help support these students?
- Are there oral language development activities (including speaking and listening) for EL students to engage with grade-level content and to develop disciplinary practices and knowledge of the subject matter?
- Are there reading and writing activities that engage ELs in topics and prompts with peers and teacher throughout and as an integral part of the reading and writing process to develop disciplinary practices and knowledge of the subject matter?
- Do the materials for teachers provide guidance for instructional practices that promote student agency and learner autonomy for ELs?
- Do the materials provide guidance for teachers to anticipate and address potential language demands and opportunities that may interfere with engagement of content? Do they clearly identify where both student successes and challenges may be rooted in misconceptions in content vs. language demands, through learning and assessment?
- Do the materials support teachers in identifying students at various language levels with guidelines for supporting these students in monitoring and moving their language development along the English proficiency progression?
- For ELs still developing their language skills but exceeding in their ability to engage in grade-level content, do the materials allow for them to develop and deepen their understanding of concepts in their primary language?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3r	Materials provide a balance of images or information about people, representing various demographic and physical characteristics.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the series to determine if the materials include a balance of images or information about people, representing various demographic and physical characteristics.

Research or Standards connection:

"The diverse knowledge and skills that members of different cultural groups bring to formal and informal science learning contexts are assets to build on." (A Framework for K-12 Science Education, p. 288)

"When appropriate and relevant to the science issue at hand, standards documents should explicitly represent the cultural particulars of diverse learning populations throughout the text (e.g., in referenced examples, sample vignettes, performance expectations). Similarly, an effort should be made to include significant contributions of women and of people from diverse cultures and ethnicities. We acknowledge the challenge of creating a set of standards that attempts to represent all salient cultural groups, but that should not be an excuse for excluding them all." (A Framework for K-12 Science Education, p. 288)

Resources:

- A Framework for K-12 Science Education

Indicator 3r Guiding Question:

Do the materials provide a balance of images or information about people, representing various demographic and physical characteristics?

Evidence Collection

Review the student materials across the series.

Look for and record evidence to:

- Describe if and how the materials provide examples of various demographic and physical characteristics.
- Describe if the images and those represented show students engaging in and able to do the work related to the context of the learning.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do materials and assessments depict different individuals of different genders, races, ethnicities, and other physical characteristics?
- How and where do materials and assessments balance positive portrayals of demographics or physical characteristics? Do names used in assessments, or images throughout the materials depict different genders, races, ethnicities, and other physical characteristics?
- Do the materials avoid stereotypes or language that might be offensive to a particular group?
- Are depictions of demographics or physical characteristics portrayed positively across the series, or is one demographic represented more positively than others? For example, do assessment items proportionately use male and female names for both correct and incorrect responses, or is one gender predominately used for incorrect responses?
- Do the materials provide representations that show students that they can succeed in the subject, going beyond just showing photos of diverse students not engaged in work related to the context of the learning?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3s	Materials provide guidance to encourage teachers to draw upon student home language to facilitate learning.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials for teacher guidance on connecting learning opportunities to students through use of student home language.

Indicator 3s Guiding Question:

Do the materials present multilingualism as an asset in reading, and encourage support teachers of English learners to use their students' home language strategically for learning how to negotiate texts in the target language?

Do the materials include instructions on how to garner information of a students' home language that will aid in learning?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe if and how the materials provide suggestions and strategies to use the home language to support students in learning science.
- Describe if and how the materials present multilingualism as an asset in reading, and students are explicitly encouraged to develop home language literacy and to use their home language strategically for learning how to negotiate texts in the target language. Teacher materials should include guidance on how to garner information that will aid in learning, including the family's preferred language of communication, schooling experiences in other languages, literacy abilities in other languages, and previous exposure to academic or everyday English.

Cluster Meeting

Discuss and answer the following question to support consensus scoring conversations:

- What strategies are present to utilize student home language in context with the materials? Are these strategies generalized or specific to certain content?

- Do materials promote home language and knowledge as an asset to engage students in the content material?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3t	Materials provide guidance to encourage teachers to draw upon student cultural and social backgrounds to facilitate learning.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines whether materials are designed to elicit and leverage diverse cultural and social backgrounds of students.

