

Primary Evaluation of Essential Criteria (PEEC) for Next Generation Science Standards Instructional Materials Design

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Table of Contents

Acknowledgements	2
<i>Legal</i>	2
Table of Contents	3
What is PEEC?	5
<i>PEEC evaluates instructional material programs, not individual lessons.</i>	5
<i>PEEC describes the innovations in the NGSS.</i>	5
<i>PEEC is a process.</i>	6
<i>PEEC builds on other tools.</i>	7
<i>PEEC continues to evolve.</i>	7
Purposes and Contexts	8
<i>PEEC and Other Framework-based Standards</i>	9
The NGSS Innovations and Instructional Materials	10
<i>Innovation 1: Making Sense of Phenomena & Designing Solutions to Problems</i>	10
<i>Innovation 2: Three-Dimensional Learning</i>	12
<i>Innovation 3: Building K–12 Progressions</i>	17
<i>Innovation 4: Alignment with English Language Arts and Mathematics</i>	21
<i>Innovation 5: All Standards, All Students</i>	22
Using PEEC to Evaluate Instructional Materials Programs	27
<i>States and PEEC</i>	27
<i>School Districts and PEEC</i>	28
<i>Developers, Writers, and PEEC</i>	28
PEEC Phase 1: Prescreen	29
<i>Preparing to PEEC</i>	30
<i>Applying the PEEC Prescreen</i>	32
<i>Analyzing Results From A Prescreen</i>	34
<i>Wrapping Up a Prescreen</i>	34
PEEC Phase 2: Unit Evaluation	35
<i>Selecting a Unit</i>	36
<i>Applying the EQUiP Rubric for Science</i>	37
<i>Connecting the EQUiP Rubric for Science to the NGSS Innovations:</i>	38
PEEC Phase 3: Program Level Evaluation	39
<i>Creating A Sampling Plan</i>	40
<i>Reviewing Claims and Evidence From The Sample</i>	41
<i>Summing Up</i>	42
Beyond PEEC	43
<i>Student Instructional Materials</i>	43
<i>Teacher Instructional Materials and Support</i>	43
<i>Equitable Opportunity to Learn in Instructional Materials</i>	43
<i>Assessment in Instructional Materials</i>	44

Glossary	45
Frequently Asked Questions	47
References	52
Tool 1A: PEEC Prescreen Response Form (Phenomena)	54
Tool 1B: PEEC Prescreen Response Form (Three Dimensions)	56
Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)	58
Tool 2: PEEC Prescreen: Recommendation for Review?	60
Tool 3: Unit Selection Table	61
Tool 4: EQulP Rubric Data Summary	62
Tool 5A: Program Level Evaluation Innovation 1: Making Sense of Phenomena and Designing Solutions to Problems	65
Tool 5B: Program Level Evaluation Innovation 2: Three-Dimensional Learning	68
Tool 5C: Program Level Evaluation Innovation 3: Building Progressions	72
Tool 5D: Program Level Evaluation Innovation 4: Alignment with English Language Arts and Mathematics	77
Tool 5E: Program Level Evaluation Innovation 5: All Standards, All Students	80
Tool 6: PEEC Evidence Summary	84
Tool 7: Final Evaluation	87

What is PEEC?

PEEC is an acronym for the Prietary Evaluation of Essential Criteria for NGSS Instructional Materials Design. Per the [Guide to Implementing the Next Generation Science Standards](#), high quality instructional materials designed for the NGSS are a critical component of NGSS implementation. PEEC is designed to:

- Bring clarity to the complicated and parallel processes of selecting and developing those instructional materials.
- Help educators and developers to focus on the critical innovations within the NGSS via a process to dig deeply into instructional materials programs to evaluate their presence.
- Answer the question “How thoroughly are these science instructional materials programs designed for the NGSS?”

PEEC evaluates instructional material programs, not individual lessons.

PEEC can be used to evaluate the NGSS design instructional materials programs of a variety of digital and print formats: kits, modules, workbooks, textbooks, textbook series. Appropriate materials may be commercially available, developed by states or districts, and/or provided as open educational resources. They can span several grade levels (e.g. a grades 5-8 middle school sequence) or be complete semester or year-long courses (e.g., high school biology).

PEEC is *not* intended for the evaluation of individual lessons or instructional units. For these smaller grain sizes of instructional materials, it would be more appropriate to use the [NGSS Lesson Screener](#) or the [EQuIP Rubric for Science](#), which are explicitly designed for this purpose. PEEC is also not intended to be used with supplemental materials or instructional materials compiled from several *different* sources (e.g., a combination of various textbooks, kits, modules, and digital supplements assembled by the user) *unless there is clear guidance* for how the different components will be used in the classroom to address the criteria highlighted in this evaluation.

PEEC describes the innovations in the NGSS.

To determine the degree to which an instructional materials program is designed for the NGSS, PEEC focuses on what makes the NGSS new and different from past science standards. These differences were first articulated as “conceptual shifts” in [Appendix A](#) of the standards released in 2013, but four years of subsequent implementation has refined our collective understanding of what is unique about the NGSS and has revealed that these aren’t just *shifts*. These differences represent innovations in science teaching and learning.

The five “NGSS Innovations” are:

1. **Making Sense of Phenomena and Designing Solutions to Problems.** Making sense of phenomena and/or designing solutions to problems in the context for student work, and drives student learning.
2. **Three-Dimensional Learning.** Student engagement in making sense of phenomena and designing solutions to problems *requires* student performances that include and connect grade-appropriate elements of the Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), and Disciplinary Core Ideas (DCIs) in instruction and assessment.
3. **Building K–12 Progressions.** Students’ phenomena and three-dimensional learning experiences are designed and coordinated over time to ensure students build their understanding and application of all three dimensions of the standards,
4. **Alignment with English Language Arts and Mathematics.** Students engage in learning experiences with explicit connections to and alignment with English language arts (ELA) and mathematics standards.
5. **All Standards, All Students.** All students have equitable access and opportunity to learn with science instructional materials.

Each of these innovations are described in detail in this document. These innovations are the lens that PEEC uses to help educators evaluate instructional materials and they should be the focus of those developing instructional materials for the NGSS.

It should be noted that there are certainly additional criteria for evaluating the quality of instructional materials that are not the primary focus of document, such as cost or ease of use of any technological components. Their omission is not because they are not important, but merely because they are not unique to materials designed for the NGSS. An initial discussion of these issues is found in the Beyond PEEC section on page 43.

PEEC is a process.

PEEC is a process for schools, districts, or other teams of teachers to use to evaluate aspects of instructional materials as described above. The PEEC evaluation process involves three successive phases that are each explained in detail in this document.

1. **PEEC Prescreen:** The prescreen focuses on a small number of criteria that should be readily-apparent in instructional materials designed for the NGSS. This allows those selecting materials to take a relatively quick look at a wide range of materials and narrow the number of programs worthy of a closer look.
2. **Unit Evaluation:** If the prescreen of the materials indicates that there is at least the potential they are designed for the NGSS, the PEEC process uses the [EQuIP Rubric for Science](#) as a sampling tool to evaluate a single unit of instruction for evidence it is designed for the NGSS.
3. **Program Level Evaluation:** For materials that successfully complete the previous phase, the final phase of the PEEC process evaluates the evidence that the NGSS Innovations are embedded across the entire instructional materials program.

PEEC builds on other tools.

To effectively use PEEC, instructional materials evaluators and developers should already be fluent in the language of the *Framework*, be comfortable navigating the NGSS—including the [Appendices](#) to the standards—and have experience with applying the EQuIP Rubric for Science to evaluate units. Users that are not familiar with these documents can find them and resources to support a deeper understanding of them at www.nextgenscience.org. PEEC also draws heavily from the discussions and evaluative criteria in [Guidelines for the Evaluation of Instructional Materials in Science](#). This document describes the research base for evaluative criteria that should be considered in building tools for evaluating instructional materials designed for the NGSS. The criteria for all three phases of PEEC have a close connection to those presented in the *Guidelines*.

PEEC continues to evolve.

PEEC represents the collective input, guidance, and efforts of many science educators around the country. As their work continues, subsequent versions of PEEC will build on and incorporate their experience.

We invite you to share your reactions to and suggestions for subsequent versions of PEEC by emailing peec@achieve.org.

Purposes and Contexts

PEEC takes the compelling vision for science education as described in *A Framework for K–12 Science Education* and embodied in the Next Generation Science Standards (NGSS) and operationalizes it for two purposes:

1. to help educators determine how well instructional materials under consideration have been designed for the *Framework* and NGSS, and
2. to help curriculum developers construct and write science instructional materials that are designed for the *Framework* and NGSS.

The NGSS do not shy away from the complexity of effectively teaching and learning science. They challenge us all to shift instructional materials to better support teachers as they create learning environments that support all students to make sense of the world around them and design solutions to problems. This vision is summarized in the following paragraph from the *Framework*:

By the end of the 12th grade, students should have gained sufficient knowledge of the practices, crosscutting concepts, and core ideas of science and engineering to engage in public discussions on science-related issues, to be critical consumers of scientific information related to their everyday lives, and to continue to learn about science throughout their lives. They should come to appreciate that science and the current scientific understanding of the world are the result of many hundreds of years of creative human endeavor. It is especially important to note that the above goals are for all students, not just those who pursue careers in science, engineering, or technology or those who continue on to higher education.

This vision isn't only aspirational; it is based on scientific advances and [educational research](#) about how students best learn science. This research and resulting vision for science education have implications for instructional materials that reach far beyond minor adjustments to lessons, adding callout boxes to margins, crafting a few new activities, or adding supplements to curriculum units. The advances in the NGSS will be more successfully supported if entire science instructional materials programs are *designed* with the innovations described by this evaluation tool and if states, districts, and schools use this tool to ensure that the materials they choose really measure up.

The word “**designed**” is intentionally and deliberately used here—and throughout the PEEC materials—instead of “aligned.” This choice was made because *alignment has come to represent a practice that is insufficient to address the innovations in these standards.*

When new standards are released, educators traditionally create a checklist or map in order to tally how well their instructional materials match up with the standards. If enough of the pieces of the standards match up with the pieces in the lessons or units or chapters, the instructional materials are said to be “aligned.” In this sense, “alignment” is primarily correlational and, if the

correlation is not high enough, the only shift that is needed is to add additional materials or remove particular pieces. This traditional approach to alignment assumes that (1) matching content between the language of the standards and the instructional materials is sufficient for ensuring that students meet the standards, and (2) that all approaches to the way instructional experiences are designed in materials are created equally as long as the content described by the standards appears.

However, the innovations of the *Framework* and NGSS cannot be supported by instructional materials that simply have the same pieces and words as the standards. In the NGSS, academic goals for students are stated as performance expectations that combine disciplinary core ideas, cross-cutting concepts, and science and engineering practices. The nature of this multidimensional combination is as important as the presence of the constituent components, and has implications for how students build the knowledge and skill needed to be able to meet multidimensional standards. Thus, the word “designed” was chosen because it reflects the degree to which the innovations represented by the standards are a foundational aspect of both the design and content the instructional materials.

This focus on these innovations speaks to the second purpose of PEEC—to support authors and curriculum developers as they work to produce instructional materials for the NGSS. This support began with NGSS [Appendix A](#) (the Conceptual Shifts in the Next Generation Science Standards), and was soon followed by the first version of the Educators Evaluating the Quality of Instructional Products (EQuIP) Rubric for Science that described what these shifts looked like in instructional materials at the lesson and unit level. The [EQuIP Rubric for Science](#) has been successively revised based on extensive use and feedback, and is now in its third version. The lessons from EQuIP process have been further articulated and codified to form the NGSS Innovations section of PEEC. While different from the “[Publisher’s Criteria](#)” that were developed for the Common Core State Standards in scope, format, and structure, the core intent of the Innovations is similar: to help curriculum developers and curriculum users think about how the standards should manifest themselves in instructional materials by focusing on the aspects that are most central to meeting the demands of the NGSS and most different from traditional approaches to standards, instruction, and materials. The goal is to help developers more easily create and refine instructional materials, and to do so knowing that their efforts are focused on the same innovations that schools, districts, and states will be using to select instructional materials for use.

PEEC and Other Framework-based Standards

Although PEEC was explicitly and specifically designed to evaluate materials designed for the NGSS and there are regular references to the NGSS throughout, the innovations that are part of these standards are fundamentally rooted in the *Framework*. This means that states and districts that did not adopt the NGSS, but that adopted standards based on the three dimensions of the *Framework* should also be able to use it to evaluate instructional materials that are developed for these key innovations.

The NGSS Innovations and Instructional Materials

To use PEEC effectively, both educators and developers need a common understanding of what is new and different about the NGSS. This section describes five “NGSS Innovations” and provides insight on how these innovations should be expected to appear in instructional materials. These innovations build on the conceptual shifts described in [Appendix A](#) of the NGSS and lessons learned by educators and researchers since implementation efforts began in 2013.

Innovation 1: Making Sense of Phenomena & Designing Solutions to Problems

Summary	Making sense of phenomena or designing solutions to problems drives student learning.
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From the *Framework*:

The learning experiences provided for students should engage them with fundamental questions about the world and how scientists have investigated and found answers to those questions.

Making sense of phenomena and designing solutions to problems are central to the work of scientists and engineers, and the *Framework* and the NGSS make that work central to student learning as well. This is more than an occasional engagement strategy that hooks students in with an exciting event or concludes with a fun building project after they have already learned the science they need to know. By centering instruction on the goal of students making sense of phenomena and designing solutions to problems, students have a reason to learn beyond acquiring information they are told they will later need. The focus of learning shifts from *learning about a topic* to *figuring out why or how something happens*. Making sense of phenomena and designing solutions to problems allows students to build science ideas through their application to understanding phenomena in the real world. This leads to deeper and more transferable knowledge and moves us closer to the vision of the *Framework*.

Students making sense of phenomena and designing solutions to problems are not entirely new processes for instructional materials, but the way that they are used in materials designed for the NGSS represents an innovation in teaching and learning. Making sense of phenomena and designing solutions to problems should be more than just instructional techniques to engage students, extensions, or sidebars—they are *central to the student learning experience*. In instructional materials programs designed for the NGSS, this should be obvious in the organization and flow of learning in student materials and a clear focus of the teacher supports for instruction and monitoring student learning. (See Table 1 for additional ways that making sense of phenomena and designing solutions to problems are different in the NGSS.) This focus should be clear in a

quick scan through instructional materials designed for the NGSS and, after a closer look, central to student learning within lessons and units and coordinated over the whole program in a way that is coherent for both students and teachers.

For more resources on how making sense of phenomena and designing solutions to problems are important for teaching and learning designed for the NGSS, visit <https://www.nextgen-science.org/resources/phenomena>.

Table 1 Innovation 1: Making Sense of Phenomena & Designing Solutions to Problems

Instructional materials programs designed for the NGSS include:

Less	More
Focus on delivering disciplinary core ideas to students, neatly organized by related content topics; Making sense of phenomena and designing solutions to problems are used occasionally as engagement strategies, but are not a central part of student learning.	Engaging all students with phenomena or problems that are meaningful and relevant; that have intentional access points and supports for all students; and that can be explained or solved through the application of targeted grade-appropriate SEPs, CCCs, and DCIs as the central component of learning.
Making sense of phenomena and designing solutions to problems separated from learning (e.g., used only as an engagement tool to introduce the learning, only loosely connected to a disciplinary core idea, or used as an end of unit or enrichment activity).	Students using appropriate SEPs and CCCs (such as systems thinking and modeling) to make sense of phenomena and/or to design solutions to give a context and need for the ideas to be learned.
Instructions for students to “design solutions” as a step-by-step directions-following exercise.	Students learning aspects of how to design solutions while engaged in the design process.
Only talking or reading about phenomena or how other scientists and engineers engaged with phenomena and problems.	Students experiencing phenomena directly or through rich multimedia.

Less	More
Leading students to just getting the “right” answer when making sense of phenomena.	Using student sense-making and solution-designing as a context for student learning and a window into student understanding of all three dimensions of the standards.

Innovation 2: Three-Dimensional Learning

Summary	Students making sense of phenomena or designing solutions to problems <i>requires</i> student performances that integrate elements of the SEPs, CCCs, and DCIs in instruction and assessment.
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From the *Framework*:

Instructional materials must provide a research-based, carefully designed sequence of learning experiences that develop students’ understanding of the three dimensions and also deepen their insights in the ways people work to seek explanations about the world and improve the built world.

That there are three dimensions in the standards—the science and engineering practices (SEPs), the disciplinary core ideas (DCIs), and crosscutting concepts (CCCs)—is probably the most immediately apparent innovation in the NGSS, but there is important and often-missed subtlety in the three-dimensionality that is of particular importance for instructional materials designed for the NGSS. The subtlety is highlighted in the three parts of this innovation:

- A. ***Three Dimensions***—all three dimensions are equally important learning outcomes.
- B. ***Integrating the Three Dimensions in Instruction***—the three dimensions need to work together and not be taught in isolation.
- C. ***Integrating the Three Dimensions in Assessment***—monitoring student learning should focus on tasks and assessments that integrate the three dimensions.

Part A: Three Dimensions

In the NGSS, all [three dimensions](#) of the *Framework* represent equally important learning outcomes ([Next Generation Science Standards](#), 2013). Though the precursors of each of these dimensions existed in past science standards in many states, they were not valued equally. Giving them equal footing as learning outcomes is an innovation of the NGSS.

Prior to the NGSS, the bulk of most state standards documents identified “science content” expected for students to know or understand. This “science content” was the precursor of *disciplinary core ideas*. In practice, the “regurgitation” of details often became a proxy for evaluating student conceptual understanding. Because of the sheer breadth of detailed information, most instructional materials and the instruction they supported focused on creative ways to disseminate this information to students, rather than on students building a deep conceptual understanding of disciplinary core ideas that they could use to make sense of the world.

Many state standards also included at least one standard that highlighted what students needed to know about how scientists do their work—the precursor to the *science and engineering practices*. Often called “inquiry,” this led off many state standards documents. Not surprisingly, it was frequently also the first chapter in textbooks based on the standards and was taught in classrooms as an introductory unit separate from any learning about “science content.” The separation of skills and knowledge in instructional materials combined with a much larger proportion of the standards being focused on “science content” led to an emphasis (in both instruction and assessment) on “science content.” In addition, when inquiry was included, inquiry skills were often superficial and did not build in complexity over time; there were not many differences in the expectations of elementary and secondary students, and often no clear and supported progression within grades or grade-bands for developing the knowledge and skills associated with inquiry targets.

Not quite as common—but still included in many state standards documents—were references to ideas derived from the “[Unifying Concepts and Processes](#)” of the [National Science Education Standards](#) (NRC 1996), the “[Common Themes](#)” of the *Benchmarks for Science Literacy* (AAAS 2009), “themes” in [Science for All Americans](#) (AAAS 1989), and “crosscutting ideas” NSTA’s Science Anchors Project (2010). These ideas—the precursor to the *crosscutting concepts*—were frequently addressed either in the front matter of the standards documents and/or were buried in standards that were viewed to be supplemental to core learning. Though they were often passively and implicitly included in science teaching and learning, there was generally little emphasis on them in learning goals for students.

Though these dimensions are similar to what has been in past standards in many states, what is addressed in each of these dimensions has significant changes based on the *Framework*. In addition, setting them as equally valuable learning goals is significantly different than how the three dimensions have been historically handled in instructional materials—both science content and scientific endeavor are essential components of the knowledge and skills students need for success. The science and engineering practices and crosscutting concepts are not in the service of the acquisition of the disciplinary core ideas, rather all three dimensions are used in service of students making sense of the world they live in. Instructional materials designed for the NGSS must be designed in a way that communicates this equal value while also clearly and methodically building student proficiency in all three dimensions over the course of the program.

Part B: Integrating the Three Dimensions in Instruction

Building student proficiency in all three dimensions is a significant innovation all by itself, but the implication of this innovation goes beyond three separate strands of learning that are equally

valued. The fact that these standards are written as three-dimensional performance expectations is significant and intentional, and should be reflected in the learning experiences within instructional materials. The *Framework* makes it clear that, “In order to achieve the vision embodied in the framework and to best support students’ learning, all three dimensions need to be integrated into the system of standards, curriculum, instruction, and assessment” (2012). Students develop and apply the skills and abilities described in the practices, as well as use the CCCs to make sense of phenomena and make connections between different DCIs in order to help gain a better understanding of the natural and designed world. To accomplish this, instructional materials designed for the NGSS must be anchored with integrated three-dimensional student performances. Simply parsing these dimensions back out into separate entities to be learned and assessed in isolation misses the vision of the NGSS and the *Framework*.

It is important to highlight that the standards were designed to be *endpoints* for a grade level (K–5), or grade band (6–8; 9–12) and that they collectively describe what students should know and be able to do—not *the only* performances students should experience. As such, the exact pairings of the dimensions in the standards should not limit how the dimensions are integrated during classroom instruction and assessment. That these standards are not intended to be curriculum is not necessarily a unique innovation—prior standards weren’t curriculum either—but it is highlighted here to avoid potential misinterpretations of the three-dimensional performance expectations in the NGSS. Because the very architecture of the NGSS models three-dimensionality, the standards themselves may end up *seeming like* a classroom lesson or unit, but it is absolutely **not** the intent of the standards to have students simply “do the standards.” Such an endeavor would be impractical and inefficient as many standards (and parts of standards) overlap with and connect to each other, but since the standards are written as grade level endpoints, they often contain elements of the dimensions that should be taught at different times of the year. For example, a standard may include a foundational DCI that makes sense to address early in the year, but a more advanced level of a CCC or SEP that students might not be prepared to achieve until the end of that same year (or end of the grade band). The NGSS performance expectations explicitly do **not** specify or limit the intersection of the three dimensions in classroom instruction. Instead, three-dimensional learning experiences that integrate multiple SEPs, CCCs, and DCIs will be needed to help all students build the needed competencies toward the targeted performance expectations.

Instructional materials designed for this innovation of the NGSS need to build student understanding across all three dimensions in a way that moves student proficiency toward the standards and helps educators track that progress. It should be clear which elements of the three dimensions are targeted by a lesson or unit, and how student progress will be measured across the three dimensions.

Part C: Integrating the Three Dimensions in Assessment

In addition to integrating the three dimensions in student learning experiences, high quality instructional materials designed for the NGSS will integrate the three dimensions when student progress is being measured throughout their embedded formative and summative assessments. This means more than just an occasional three-dimensional assessment task here or there, or assessments designed to measure one dimension at a time. The focus of measuring student

learning should utilize items and tasks that are measuring the dimensions together—in pre-assessments, formative assessments, and summative assessments. Three-dimensional assessment tasks should be embedded throughout instructional experiences, taking advantage of the rich opportunities that are part of instruction during which students make their thinking visible to themselves, their peers, and educators.

Assessment tasks must be designed to provide evidence of students' ability to use the SEPs, to apply their knowledge of CCCs, and to draw on their understanding of DCIs, all in the context of addressing specific problems or answering certain questions (National Research Council 2014). Instruction and assessments must be designed to support and monitor students as they develop increasing sophistication in their ability to use SEPs, apply CCCs, and understand DCIs as they progress through the year and across the grade levels. As in instruction, the focus of classroom level assessments should be tasks that integrate the dimensions in student performances. Although factual knowledge is fundamental and understanding the language and terminology of science is important, tasks that demand only declarative knowledge about practices or isolated facts would be insufficient to measure performance expectations in the NGSS (National Research Council 2014).

Effective assessment of three-dimensional science learning requires more than a one-to-one mapping between the NGSS performance expectations and assessment tasks. It is important to note that more than one assessment task may be required to adequately assess students' mastery of some three-dimensional targets, 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. To adequately cover the three dimensions, assessment tasks will generally need to contain multiple components (e.g., a set of interrelated questions). Developers might focus on individual SEPs, DCIs, or CCCs in some components of an assessment task, but together, the components need to support inferences about students' three-dimensional science learning as described in a given set of three-dimensional learning targets.