Research or Standards connection:

"The diverse knowledge and skills that members of different cultural groups bring to formal and informal science learning contexts are assets to build on." (A Framework for K-12 Science Education, p. 288)

"Instructional materials can provide a motivating context to engage students by offering contexts that are personally or socio-culturally relevant to them, fostering learning through social and collaborative interactions, using project-based or place-based approaches, and providing activities, such as an engineering design problem, that allow students to experience a challenge and the satisfaction of overcoming the challenge. These kinds of activities situated in a relevant context promote students' engagement in the practice of science rather than experiencing science as a static set of facts or theories to be learned." (Guidelines for the Evaluation of Instructional Materials in Science, p. 33)

"instruction that builds on prior interest and identity is likely to be as important as instruction that builds on knowledge alone. All students can profit from this approach, but the benefits are particularly salient for those who would feel disenfranchised or disconnected from science should instruction neglect their personal inclinations." (A Framework for K-12 Science Education, p. 287)

Related indicator 1h in Gateway 1 focuses on leveraging students prior knowledge and experiences related to phenomena and problems. This indicator is broader in nature and leverages students' cultural and social backgrounds as assets to increase relevance and student interest and motivation.

Resources:

- A Framework for K-12 Science Education
- Guidelines for the Evaluation of Instructional Materials in Science

Indicator 3t Guiding Question:

Do the materials provide guidance to encourage teachers to draw upon student cultural and social backgrounds to facilitate learning?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe if and how materials make connections to the linguistic, cultural, and conventions used in learning science.
- Describe if and how materials make connections to the linguistic and cultural diversity to facilitate learning.
- Identify if teacher guidance is present on how to engage culturally diverse students in the learning of science.
- Identify equity guidance and opportunities in the materials.
- Identify opportunities for students to feel “acknowledged” such as tasks based on customs of other cultures; sections provided in multiple languages such as the glossary, digital materials, family letters; etc.
- Identify prompts where students are encouraged to share how they (or their parents) do things at home or use information to create personal problems, etc.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How well do the materials capitalize on diverse cultural and social backgrounds of students?
- How well do the materials help to promote equity and access (across genders, cultures, or countries of origin)?
- How well are the learning goals, instructional activities, text, and images presented in a context designed to leverage diverse cultural and social backgrounds of students?
- How well are the learning goals, instructional activities, text, or images, likely to be relevant, interesting and/or motivating to students?
    - How well do the materials connect to the students’ funds of knowledge, culture, or community?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3u	Materials provide supports for different reading levels to ensure accessibility for students.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine if supports are present for a range of student reading levels to work with grade-level/grade-band science and engineering and to determine if the materials indicate the reading levels for informational text-based components.

Research or Standards connection:

"Students' preparation in other subjects, especially literacy and mathematics, also affects their achievement in science. If some groups of students fail to become effective readers and writers by late elementary school, teachers have difficulty helping them to make progress—not only in science but also across all subject areas. These students fall further behind, and the problem for teachers grows more complex and challenging. Such dynamics can, in effect, reinforce the low-expectation tracking of students as they move through school, thereby significantly reducing their access to science and engineering pathways through K-12 and limiting the possibility of their going to college." (A Framework for K-12 Science Education, p. 279)

Resources:

- A Framework for K-12 Science Education

Indicator 3u Guiding Question:

Do the materials provide supports for different reading levels to ensure accessibility for students?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe how and where the materials provide all students, including those who read, write, speak, or listen below grade level, opportunities to work with grade-level text.
- Describe whether materials provide the reading levels for informational text components.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do the materials include specific supports or strategies to modify lessons or activities for students who read, write, speak, or listen below grade level?
- Where do the materials provide scaffolds or supports to support academic and/or disciplinary vocabulary or concept development?
- Do the materials provide teachers and students with purposeful and targeted activities for learning how to read typical scientific texts, for example, identifying evidence?
- Do materials include “just-right” pre-reading activities that offer visuals and other types of supports and scaffolds for building essential and pertinent background knowledge on new or unfamiliar themes/ topics?

Gateway 3: Usability

Criterion 3.3	The program includes materials designed for each child's regular and active participation in grade-level/grade-band/series content.
Indicator 3v	**This is not an assessed indicator in Science.*

Gateway 3: Usability

Criterion 3.4

Intentional Design

The program includes a visual design that is engaging and references or integrates digital technology, when applicable, with guidance for teachers.

What is the purpose of this Criterion?

This criterion:

- examines how the materials integrate digital technology and interactive tools to support student engagement in the three dimensions of science.
- examines how the materials use digital technology to provide collaborative opportunities for teachers and/or students.
- examines how the embedded technology and visual design supports student engagement and learning.

Scoring: Narrative Evidence Only

Note: No score is given for this criterion. Only qualitative evidence is provided.