For an introduction regarding assessments and the NGSS, see [Seeing Students Learn Science: Integrating Assessment and Instruction in the Classroom \(2017\)](#), the STEM Teaching Tool [practice briefs on assessment](#), and [Developing Assessments for the Next Generation Science Standards](#).

For some more concrete examples of what *Innovation 2: Three-Dimensional Learning* looks like in instructional materials programs, see Table 2.

Table 2: NGSS Innovation 2—Three-Dimensional Learning

High quality instructional materials programs designed for the NGSS include:

Less	More
<p>Using science practices and crosscutting concepts only to serve the purpose of acquiring more science information—valuing the DCI dimension over the others.</p>	<p>Careful design to build student proficiency in all three dimensions of the standards.</p> <p>Student performances where the three dimensions intentionally work together to explain phenomena or design solutions to problems.</p>
<p>Students learning the three dimensions in isolation from each other, i.e.:</p> <ul style="list-style-type: none"> • A separate lesson or unit on science process/methods followed by a later lessons or units focused on delivering science knowledge. • Including crosscutting concepts only implicitly, or in sidebars with no attempt to build student proficiency in utilizing them. • Rote memorization of facts and terminology; providing discrete facts and concepts in science disciplines, with limited application of practice or the interconnected nature of the disciplines. • Prioritizing science vocabulary and definitions that are introduced before (or instead of) students develop a conceptual understanding. 	<p>Integrating the SEPs, CCCs, and DCIs in ways that instructionally make sense, as well as inform teachers about student progress toward the performance expectations, including:</p> <ul style="list-style-type: none"> • Students actively engaged in scientific practices to develop an understanding of each of the three dimensions. • CCCs are included explicitly, and students learn to use them as tools to make sense of phenomena and make connections across disciplines. • Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning.
<p>Teachers posing questions with only one correct answer.</p>	<p>Teacher questions elicit the range of student understanding.</p> <p>Students discussing open-ended questions that focus on the strength of evidence used to generate claims.</p>
<p>Only taking a snapshot of student understanding through summative assessments.</p>	<p>Formative assessment processes embedded into instruction to capture changes in</p>

Less	More
...administering additional assessments during instruction (e.g., vocabulary checks) that lack a clear feedback process to monitor and/or move student experiences to meet targeted learning goals.	student thinking over time and adjust instruction
Assessments that focus on one dimension at a time and are mostly concerned with measuring students' ability to remember information.	Assessments within the instructional materials reflect each of the three distinct dimensions of science and their interconnectedness.

Innovation 3: Building K–12 Progressions

Summary	Students' three-dimensional learning experiences are designed and coordinated over time to ensure students build understanding of <i>all three dimensions</i> of the standards, Nature of Science (NOS) concepts, and Engineering Design concepts and practices as expected by the standards.
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From the *Framework*:

[Instructional materials] 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 addition, curriculum materials need to be developed as a multiyear sequence that helps students develop increasingly sophisticated ideas across grades K–12.

To ensure that students can build their understanding over time in this way, lessons and units need to be thoughtfully designed and coordinated over time. Though a given curriculum or instructional materials program being evaluated with PEEC may focus on a single grade level or grade band, the NGSS place all of these progressions in a K–12 context. Both within years and across years, instructional materials should be thoughtfully, deliberately, and clearly progressing as elaborated below.

Three Dimensions K–12 Progression

The three-dimensional learning experiences described in *Innovation 2: Three-Dimensional Learning* need to be coherently coordinated over time to increase student proficiency in all three dimensions. In other words, the way that students use any given science and engineering practice on day one of a curriculum should be significantly different from how they are using that practice on day 180, and students should have many experiences across the year learning new elements of the practice and applying elements of the practice that have already been learned to new situations. The same can be said of the DCIs and the CCCs. Progressions of all three dimensions should be coordinated over time, and clear support should be provided to the teacher to see how these progressions build over time. Guidance should also be provided for teachers to support adjusting instruction of all three dimensions to meet the needs of their students. In programs that extend beyond a single year, these progressions should be coordinated over the full breadth of the instructional materials program.

Teachers at each grade level may feel that there is a lot of content to “cover” in their grade level. However, by ensuring that instructional materials build coherent progressions, teachers and students do not need to start from scratch with each learning sequence or unit. Teachers need to understand where students’ understanding and abilities are in each dimension, and they need to know how much students are expected to progress during their grade level. Instructional materials designed for the NGSS provide sustained learning opportunities from kindergarten through high school for all students to engage in and develop a progressively deeper understanding of each of the three dimensions. Students require coherent, explicit learning progressions both within a grade level and across grade levels so they can continually build on and revise their knowledge and expand their understanding of each of the three dimensions by grade 12. High quality NGSS-designed instructional materials must clearly show how they include coherent progressions of learning experiences that support students in reaching proficiency on **all** parts (e.g., all elements of the SEPs, DCIs, and CCCs) of the NGSS by the end of each grade level and across grades.

See NGSS [Appendix E](#), [Appendix F](#), and [Appendix G](#) for more information about the learning progressions for each dimension and how they build over time. For some more concrete examples of what *Innovation 3: Building K-12 Progressions* looks like in instructional materials programs, see Table 3.

Table 3: NGSS Innovation 3: Three Dimensions K–12 Progression

High quality instructional materials programs designed for the NGSS include:

Less	More
Building on students’ prior learning only for the DCIs.	Building on students’ prior learning in all three dimensions.

Less	More
Little to no support for teachers to reveal students' prior learning.	Explicit support to teachers for identifying students' prior learning and accommodating different entry points, and describes how the learning sequence will build on the prior learning.
Assuming that students are starting from scratch in their understanding.	Explicit connections between students' foundational knowledge and practice from prior grade levels.
Students engaging in the SEPs only in service of learning the DCIs	Students engaging in the SEPs in ways that not only integrate the other two dimensions, but also explicitly build student understanding and proficiency in the SEPs over time.
CCCs marginalized to callout boxes, comments in the margins, or are implicit and conflated with the other dimensions.	Students learn the CCCs in ways that not only integrate the other two dimensions, but also explicitly build student understanding and proficiency in the CCCs over time.
Including teacher support that focuses only on the large grain size of each dimension rather than digging down to the element level (e.g. the SEP "Analyzing and Interpreting data" rather than the grade 3–5 element of the same practice "Analyze data to refine a problem statement or the design of a proposed object, tool, or process.")	Including teacher support clearly explains out how the elements of the practices are coherently mapped out over the course of the instructional materials program.

Engineering Design and the Nature of Science

The NGSS include engineering design and the nature of science as significant concepts. Similar to the three dimensions of the standards, engineering design and the nature of science have been included in past science standards, but the degree to which and the way they are incorporated

into the NGSS is a distinct part of this innovation of the NGSS. They are both blended into the three dimensions of the standards and called out in specific places. While all the SEPs have elements that are explicitly focused on engineering, there are specific Engineering Design DCIs throughout the standards, and crosscutting ideas related to the interplay of Engineering, Technology, Science, and Society are integrated into standards in each grade band. (See [Chapter 3 in the Framework](#) for a detailed description of how the practices are used for both science and engineering. Box 3-2 briefly contrasts the role of each practice’s manifestation in science with its counterpart in engineering.) These engineering concepts and practices are included in standards throughout the NGSS that are marked with an asterisk. There are also grade-banded engineering design-specific standards in the NGSS to ensure that student learning about engineering design concepts is coherent and builds over time. NGSS [Appendix I](#) and [Appendix J](#) describe these progressions in more detail. Instructional materials designed for the NGSS should make sure that engineering is not an extension or engagement tool, but is incorporated meaningfully with science throughout student learning, and included as explicit and integrated learning targets.

As students engage in the science and engineering practices and use the crosscutting concepts and deepen understanding of the DCIs to make sense of phenomena and problems, they might accomplish some of what was referred to in separate areas of previous science standards documents as “Understanding the nature of science”. However, several aspects of the nature of science (e.g., the concepts that scientific investigations use a variety of methods, scientific knowledge is based on empirical evidence, science is a way of knowing, science is a human endeavor) are also explicitly included in the NGSS and integrated into the performance expectations. This is explained in more detail in NGSS [Appendix H](#). Instructional materials designed for the NGSS should ensure that these nature of science concepts are likewise explicitly embedded throughout student learning experiences and teacher supports, building learning progressions across grade bands.

For more examples of what NGSS Innovation 3: Building K-12 Progressions looks like in instructional materials programs as they relate to engineering design and the nature of science, see Table 4.

Table 4: NGSS Innovation 3B: Engineering Design and the Nature of Science

High quality instructional materials programs designed for the NGSS include:

Less	More
Presenting engineering design and the nature of science disconnected from other science learning (e.g., design projects that do not require science knowledge to complete successfully, or an intro unit on the nature of science).	Engaging all students in learning experiences that connect engineering design and the nature of science with the three dimensions of the NGSS; not separated from science DCIs.

Less	More
Presenting engineering design and/or nature of science in a hit or miss fashion, i.e. they are made apparent to students, but there is no coherent effort to coordinate or improve student understanding or proficiency over time.	Both engineering design and nature of science are thoughtfully woven into the three dimensional learning progressions so that students receive support to develop their understanding and proficiency.
Introducing students to ideas about engineering design or the nature of science, but not expecting students to retain or apply this information.	Measuring student learning in relation to engineering design and the nature of science across a system of assessments.
Teacher support only explains the importance of the nature of science and engineering design without a plan for scaffolding student understanding and application.	Teacher support explains how engineering design and the nature of science are coherently mapped out over the course of the instructional materials program.

Innovation 4: Alignment with English Language Arts and Mathematics

Summary	Students engage in learning experiences with explicit connections to and alignment with English language arts (ELA) and mathematics.
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From the *Framework*:

...achieving coherence within the system is critical for ensuring an effective science education for all students. An important aspect of coherence is continuity across different subjects within a grade or grade band. By this we mean “sensible connections and coordination [among] the topics that students study in each subject within a grade and as they advance through the grades” [3, p. 298]. The underlying argument is that coherence across subject areas contributes to increased student learning because it provides opportunities for reinforcement and additional uses of practices in each area. (A Framework for K–12 Science Education, 2012)

This degree of connection across content areas is a significant innovation in the NGSS. As is highlighted in [Appendix L](#) and [Appendix M](#), the NGSS went to great lengths to ensure that the English

language arts and mathematics expectations of students were grade-appropriate. The NGSS not only provide for coherence in science teaching and learning but also provide explicit connections with mathematics and ELA. The process of developing the standards also helped to highlight the many overlaps in the mathematics, ELA, and science practices. As the NGSS were being drafted, the writers ensured alignment to and identified some possible connections with the Common Core State Standards for English Language Arts in Science and Technical Subjects and Mathematics as an example of ways to connect the three subjects. In instruction within the science classroom, mathematical and literacy skills can be applied and enhanced to provide a symbiotic pace of learning in all content areas.

Instructional materials designed for the NGSS will highlight and support teachers in making connections between science, mathematics, and ELA. Grade-appropriate and substantive overlapping of skills and knowledge helps provide all students equitable access to the learning standards for science, mathematics, and ELA (e.g., see [NGSS Appendix D Case Study 4: English Language Learners](#)). For examples of NGSS Innovation 4: Alignment with English language arts and Mathematics, see Table 5.

Table 5: NGSS Innovation 4: Alignment with ELA and Mathematics

High quality instructional materials programs designed for the NGSS include:

Less	More
Providing siloed or disparate science knowledge that students learn in discipline-specific courses in isolation from reading, writing, and arithmetic—the historical “basic” knowledge.	Engaging all students in science learning experiences that explicitly and intentionally connect to mathematics and ELA learning in meaningful, real-world, grade-appropriate, and substantive ways and that build broad and deep conceptual understanding in all three subject areas.

Innovation 5: All Standards, All Students

Summary	Science instructional materials support equitable access to science knowledge and practice for all students.
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The NGSS offer a vision of science teaching and learning that presents both opportunities and demands for **all** students. This is an innovation of the NGSS based on both how the standards were developed as well as the nature of the common minimum expectations for all students by the end of 12th grade. During the development of the NGSS, the research about how students from diverse backgrounds and experiences learn science was built into the very architecture and

make-up of the standards rather than only being a part of a review—for example, the SEPs and CCCs provide multiple ways and access points for students to approach learning goals; and science is expected to build progressively from elementary school onward such that all students have the opportunity to develop scientific knowledge and practice. The standards pose the expectation that all students should have access to—and be well supported in learning—knowledge and practice across the range of DCIs, SEPs, and CCCs. This contrasts with science expectations that are only applicable to some students, and represents a significant shift to ensuring that all students are better prepared for their lives beyond high school.

Instructional materials that are designed for the NGSS provide opportunities for students and guidance to teachers for intentionally supporting diverse student groups, including students from economically disadvantaged backgrounds, students with special needs (e.g., visually impaired students, hearing impaired students), English language learners, students from diverse racial and ethnic backgrounds, students with alternative education needs, and talented and gifted students. They do so using a variety of strategies, but also ensure the following features of NGSS design are intentionally leveraged to support diverse learners.

Using relevant and authentic phenomena to create equitable learning contexts.

The focus on engaging real-world phenomena and design problems addresses diversity and equity considerations when the phenomena and problems are relevant to students and offer opportunities for students to make meaningful connections to them based on their own experiences and questions as drivers of learning experiences. Instructional materials should support teachers in meeting the needs of diverse students and in identifying, drawing on, and connecting with the cultural and linguistic experiences their students bring to the science classroom (National Research Council 2014), as research suggests that students’ science learning will be most successful if classroom experiences draw on and connect with these experiences (Rosebery et al. 2010; Warren, Ballenger, et al. 2001). Materials should carefully choose and/or provide flexibility in the focus phenomena or problems for each course, unit, or lesson, considering the interest and prior experiences of diverse students. When phenomena may not be relevant or clear to some students (e.g., crop growth on farms might not be relevant to those who don’t live near farms), the materials should offer alternate phenomena or problems to the teacher, or alternative ways for the teacher to ensure all students have an authentic and meaningful access point to connect to the learning experience. Materials also need to provide opportunities for students to make meaningful connections to the learning context, including by consistently cultivating student questions that connect the phenomena and problems to their current understandings, interests, and backgrounds, and regularly using those questions to drive the next learning experience.

Using the three dimensions to support equity and access.

Selecting relevant and authentic learning contexts to ground learning experiences in instructional materials is critical to supporting all students, but it is not sufficient. Students’ learning experiences that are connected to those phenomena also need to be designed such that making pro-

gress toward learning goals is accessible to all students. The three-dimensions and three-dimensional learning offer a path for students to negotiate their thinking and advance their understanding in accessible ways, when used intentionally to support diverse students. As an example, the NGSS offer opportunities for all students to engage in collaborative, rigorous science learning and rich language learning via the SEPs (Lee, Quinn, & Valdés, 2013; Quinn, Lee, & Valdés, 2012), and materials can highlight this by including additional supports, such as modifications for language learners, that do not compromise the science content; offering alternative approaches to engaging in practices (e.g., written, oral, diagrams); or offering ways to increase the sophistication with which students use the three-dimensions productively within a learning experience for students with high interest or advanced understanding. For more information regarding equitable learning opportunities and research-based effective classroom strategies for diverse student groups, see [Appendix D, “All Standards, All Students”](#) and the accompanying [Case Studies](#), which provide examples of strategies classroom teachers can use to ensure that the NGSS are accessible to all students.

Ensuring equitable opportunities to demonstrate student thinking.

Students need to have adequate opportunities to demonstrate their understandings and abilities in a variety of ways and appropriate contexts. Instructional materials designed for the NGSS should include many kinds of assessment opportunities, including (1) many that don’t rely solely on English speaking or writing skills to effectively demonstrate science learning, and (2) opportunities for students to provide, receive, and act on feedback from a range of sources (self, peer, teacher) as well as formats (e.g., discourse; performance tasks; oral, written, graphical presentations). Materials should include support for appropriate modifications and accommodations, as well as support for interpreting and acting on assessment information in ways that promote equitable science learning.

For more examples of NGSS Innovation 5: All Standards, All Students, see Table 6.

Table 6: NGSS Innovation 5: All Standards, All Students

High quality instructional materials programs designed for the NGSS include:

Less	More...
Students focusing on finding ways to remember information without coordinated opportunities to connect the learning to their personal experiences inside and outside of school.	Students having substantial opportunities to express and negotiate their ideas, prior knowledge, and experiences in ways that are productively connected to the learning experiences.

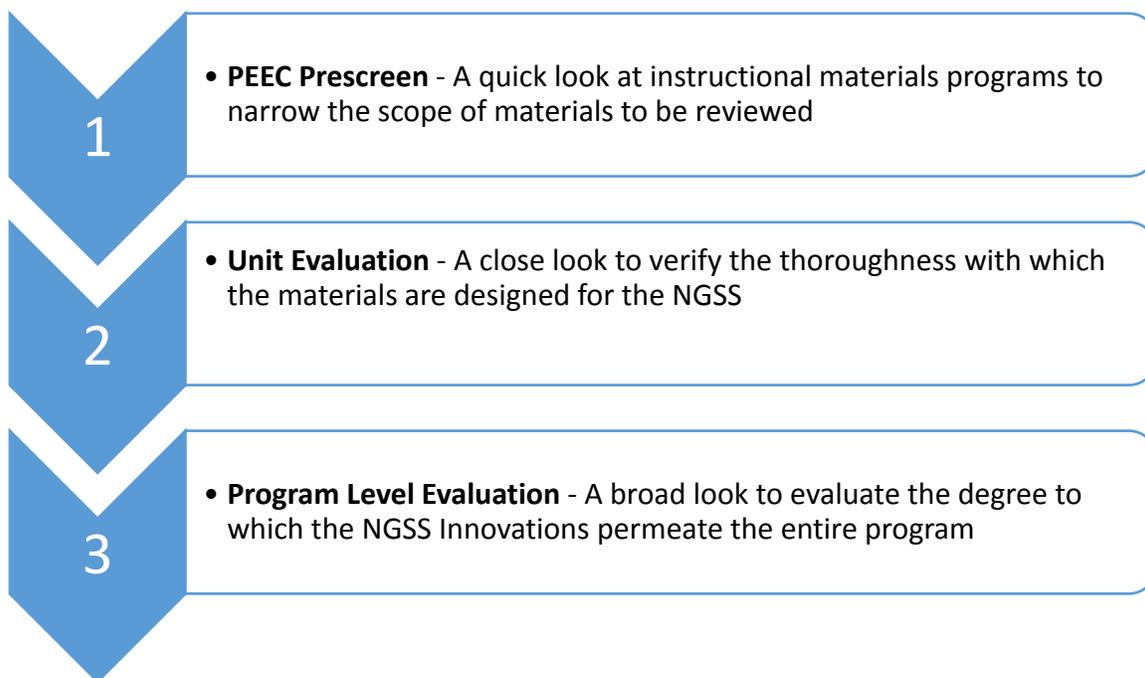
Less	More...
Materials including separate lessons or activities for students with different language or abilities.	Instructional materials create learning experiences that students with diverse needs and abilities can connect to and use to make progress toward common learning goals through a variety of student approaches within the same learning sequence.
Use of flashy phenomena as an interesting hook with the assumption that all students will find that compelling.	Inclusion of phenomena and problems that are relevant and authentic to a range of student backgrounds and interests, with supports for modifying the context to meet local needs and opportunities for students to make meaningful connections to the context based on their current understanding and personal experiences.
Materials providing limited ways of meeting learning goals, such as reading about topics, listening to lectures and note-taking, and following written or oral labs.	Materials engaging the SEPs, CCCs, and DCIs as access points and diverse ways for students to learn (e.g., students using the practice of argumentation and evidence-based discourse to develop scientific understanding; students developing and using modeling to make sense of phenomena and problems as well as make thinking visible in ways that are less dependent on English language proficiency).
Focusing teacher materials on delivering information to students without providing support to help teachers value and build on the experiences and knowledge that students bring to the classroom	Teacher materials including suggestions for how to connect instruction to the students' home, neighborhood, community and/or culture as appropriate and providing opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience.
Teacher materials only offering minimal or non-context specific support for differentiation.	<p>Teaching materials including:</p> <ul style="list-style-type: none"> • Appropriate reading, writing, listening, and/or speaking alternatives (e.g., translations, picture support, graphic organizers, etc.) for students who are English language learners, have special needs, or read well below the grade level.

Less	More...
	<ul style="list-style-type: none">• Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations.• Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts.

Using PEEC to Evaluate Instructional Materials Programs

The *NGSS Innovations* just described form the foundation of the PEEC instructional materials evaluation process. The criteria in PEEC explicitly focus on these innovations and how thoroughly they are represented in instructional materials programs.

The PEEC process involves three phases for each instructional materials program under consideration.



PEEC was designed to determine the degree to which instructional materials programs are designed with the innovations of the NGSS. As such, it is useful for both curriculum developers and instructional materials authors as well as by schools, states, and districts seeking to purchase or obtain instructional materials.

Some idea about how PEEC can be used by various audiences are below.

States and PEEC

PEEC can be used by States to:

- Develop criteria for reviewing and selecting state adopted or recommended *entire school science instructional materials programs*—school science textbooks, textbook series, kit-

based and other instructional materials and support materials for teachers—that are designed for both year-long and K–12 education, that represent comprehensive programs; or

- Describe a process for reviewing and selecting state adopted or recommended *entire school science instructional materials programs*—school science textbooks, textbook series, kit-based and other instructional materials and support materials for teachers—that are designed for both year-long and K–12 education, that represent comprehensive programs; or
- Provide guidance to districts to make strong instructional materials selections.

School Districts and PEEC

PEEC can be used by district and school educators to:

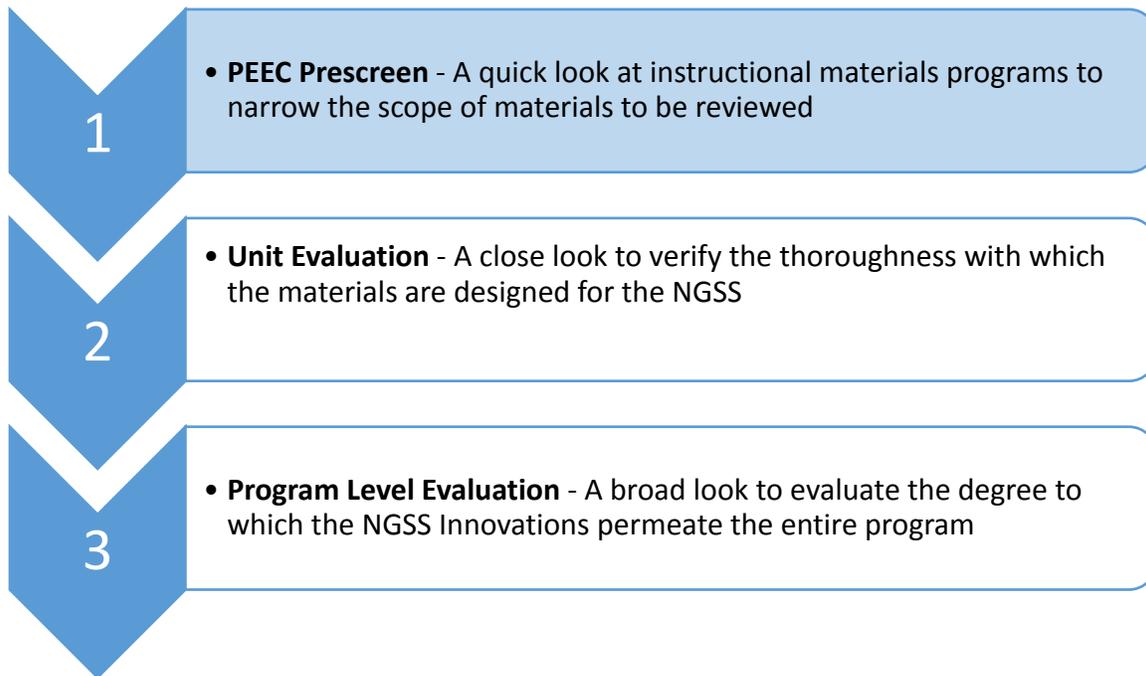
- Describe the process for reviewing and selecting *entire school science programs*—school science textbooks, textbook series, kit-based and other instructional materials and support materials for teachers—that are designed for the NGSS; or
- Evaluate current science instructional materials to identify adaptations and modifications to support NGSS implementation.