Gateway 3: Usability

Criterion 3.4	The program includes a visual design that is engaging and references or integrates digital technology, when applicable, with guidance for teachers.
Indicator 3w	Materials integrate interactive tools and/or dynamic software in ways that support student engagement in the three dimensions, when applicable.

Scoring: Narrative Evidence Only

Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines whether materials integrate interactive tools and/or dynamic software in ways that support student engagement in the three dimensions of science and is applicable to materials with digital components only.

Indicator 3w Guiding Question:

Do the materials integrate interactive tools and/or dynamic software in ways that support student engagement in the three dimensions, when applicable?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe if and how digital technology and interactive tools, such as data collection tools, simulations, and/or modeling tools are available to students.
- Describe if and how included digital tools support student engagement in the three dimensions of science.
- Describe if and how digital materials can be customized for local use (i.e., to embed local phenomena and problems).

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- What digital technology and interactive tools are included in the materials?
- How are digital technology and interactive tools, such as data collection tools, simulations, and/or modeling tools made available to students?
- How do included digital tools support student engagement in the three dimensions of science?
- How can digital materials be customized for local use (i.e., student and/or community interests)?

Gateway 3: Usability

Criterion 3.4	The program includes a visual design that is engaging and references or integrates digital technology, when applicable, with guidance for teachers.
Indicator 3x	Materials include or reference digital technology that provides opportunities for teachers and/or students to collaborate with each other, when applicable.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the series to determine if the materials provide opportunities and guidance for teachers and/or students to collaborate with each other and is applicable to materials with digital components only.

Indicator 3x Guiding Question:

Do the materials include or reference digital technology that provides opportunities for teachers and/or students to collaborate with each other, when applicable?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe how and where the materials include or reference digital technology that provides opportunities for teachers and/or students to collaborate with each other.
- Describe which stakeholders the materials support collaboration between: teacher to teacher, teacher to student, or student to student.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- How and where do the materials provide opportunities for online or digital collaboration?
- How and where do the materials provide opportunities for students to collaborate with the teacher and/or with other students?

Gateway 3: Usability

Criterion 3.4	The program includes a visual design that is engaging and references or integrates digital technology, when applicable, with guidance for teachers.
Indicator 3y	The visual design (whether in print or digital) supports students in engaging thoughtfully with the subject, and is neither distracting nor chaotic.

Scoring: Narrative Evidence Only

Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the visual design to determine if images, graphics, and models support student learning and engagement, without being visually distracting; examines for consistency in layout of the teacher and student materials; examines resources to determine whether they clearly communicate information; and examines resources to determine whether they contain any errors as they relate to usability.

Indicator 3y Guiding Question:

Does the visual design (whether in print or digital) support students in engaging thoughtfully with the subject, and is neither distracting nor chaotic?

Evidence Collection

Review teacher and student materials across the series.

Look for and record evidence to:

- Describe how images, graphics, and models support student learning and engagement without being visually distracting.
- Describe whether teacher and student materials are consistent in layout and structure across lessons/modules/units.
- Describe if and how the images, graphics, and models clearly communicate information or support student understanding of topics, texts, or concepts.
- Identify any errors in the resources related to usability.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Do all images, graphics, and models support student learning and engagement, without being visually distracting?
- Are the teacher and student materials consistent in layout and structure?
- Are there any directions, questions, or information in the materials or assessments that are ambiguous, unclear, or inaccurate?

- Are the organizational features (Table of Contents, glossary, index, internal references, table headers, captions, etc.) in the materials clear, accurate, and error-free?

Gateway 3: Usability

Criterion 3.4	The program includes a visual design that is engaging and references or integrates digital technology, when applicable, with guidance for teachers.
Indicator 3z	Materials provide teacher guidance for the use of embedded technology to support and enhance student learning, when applicable.

Scoring: Narrative Evidence Only
Note: No score is given for this indicator. Only qualitative evidence is provided.

About this indicator:

What is the purpose of this Indicator?

This indicator examines the materials to determine whether they provide teacher guidance for the use of embedded technology to support and enhance student learning and is applicable to materials with digital components only.

Indicator 3z Guiding Question:

Do the materials provide teacher guidance for the use of embedded technology to support and enhance student learning, when applicable?

Evidence Collection

Review teacher materials across the series.

Look for and record evidence to:

- Describe where and how the materials provide guidance for using embedded technology to support and enhance student learning, where applicable.

Cluster Meeting

Discuss and answer the following questions to support consensus scoring conversations:

- Where and how do teacher materials provide guidance for using embedded technology to support and enhance student learning, where applicable?