Developers, Writers, and PEEC

PEEC can be used by instructional materials developers, authors, writers, and designers to:

- Enhance initial design and planning of an *entire school science programs*—school science textbooks, textbook series, kit-based and other instructional materials and support materials for teachers—so that subsequent development, writing, and field testing best incorporates the NGSS.
- Analyze a program currently in development or in the market to understand if and how the innovations within the NGSS manifest themselves, to make better decisions about revisions or updates.
- Collect, document, and share evidence and claims so other educators can understand how a given set of instructional materials are designed for the NGSS.
- Enhance the capacity of development and sales or marketing teams, so that the people who work with schools, districts and states on behalf of a vendors understand the NGSS and the innovations the NGSS calls for.

PEEC Phase 1: Prescreen



Summary	PEEC Phase 1: Prescreen is a quick look at NGSS design for instructional materials programs.
Process	<ol style="list-style-type: none"> 1. Prepare for the review by identifying the people involved, the components of the instructional materials in question to review, and the evidence to be sought. 2. Apply the PEEC prescreen. Use <i>Tool 1A: PEEC Prescreen Response Form (Phenomena)</i>, <i>Tool 1B: PEEC Prescreen Response Form (Three Dimensions)</i>, and <i>Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)</i>. 3. Analyze the results. Use <i>Tool 2: PEEC Prescreen: Recommendation for Review?</i>.

The purpose of the prescreen is to do a relatively quick survey of an instructional materials program to see if it warrants further review. The prescreen offers users a process to determine if a given set of instructional materials appears to be designed for the NGSS. If the evidence for these three criteria is not clear and compelling, the materials are likely not worth the time and capacity necessary to fully evaluate the degree to which the programs are designed for the NGSS.

The prescreen focuses on three criteria related to the first two NGSS Innovations—*Innovation 1: Making Sense of Phenomena and Designing Solutions to Problems* and *Innovation 2: Three-Dimensional Learning* as shown in Table 7.

Applying the prescreen is not a thorough vetting of a resource and is not sufficient to support claims of being designed for the NGSS. However, if these innovations are not clearly visible, it is difficult to imagine that the resource is designed for the NGSS in a way that will support advancing science instruction in the classroom.

Table 7: PEEC Prescreen Summary Table

The instructional materials program is designed to engage all students in making sense of phenomena and/or designing solutions to problems through student performances that integrate the three dimensions of the NGSS.

Innovation 1	<p>Making Sense of Phenomena and Designing Solutions to Problems</p> <p>The instructional materials program focuses on supporting students to make sense of a phenomenon or design solutions to a problem.</p>
Innovation 2	<p>Three Dimensions</p> <p>The instructional materials program is designed so that students develop and use multiple grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs), which are deliberately selected to aid student sense-making of phenomena or designing of solutions.</p> <p>Integrating the Three Dimensions for Instruction and Assessment</p> <p>The instructional materials program requires student performances that integrate elements of the SEPs, CCCs, and DCIs to make sense of phenomena or design solutions to problems, and elicits student artifacts that show direct, observable evidence of three-dimensional learning.</p>

Preparing to PEEC

Before beginning a PEEC review process, several questions need to be answered.

Preparation Question 1: Who will be conducting the review?

In the beginning of the review process, a decision needs to be made about who will be applying the prescreen and conducting subsequent parts of the PEEC process. Will it be the whole group that is reviewing materials, or will it be a small leadership group? Applying the prescreen with the full group doing the review can be a way to build a common understanding of the first two innovations before digging in deeper with the Unit Evaluation. However, depending on the number of instructional materials programs being reviewed and the resources available to support the review, it may make sense for only a leadership group to apply the Prescreen to the full scope of materials being considered. Then, once a smaller set of programs have been identified, a larger group of educators can be involved in the remaining two phases of PEEC.

Certainly, refer to state, district, and local laws, rules, and guidance documents to ensure that all requirements are met. Suggestions for potential membership on the instructional materials committee include state, district, and school level science instruction, assessment, and equity supervisors, district administrators, school principals, elementary, middle, and high school science teachers, higher education and STEM partners, parents, students, and community members.

All committee members need a thorough understanding of the National Research Council's *A Framework for K–12 Science Education*, the Next Generation Science Standards (NGSS), and the NGSS Innovations. They need to be comfortable applying the EQuIP Rubric for Science 3.0. If participants have not received formal professional learning to support using the EQuIP Rubric for Science, that will need to be included in the process.

While it is possible for the prescreen and subsequent phases of the PEEC review to be applied by an individual, the quality review process works best with a team of reviewers as a collaborative process. As more people get involved, the likelihood for better evidence and understanding increases as the additional perspectives can deepen the review process. However, adding more review team members will increase the complexity and costs of a review effort. Working as a group will not only result in a better-informed decision, but the conversations can also bring the group to a common, deeper understanding of what instructional materials designed for the NGSS look like.

Regardless of the number of people involved, the same process works to collect input from individuals to make a collective decision. Just as when using the full EQuIP Rubric for Science, users should follow the sequence of steps below for each instructional materials program under consideration:

1. Individually record criterion-based evidence.
2. Individually use this evidence to make a recommendation about whether to continue review.
3. With team members, discuss evidence, recommendations, and reasoning.
4. Reach a consensus decision about conducting deeper analysis for this instructional materials program in subsequent PEEC phases.

Preparation Question 2: Which components of the instructional materials program will you review?

The NGSS Innovations evaluated by the prescreen should be explicit and obvious, and they should be present in the materials that are in the hands of all students and teachers—not just in optional or ancillary materials. The components of the instructional materials program chosen to review need to be selected in advance and consistent across programs. It is important to **review only what will be available to all teachers and to all students**. Though this is intended to be a quick read-through of materials, it is important—for all the materials reviewed and for each of the criteria—to evaluate both the overall organization of the materials and their content.

For each of the instructional material programs under consideration, teams should identify which components will be included and which ones will not be included in the PEEC review process.

Preparation Question 3: What evidence should be sought?

Before applying the prescreen, it's important that the review group has a common understanding of what qualifies as evidence for the criteria. To establish this understanding, start by reading the “less like, more like” tables in *Tool 1A: PEEC Prescreen Response Form (Phenomena)*, *Tool 1B: PEEC Prescreen Response Form (Three Dimensions)*, and *Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)*. These are shortened versions of the tables embedded in the NGSS Innovations discussion. If necessary, review the descriptions of NGSS Innovations 1 and 2, and answer the following questions for each criterion in the prescreen:

1. What would it look like for a student or teacher resource to be *organized* in a way that demonstrates this innovation?
2. How would *the content* of a student or teacher resource look different if it were demonstrating this innovation?

Applying the PEEC Prescreen

Once the reviewers have a common understanding of the evidence they are looking for, it is time to examine the instructional materials programs under consideration. For each instructional materials program that is to be reviewed, page through the selected program materials and examine the chapter/unit/overall organization as well as the individual lessons and units. For both the organization of the materials and the content, look for evidence that would indicate that the instructional materials program **is** designed for each criterion as well as for evidence that the program is **not** designed for each criterion.

There are three forms to use, one for each criterion, to collect and articulate this evidence: *Tool 1A: PEEC Prescreen Response Form (Phenomena)*, *Tool 1B: PEEC Prescreen Response Form (Three Dimensions)*, and *Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)*. See Table 8 below as an example. What is recorded as evidence should answer the question in the table, “What was in the materials, where was it, and why is this evidence?” relevant to each criterion.

During this stage of the work, it is important to remember that this is a prescreen and not the full evaluation. It is not necessary to find every piece of evidence in the program; instead, make a relatively quick pass through the materials. In materials that at least show promise for being designed for the NGSS, it should not be difficult to see evidence of at least an attempt to address these innovations. The degree to which these innovations are truly designed into the materials will be evaluated in more detail later in this process.

Table 8: Example Tool 1A: PEEC Prescreen Response Form (Phenomena)

Less Like This	More Like This	Shows promise?
<p>Evidence this criterion is not designed into this instructional materials program.</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>Evidence this criterion is designed into this instructional materials program.</p> <p>What was in the materials, where was it, and why is this evidence?</p>	
<p>Page iii: table of contents is organized by "typical" science topics; the unit and chapter titles give no indication that students are making sense of phenomena or designing solutions to problems;</p> <p>Page 115 (Unit 4 teacher text)—the teacher support for using the phenomena of this unit only talks about using the phenomena as hooks or engagement; it positions the teacher to explain the phenomena rather than the students.</p>	<p>Pages 15-47 (Unit 1 student text)—though the title of this unit is "cells," it engages students with making sense of a series of phenomena; student explanations of several smaller phenomena support students to explain a larger phenomenon</p> <p>Pages 124-177 (Unit 5 student text)—this unit explicitly incorporates the engineering design process; it is not just for enrichment, or a culminating activity; it is not just a directions-following activity;</p> <p>Pages 144-147 (Unit 5 teacher text)—there is ample support here for teachers to organize instruction to support student discourse and suitable information for teachers in our district that may not have experience with teaching engineering.</p>	<input type="checkbox"/>

Analyzing Results from A Prescreen

Once the evidence has been recorded on *Tool 1A: PEEC Prescreen Response Form (Phenomena)*, *Tool 1B: PEEC Prescreen Response Form (Three Dimensions)*, and *Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)*, it is time to decide if the evidence indicates that the instructional materials program shows promise. There are two levels where this question needs to be answered:

Is there enough evidence to check the “shows promise?” box for each criterion?

Tool 1A: PEEC Prescreen Response Form (Phenomena), *Tool 1B: PEEC Prescreen Response Form (Three Dimensions)*, and *Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)* all include a “shows promise?” checkbox that should be considered once the evidence has been recorded on the tool.

To answer this question, weigh the “More Like This” evidence with the “Less Like This” evidence. This first phase of PEEC is meant to be a quick glance that sorts out instructional materials programs that are not designed for the NGSS—if a program is close, it warrants further review. Checking the box here does not mean that the criterion is thoroughly and appropriately designed into the instructional materials program, but it does mean the program shows promise and it is worth the time to dig deeper. Leaders should trust in the expertise of the educators doing the review—their knowledge of the innovations of the NGSS and their awareness of the needs of students in their classrooms is key to making this decision.

Is there enough evidence across the three criteria to warrant further review?

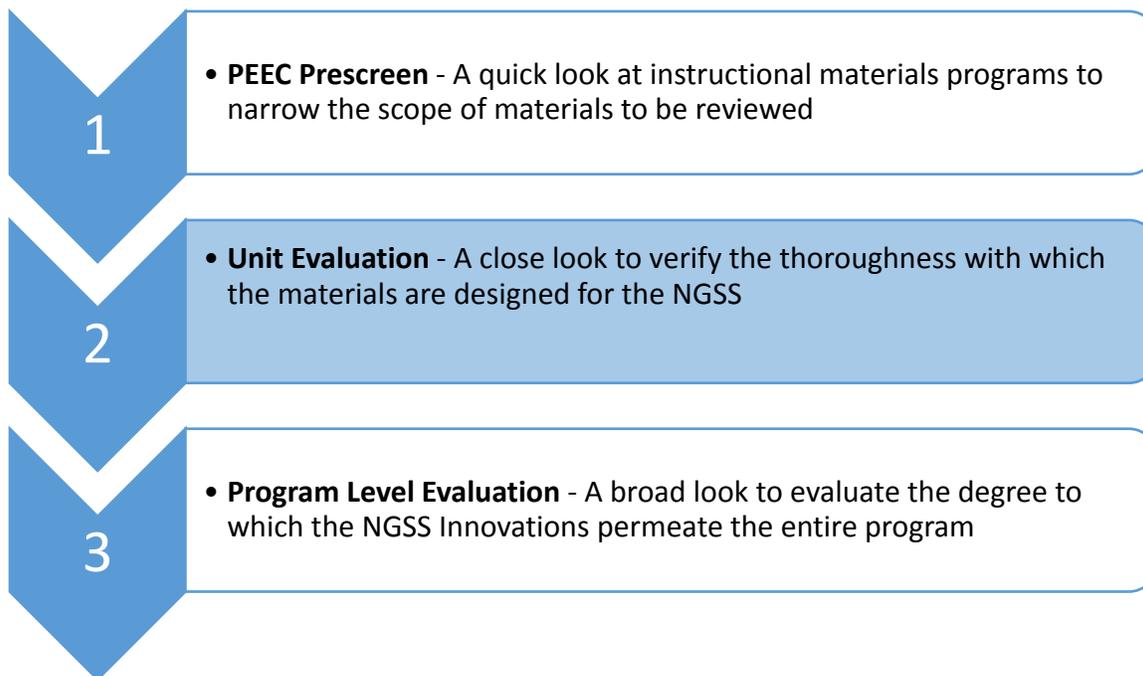
All three criteria should have their “Shows promise” box checked to indicate that there is sufficient *initial* evidence that the instructional materials program is designed to address these first two key innovations of the NGSS. If instructional materials programs that do not meet this expectation are carried over to the next step in this process, it should be done with the awareness that this will require more time, effort, and energy in the review process.

Wrapping Up a Prescreen

After applying the PEEC Prescreen across the instructional materials programs that are being considered, those that don’t meet the fundamental criteria of the prescreen should be set aside. They can always be analyzed later if none of the initial materials measures up, but the remaining analyses are more time- and resource-intensive, so focus on the programs that have the clearest prescreen evidence of NGSS-design.

Each member of the review group should complete *Tool 2: PEEC Prescreen: Recommendation for Review?* to document their final analysis.

PEEC Phase 2: Unit Evaluation



Summary	PEEC Phase 2: Unit Evaluation uses the EQulP Rubric for Science to dig deep into a given unit of an instructional materials program.
Process	<ol style="list-style-type: none"> 4. Select a single unit from the instructional materials program in question to analyze. Use <i>Tool 3: Unit Selection Table</i>. 5. Applying the EQulP Rubric for Science to the unit you have selected. 6. Connecting the EQulP Rubric for Science to the NGSS Innovations using <i>Tool 4: EQulP Rubric Data Summary</i>.

Once instructional materials programs have been established by the PEEC Phase 1: Prescreen to at least have the appearance of being designed for the NGSS, the next step is to look at a full unit to evaluate evidence for the rest of the NGSS Innovations. Luckily, a tool already exists for this type of evaluation—the [Educators Evaluating the Quality of Instructional Products \(EQulP\) Rubric for Science](#) provides criteria by which to measure the alignment and overall quality of lessons and units with respect to the NGSS. The EQulP Rubric for Science guides reviewers to look for evidence of three categories of NGSS Design, as show on Table 9.

Table 9: Categories of Evidence in the EQuIP Rubric for Science

Category	Title	Description
1	NGSS Three-Dimensional Design	The unit is designed so students make sense of phenomena and/or design solutions to problems by engaging in student performances that integrate the three dimensions of the NGSS.
2	NGSS Instructional Supports	The unit supports three-dimensional teaching and learning for ALL students by placing lessons in a sequence of learning for all three dimensions and providing support for teachers to engage all students.
3	Monitoring NGSS Student Progress	The unit supports monitoring student progress in all three dimensions of the NGSS as students make sense of phenomena and/or design solutions to problems.

Selecting a Unit

There are a variety of factors to consider in selecting a single unit to represent an instructional materials program in the unit evaluation process. These include: the length of the unit; similarity of units across programs; evaluator expertise; and available resources for review. These features are described in this section. *Tool 3: Unit Selection Table* should be used by groups to make the unit selection.

Different instructional materials programs may define a “unit” in different ways, so it will be important to look across the programs that have cleared the prescreen and select a portion of the program that has a comparable length of instruction. Generally, a unit is a collection of lessons in an intentional sequence tied to a learning goal. Units usually longer than a few days of classroom time to complete, whereas lessons take days.

To be able to effectively apply the EQuIP Rubric for Science, a selected unit should include sufficient length for students to:

- Explain at least one phenomenon and/or design a solution to at least one problem;
- Engage in at least one three-dimensional student performance; and
- Have their learning measured across the three dimensions of the standards.

The unit evaluation should also include the teacher support materials that correspond with the unit of instruction. The only caveat to this would be if these materials won't be available to the teachers who will be implementing the program. In this case, only student materials should be evaluated. The unit for evaluation may correspond with a chapter or unit in a book, or the materials accompanying an online module, but reviewers should strive to select a comparable section for review across programs.

As instructional materials programs are being designed for the NGSS and focusing more on students using the three dimensions to make sense of phenomena and design solutions to problems, it is quite possible that the units may not be as easily comparable in topic and organization as they once were. For example, most current high school biology texts have a single Biology unit focused on photosynthesis. However, as instructional materials programs designed with the NGSS Innovations in mind are developed, the DCI information related to photosynthesis may be spread out through both Chemistry and Biology courses, and the concepts might be developed through several different instructional units. Since developers will likely not all make curriculum design decisions in the same way, finding the right unit to compare may become increasingly difficult. A plan should be made to ensure that a comparable unit is selected across programs.

In considering which unit to review in each program, it is also important to consider the expertise of the review team. The degree of comfort the review team has with the three dimensions of the standards that are the focus of student learning for the unit being reviewed will affect their reviews—many physics teachers aren't intimately familiar with cellular respiration, for instance. But this can cut both ways: teachers that have deep knowledge of the DCIs in the unit might be able to better recognize deficiencies in how the DCIs are addressed, but they also might read between the lines to see connections that aren't explicit in the program; they might see connections that teachers without that background would not see or be able to help students make. The unit that is selected should consider this factor when both selecting the unit for review and assigning it to groups for review.

As always, these factors will need to be balanced with the resources—people, time, and money—that are available. A longer selection will give a better look at what the program offers, but it will also take more resources to evaluate. Having multiple groups look at each resource and compare their evaluations will provide a more balanced evaluation, and the ensuing conversations, if properly facilitated, can help prepare teachers to implement the materials once they are selected. However, this requires a greater time commitment from those participating in the review.

For each program being reviewed, identify which unit will be reviewed and explain why that unit was selected in the *Tool 3: Unit Selection Table*.

Applying the EQIP Rubric for Science

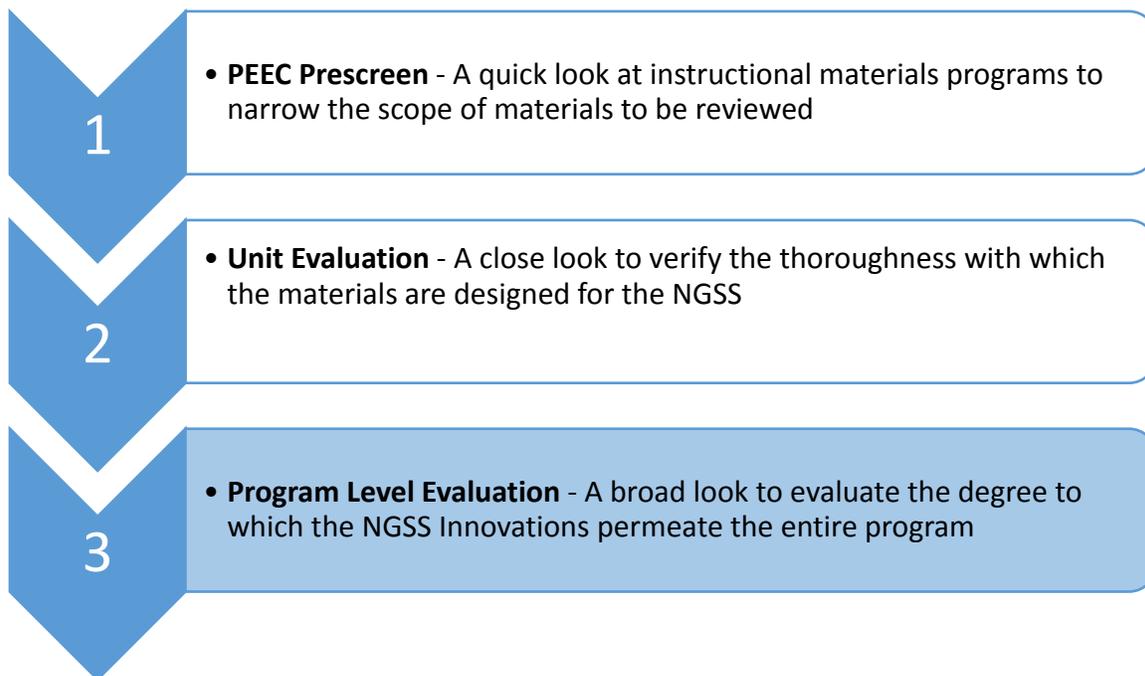
Once the unit that will be evaluated within each instructional materials program have been identified, it is time to use the [EQIP Rubric for Science](#) to evaluate each unit. Full support for using the EQIP Rubric for Science is not included within the PEEC document, but the process for using it is described within the rubric itself and in the [EQIP Professional Learning Facilitator's Guide](#)

and associated resources found on the [EQuIP Rubric for Science webpage](#). Reviewers should not be expected to reliably apply this rubric to units without professional learning support. *It is not necessary to use the scoring guide portion of the rubric*, because of how the information from EQuIP is incorporated into PEEC, but it is important to gather specific evidence of each criterion within the unit.

Connecting the EQuIP Rubric for Science to the NGSS Innovations:

Once the EQuIP Rubric for Science has been completed for the unit, transfer the information captured in the “Evidence of Quality?” checkboxes to *Tool 4: EQuIP Rubric Data Summary* and then, based on the pattern of checks and the evidence recorded in the rubric, decide the degree to which the unit appears to have integrated the NGSS Innovations.

PEEC Phase 3: Program Level Evaluation



Summary	In PEEC Phase 3: Program Level Evaluation, the NGSS Innovations are evaluated across an entire program.
Process	<ol style="list-style-type: none"> 7. Determine a sampling plan for the instructional materials program in question. 8. Review evidence and associated claims from the sample. 9. Sum up the claims and make a final recommendation.

The EQuIP Rubric for Science provides a close look at a single unit, but in programs designed for the NGSS, the NGSS Innovations need to build across the program. For each of the Innovations, this means looking for evidence beyond just the unit that was evaluated in PEEC Phase 2.

For example, the unit may have provided multiple and varied opportunities for students to ask scientific questions based on their experiences—clearly engaging students in the SEP “Asking Questions and Designing Problems”, but the scope of the unit may have been limited to developing a particular element of the SEP (e.g., only asking scientific questions without opportunities to define criteria and constraints associated with the solution to a problem) or to developing student facility with a particular element to a certain degree (e.g., appropriately removing scaffolds for development within the unit but not for the full expression of the SEP; only beginning to connect this SEP to other relevant SEPs). It is also important that that elements of that practice are effectively incorporated throughout the instructional year. As is described in *Innovation 3*:

Building Progressions, an instructional materials program designed for the NGSS will not only engage students in the practices, but will also build their understanding and use of each practice over time. If the unit evaluated in PEEC Phase 2 is either the only time that students engage in this practice, or if students engage in the practice the same way every time, then this innovation is not embedded in the program. PEEC Phase 3: Program Level Evaluation will support reviewers in examining the instructional materials program to determine whether the unit was representative of how well the NGSS Innovations are embedded throughout the instructional materials program.

To do this across the entire instructional materials program, PEEC uses a different lens for evaluation. In this phase of evaluation, the student and teacher materials are evaluated to look for evidence of claims that would be expected to be present in materials designed for the NGSS. This will build on the evidence base of the PEEC Prescreen and Unit Evaluation to move reviewers to a final decision about which program to select.

Creating A Sampling Plan

Reviewing every lesson, unit, and component of an instructional materials program isn't feasible in most circumstances—the time and effort for such a task would outweigh the benefit for most users. Instead, PEEC users should develop a sampling plan that articulates which portion of the instructional materials program is subject to review. This is particularly important when comparing instructional materials programs.

A sampling plan is a document that articulates which portions or sections of a set of instructional material programs will be reviewed during PEEC Phase 3: Program Level Evaluation. Sampling plans generally focus on learning sequences, which would feature four or five classroom lessons. A sampling plan should:

- Focus on learning sequences that span at least 4-5 lessons
- Choose at least three learning sequences
- Ensure the learning sequences come from the beginning, middle, and end of the instructional materials program.

An example sampling plan thus might look like the following.

*As we use PEEC to review *Amazing Science* ©2017, we will*

1. Sample three learning sequences consisting of four to five lessons per sequence. Based on our unit analysis in Phase 2, this sample should allow us to look for the development and use of the three dimensions together over time in service of students progressively making sense of phenomena.
2. Intentionally select one learning sequence from the beginning third of the program, one in the middle third, and one in the final third to ensure that instructional sequences logically build student proficiency from the beginning to the end of the year (one of these samples could be the unit evaluated in phase 2).

3. Select sequences that allow for some connectivity across the year, such as a particular SEP or CCC being foregrounded in all three sequences or sequences that build on related DCIs.
4. Select sequences that cover a range of the three-dimensions so that we can evaluate some measure of coverage.

Reviewing Claims and Evidence from The Sample

Once the sampling evaluation plan has been established, read through the claims in *Tool 5A: Program Level Evaluation Innovation 1: Making Sense of Phenomena and Designing Solutions to Problems* and then read through the sample identified in the immediately preceding step to determine if there is evidence in the materials that would support the claim. Record evidence you find on the tool.

Once the evidence has been recorded, evaluate the degree to which there is evidence of each criteria. Use the following as guidance for evaluating the categories/samples:

- **No Evidence:** There is not any evidence to support the claim in the sampled materials.
- **Inadequate Evidence:** There are a few instances of evidence to support the claim, but they are intermittent or do not constitute adequate time or opportunity for students to learn the content or develop the ability.
- **Adequate Evidence:** Evidence for this claim is common and there is adequate time and opportunity, and support for all students to learn the content and develop the abilities.
- **Extensive Evidence:** Evidence for this claim is pervasive throughout the program and there is adequate time, opportunity, and support for **all** students to learn the content and develop the abilities.

These ratings of the quality of evidence supporting each claim should be done first individually and then discussed as a group to reach consensus.

Finally, based on the evidence collected and the pattern of checks, complete the bottom portion of the Tool that asks reviewers to decide the degree to which the innovation shows up across the program. For materials that only partially incorporate the innovation, provide suggestions for what will be needed—professional learning; additional lessons, units, or modules; developing a district-wide approach to using the crosscutting concepts (because they aren't well represented in the materials); etc.

Repeat this process for the remaining four NGSS Innovations by completing *Tool 5B: Program Level Evaluation Innovation 2: Three-Dimensional Learning*, *Tool 5C: Program Level Evaluation Innovation 3: Building Progressions*, *Tool 5D: Program Level Evaluation Innovation 4: Alignment with English Language Arts and Mathematics*, and *Tool 5E: Program Level Evaluation Innovation 5: All Standards, All Students*.

Summing Up

To finish the PEEC process, complete *Tool 6: PEEC Evidence Summary*, adding information from each phase of the PEEC process for the instructional materials program in question. Finally, complete *Tool 7: Final Evaluation* to articulate your final recommendation.

Beyond PEEC

It is important to reiterate that there are certainly additional criteria for evaluating the quality of instructional materials that are not discussed in this document. Their omission is not because they are not important, but merely because they are not unique to materials designed for the NGSS. Examples of these criteria can be found below. The additional criteria required by each district or state can be applied during or after phase 3 of the PEEC evaluation process.

These additional criteria should be present in all high-quality science instructional materials, but are not specific to NGSS.

Does the instructional materials program in question:

Student Instructional Materials

- Adhere to safety rules and regulations?
- Provide high-quality (e.g., durable, dependable, functioning as intended) materials, equipment in kits, technological components, or online resources, where applicable?

Teacher Instructional Materials and Support

- Include precise and usable technology specifications?
- Describe strategies including alternative approaches and delivery that will assist in differentiating instruction to meet the needs of all students (e.g., English language learners, special needs students, advanced learners, struggling students)?
- Include a detailed list of needed materials, both consumable (e.g., cotton balls, pinto beans) and permanent (e.g., laboratory equipment), that are to be used throughout the program?
- Provide sufficient description about how to use materials and laboratory equipment, including safety practices and possible room arrangements.

Equitable Opportunity to Learn in Instructional Materials

- Provide the appropriate reading, writing, listening, and/or speaking modifications (e.g., translations, front-loaded vocabulary word lists, picture support, graphic organizers) for students who are English language learners, have special needs, or read below the grade level?
- Provide extra support for students who are struggling to meet performance expectations?

Assessment in Instructional Materials

- Assessments with explicitly stated purposes that are consistent with the decisions they are designed to inform?
- Assessments with clear systems to help educators use the resulting data for feedback and monitoring purposes?
- Assessments that are embedded throughout the instructional materials as tools for monitoring students' learning and teachers' instruction?
- Assessments that use varied methods, languages, representations, and examples to provide teachers with a range of data to inform instruction?
- Assessments that are unbiased and accessible to all students?

Glossary

The following terms are used throughout PEEC. For additional help with language and terms used here, please see the [List of Common Acronyms used by Next Generation Science Standards](#).

Bundles/Bundling. Grouping elements or concepts from multiple performance expectations into lessons, units, and/or assessments that students can develop and use together to build toward proficiency on a set of performance expectations in a coherent manner. The article available [here](#) provides more description and some video examples of bundles and bundling.

Crosscutting Concepts (CCC). These are concepts that hold true across the natural and engineered world. Students can use them to make connections across seemingly disparate disciplines or situations, connect new learning to prior experiences, and more deeply engage with material across the other dimensions. The NGSS requires that students explicitly use their understanding of the CCCs to make sense of phenomena or solve problems.

Disciplinary Core Ideas (DCI). The fundamental ideas that are necessary for understanding a given science discipline. The core ideas all have broad importance within or across science or engineering disciplines, provide a key tool for understanding or investigating complex ideas and solving problems, relate to societal or personal concerns, and can be taught over multiple grade levels at progressive levels of depth and complexity.

EQuIP for Science. Educators Evaluating Quality in Instructional Products (EQuIP) for science is a tool and accompanying process for evaluating how well an individual lesson or single unit (series of related lessons) is designed to support students developing the knowledge and practice described by the Framework and the NGSS.

The Framework. A shortened title for the 2012 foundational report, *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*, published by the National Research Council (NRC) describes the scientific consensus for the science knowledge and skills students should acquire during their K-12 experience. A team of states, coordinated by Achieve, took the Framework and used it to develop the Next Generation Science Standards. [The Framework](#) is available online in a variety of formats from the National Academies Press.

Instructional Materials. Tools used by teachers to plan and deliver lessons for students. Generally instructional materials include activities for daily instruction (“lessons”), that are organized into sequences (“units”, “chapters”).

Instructional Materials Program. A set of instructional materials that spans a large chunk of time or instruction, generally a full course (e.g. a Biology textbook) or a middle-grades science sequence. Distinguished from instructional materials that aren’t nearly as comprehensive, such as those that focus on only a few days or weeks of instruction or on a given content area.

Learning Sequence. Several connected and sequential lesson that build student understanding toward a set of learning goals progressively, over the course of weeks (as opposed to days). Learning sequences target complete three-dimensional learning goals through a variety of classroom experiences.

Lesson. A set of instructional activities and assessments that may extend over several class periods or days; it is more than a single activity.

NGSS Innovations. This document describes five NGSS Innovations that describe and explain what is new and different about the NGSS, particularly regarding instructional materials design and selection. The NGSS Innovations build on the conceptual shifts described in [Appendix A](#) of the NGSS.

PEEC. Primary Evaluation of Essential Criteria (PEEC) takes the compelling vision for science education as described in *A Framework for K–12 Science Education* and embodied in the Next Generation Science Standards (NGSS) and operationalizes it for two purposes:

1. to help educators determine how well instructional materials under consideration have been designed for the *Framework* and NGSS, and
2. to help curriculum developers construct and write science instructional materials that are designed for the *Framework* and NGSS.

Performance Expectations (PEs). The NGSS are organized into a set of expectations for what students should be able to do by the end of a period of instruction, generally measured by years of schooling. The performance expectations describe the learning goals or outcomes for students. Each performance expectation describes what students who demonstrate understanding can do, often with a **clarification statement** that provides examples or additional emphasis for individual performance expectation. An **assessment boundary** guides the developers of large-scale assessments. Each performance expectation is derived from a set of disciplinary core ideas, cross-cutting concepts, and science and engineering practices that are defined in the *Framework*. Note that like all sets of standards, the NGSS do not prescribe the methods or curriculum needed to reach these outcomes.

Phenomena. Observable events that students can use the three dimensions to explain or make sense of. Lessons designed for the NGSS focus on explaining phenomena or designing solutions to problems. Some additional resources about phenomena are available [on the NGSS website](#).

Science and Engineering Practices (SEP). The practices are what students *do* to make sense of phenomena. They are both a set of skills and a set of knowledge to be internalized. The SEPs reflect the major practices that scientists and engineers use to investigate the world and design and build systems.

Three-Dimensional Learning. Learning that involves all three dimensions described in the NGSS, that allows students to actively engage with the practices and apply the crosscutting concepts to deepen their understanding of core ideas across science disciplines. Click [here](#) to read more.

Three Dimensions. As described in the *Framework*, these are the three strands of knowledge and skills that students should explicitly be able to use to explain phenomena and design solutions to problems. The three dimensions are the Disciplinary Core Ideas (DCIs), Crosscutting Concepts (CCCs), and Science and Engineering Practices (“the Practices” or SEPs). More information about the three dimensions is available [here](#).

Unit. A set of lessons that extend over a longer time period.

Frequently Asked Questions

The following questions may help clarify some of the specifics about PEEC.

Question 1: *Who is the primary audience for PEEC?*

PEEC primarily supports educators, developers, and publishers. For educators, the evaluation tool clarifies *what to look for* when identifying or selecting instructional materials programs and assessments for the NGSS. For developers and publishers, PEEC provides guidance on *what to focus on and integrate* when designing instructional materials programs for the NGSS. This tool (1) prepares educators to accurately identify, select, or evaluate resources and (2) helps enable developers and publishers to effectively design resources that meet criteria for the NGSS.

Question 2: *How do the five innovations described in PEEC differ from the “conceptual shifts” in appendix A of the NGSS and the implications of the vision of the Framework and the NGSS from the Guide to Implementing the NGSS?*

PEEC focuses on what makes the NGSS new and different from past science standards. These differences were first articulated as conceptual shifts in [Appendix A of the standards](#). These conceptual shifts still hold true today, but four years of standards implementation has refined the understanding of what is unique about the NGSS and has revealed that these shifts represent innovations in science teaching and learning.

The five “NGSS Innovations” described in PEEC are:

1. **Making Sense of Phenomena & Designing Solutions to Problems.** Making sense of phenomena or designing solutions to problems drives student learning.
2. **Three-Dimensional Learning.** Student engagement in making sense of phenomena and designing solutions to problems *requires* student performances that integrate grade-appropriate elements of the Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), and Disciplinary Core Ideas (DCIs) in instruction and assessment.
3. **Building K–12 Progressions.** Students’ three-dimensional learning experiences are designed and coordinated over time to ensure students build their understanding and application of all three dimensions of the standards, Nature of Science (NOS) concepts, and the interconnections of engineering and science as expected by the standards.
4. **Alignment with English language arts and Mathematics.** Students engage in learning experiences with explicit connections to and alignment with English language arts and mathematics.
5. **All Standards, All Students.** All students have equitable access and opportunity to learn the NGSS.

Question 3: How does PEEC relate to the EQUiP Rubric for Science?

The [EQUiP Rubric for Science](#) is designed to evaluate learning sequences and units for the degree to which they are designed for the NGSS. It is embedded within PEEC as the tool for evaluating a sample unit from the program as Phase 2 in the PEEC process. The evaluation from this phase is combined with the PEEC Phase 1: Prescreen and PEEC Phase 3: Program Evaluation to give an overall picture of how well the instructional materials program is designed for the NGSS.

Question 4: Is this a science version of the Publisher's Criteria that was developed for the Common Core State Standards for mathematics?

Both PEEC and the [Publisher's Criteria](#) documents are intended to inform both the developers of instructional materials and those making the selection of which materials to use. The *NGSS Innovations* in PEEC highlight the key differences in NGSS from previous sets of standards and clarifies how these innovations should be represented in instructional materials.

Question 5: I'm interested in working with Achieve to train my teachers on how to use PEEC to evaluate instructional materials. What should I do?

If you are interested in hiring Achieve to facilitate professional learning to support your district team in using PEEC to select instructional materials, please contact peec@achieve.org. Training for effective use takes a minimum of two days if the entire group has already received professional learning for and are comfortable using EQUiP and a minimum of four days if they are not proficient in using EQUiP.

Question 6: I'm a science teacher. How should I use PEEC?

PEEC is designed to support building and district-level selection of year-long (or longer) instructional materials programs designed for the NGSS. Sometimes this task falls to teachers to coordinate. PEEC provides guidelines for a process that teams can use to evaluate instructional materials programs.

If you are not part of your school or district's instructional materials program selection process, but you want to make sure that the process is focusing on the appropriate criteria, share and discuss this tool with those responsible for making these decisions.

If you are looking for support in transitioning your classroom lessons and units, you may want to review the [NGSS Lesson Screener](#) or the [EQUiP Rubric for Science](#).

Question 7: *I'm a school principal. How should I use PEEC?*

While principals are not the primary audience for PEEC, there are several ways that it might be relevant to your work. Some principals help with the selection of instructional materials for your school or district, and PEEC includes both criteria and a process that can be used for that purpose. If selecting instructional material programs is not a part of your duties, then share and discuss this tool with those science teachers and administrators who are responsible for making these decisions.

Question 8: *I'm a district science leader or curriculum coordinator. How should I use PEEC?*

If you're in charge of coordinating the selection of science instructional materials, PEEC is built to help your team make good decisions about what materials to purchase (or even to wait to purchase materials until you find something that better matches your expectations): the *NGSS Innovations* described in PEEC will help your selection team to develop a common understanding of what to look for in materials designed for the NGSS; PEEC Appendix A will help you to think about building your team and fitting materials selection into your broader implementation plan for science; and the three phases of the PEEC process will help you to design the process that you use for materials selection. If your team is already well-versed in [A Framework for K-12 Science Education](#) and NGSS, anticipate about three full days of professional learning to prepare your team for this effort and then several days to dig in and evaluate the materials (depending on how many materials are evaluated).

Question 9: *I'm a developer or publisher of science instructional materials. How should I use the PEEC tool?*

The *NGSS Innovations* section of PEEC describes the most significant changes from past science standards to the NGSS and their implications for instructional materials. These innovations should focus the efforts to design materials for the NGSS and should be clearly apparent to those making instructional materials selection decisions. A developer might also use the PEEC processes and tools internally to self-evaluate the program that you are developing.

If you are interested in professional learning for your development staff to better understand the evaluations, better apply the rubric, or are interested in a confidential review of your materials, please contact peec@achieve.org to discuss your needs in more depth.

Question 10: *Some instructional materials are more expensive than others. Why doesn't PEEC include cost estimates?*

PEEC does not attempt to measure all things that might be considered in selecting instructional materials. It is focused on evaluating how well an instructional materials program is designed for the NGSS and asks reviewers to reflect on what the professional learning lift would be to address

any aspects of the innovations that are not well-supported in the materials. There are some additional criteria in PEEC Appendix D that you may want to consider. Of course, purchasers must determine how to weigh quality versus cost considerations in choosing instructional materials.

Question 11: How is this document different from the Guidelines for the Evaluation of Instructional Materials in Science?

The [Guidelines for the Evaluation of Instructional Materials in Science](#) is not a tool or process for evaluating instructional materials, rather it describes the research base for evaluative criteria that should be considered in building tools and processes for evaluating instructional materials designed for the NGSS. Its development was informed by early versions of EQuIP Rubric for Science and PEEC, and it informed the most recent version of PEEC. The criteria for all three phases of PEEC have a close connection to those presented in the *Guidelines*.

Question 12: This document is listed as “Version 1”. Will there be subsequent versions?

Yes. As was the case with the EQuIP Rubric for Science, we expect that as more and more teachers, schools, districts, authors, developers, and publishers use PEEC, the feedback loops in that process will lead to ongoing improvements in PEEC. Please send comments and suggestions to peec@achieve.org.

Question 13: What’s coming in subsequent version of PEEC?

PEEC will be revised based on continued feedback from science educators and curriculum developers. Specifically, Achieve is interested in answers to the following questions about the first version of PEEC.

- **Sampling.** How can PEEC provide more specific guidance about how to sample instructional materials programs appropriately for such a process? The prescreen is intended to be a “quick read”, but leaves some judgements about what that means to the reader. How can we best balance the tradeoffs associated with both a rigorous review and the time commitment of the reviewer?
- **Evidence.** Can and should PEEC provide more specifics about what users should classify as evidence? If so, what might that guidance look like? How can we better help PEEC users to determine if the quantity and quality of evidence collected is sufficient to justify a particular claim?
- **Teaming and Decision Making.** Some states and districts may desire more details about how to form an instructional materials review team, how to manage and facilitate the decision-making processes within that team, and how to craft an overall plan for instructional materials review. What additional guidance about teaming and decision making would be most helpful?

- **Iterating the Innovations.** How can the arguments and discussion about the five NGSS Innovations be more clear and straightforward?
- **Developer Support.** What additional tools and insights will be most helpful to curriculum developers and textbook authors?
- **Utility.** How can the forms and tools that are part of PEEC be made most useful for users? Should online fillable forms be created to be downloaded? Would more examples make the process easier?

PEEC is a work in progress. Please send comments and suggestions for improvement to peec@achieve.org.

References

American Association for the Advancement of Science (1989). *Science for All Americans: A Project 2061 Report*. American Association for the Advancement of Science. Washington, D.C.: AAAS.

American Association for the Advancement of Science (1993). *Benchmarks for Science Literacy*, New York, NY: Oxford University Press.

BSCS (2017). *Guidelines for the Evaluation of Instructional Materials in Science*. Retrieved from <http://guidelinesummit.bscs.org>

Darling-Hammond, Linda. 2000. "Teacher Quality and Student Achievement: A Review of State Policy Evidence." *Education Policy Analysis Archives*.

Krajcik, Joseph, Susan Codere, Chanyah Dahsah, Renee Bayer, and Kongju Mun. 2014. "Planning Instruction to Meet the Intent of the Next Generation Science Standards." *Journal of Science Teacher Education* 157–75.

Lee, Okhee, Helen Quinn, and Guadalupe Valdés. 2013. "Science and Language for English Language Learners in Relation to Next Generation Science Standards and with Implications for Common Core State Standards for English Language Arts and Mathematics." *Educational Researcher* 223–33.

National Academies of Sciences, Engineering, and Medicine. 2017. *Seeing Students Learn Science: Integrating Assessment and Instruction in the Classroom*. Washington, DC: The National Academies Press. doi: 10.17226/23548.

National Research Council. 1996. *National Science Education Standards*. Washington, DC: The National Academies Press

National Research Council. 2007. *Taking Science to School: Learning and Teaching Science in Grades K-8*. Washington, DC: National Academies Press.

National Research Council. 2012. *A Framework for K–12 Science Education*. Washington, DC: National Academies Press.

National Research Council. 2014. *Developing Assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.

National Research Council. 2015. *Guide to Implementing the Next Generation Science Standards*. Washington, DC: The National Academies Press.

NSTA (2010). Science Anchors Project. <http://www.nsta.org/involved/cse/scienceanchors.aspx>

Quinn, H., Lee, O., & Valdés, G. (2012). *Language demands and opportunities in relation to Next Generation Science Standards for English language learners: What teachers need to know*. Stanford, CA: Stanford University, *Understanding Language Initiative* (ell.stanford.edu).

Rosebery, Ann S, Mark Ogonowski, Mary DiSchino, and Beth Warren. 2010. " 'The Coat Traps All Body Heat:' Heterogeneity as Fundamental to Learning." *The Journal of Learning Sciences* 322–57.

The Next Generation Science Standards (2013). Washington, DC: National Academies Press.

Warren, Beth, Cynthia Ballenger, Mark Ogonowski, Ann S Rosebery, and Josiane Hudicourt-Barnes. 2001. "Rethinking diversity in learning science: The logic of everyday sense making." *Journal of Research in Science Thinking* 529–52.

Tool 1A: PEEC Prescreen Response Form (Phenomena)

This tool is used during Phase 1: PEEC Prescreen to collect and organize data that describes how a single instructional materials program supports students in making sense of phenomena and designing solutions to problems.

Making Sense of Phenomena and Designing Solutions to Problems: The instructional materials program **focuses** on supporting students to make sense of a phenomenon or design solutions to a problem.

NGSS designed programs will look <i>less</i> like this:	NGSS designed programs will look <i>more</i> like this:
Making sense of phenomena and designing solutions to problems are not a part of student learning or are presented separately from “learning time” (i.e. used only as a “hook” or engagement tool; used only for enrichment or reward after learning; only loosely connected to a DCI).	The <u>purpose and focus</u> of a learning sequence is to support students in making sense of phenomena and/or designing solutions to problems. The entire sequence drives toward this goal.
The focus is only on getting the “right” answer to explain the phenomenon	Student sense-making of phenomena or designing of solutions is used as a window into student understanding of all three dimensions of the NGSS.
A different, new, or unrelated phenomenon is used to start every lesson.	Lessons work together in a coherent storyline to help students make sense of phenomena.

<p>Teachers tell students about an interesting phenomenon or problem in the world.</p>	<p>Students get <u>direct</u> (preferably firsthand, or through media representations) experience with a phenomenon or problem that is relevant to them and is developmentally appropriate.</p>
<p>Phenomena are brought into learning after students develop the science ideas so students can apply what they learned.</p>	<p>The <u>development</u> of science ideas is anchored in making sense of phenomena or designing solutions to problems.</p>

<p>Less Like This</p> <p>Evidence this criterion IS NOT designed into this instructional materials program.</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>More like this</p> <p>Evidence this criterion IS designed into this instructional materials program</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>Shows Promise?</p>
		<p><input type="checkbox"/></p>

Tool 1B: PEEC Prescreen Response Form (Three Dimensions)

This tool is used during Phase 1: PEEC Prescreen to collect and organize data that describes how a single instructional materials program supports students in three-dimensional learning.

Three Dimensions: Students develop and use grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs), which are deliberately selected to aid student sense-making of phenomena or designing of solutions across the learning sequences and units of the program.

NGSS designed programs will look <i>less</i> like this:	NGSS designed programs will look <i>more</i> like this:
A single practice element shows up in a learning sequence.	The learning sequence helps students use multiple (e.g., 2–4) practice elements as appropriate in their learning.
The learning sequence focuses on colloquial definitions of the practice or crosscutting concept names (e.g., “asking questions”, “cause and effect”) rather than on grade-appropriate learning goals (e.g., elements in NGSS Appendices F &G).	Specific grade-appropriate elements of SEPs and CCCs (from NGSS Appendices F & G) are <u>acquired</u> , <u>improved</u> , or <u>used</u> by students to help explain phenomena or solve problems during the learning sequence.
The SEPs and CCCs can be inferred by the teacher (not necessarily the students) from the materials.	Students explicitly use the SEP and CCC elements to make sense of the phenomenon or to solve a problem.

<p>Engineering lessons focus on trial and error activities that don't require science or engineering knowledge.</p>	<p>Engineering embedded in the learning sequence requires students to acquire and use elements of DCIs from physical, life, or Earth and space sciences together with elements of DCIs from engineering design (ETS) to solve design problems.</p>
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<p>Less Like This</p> <p>Evidence this criterion IS NOT designed into this instructional materials program.</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>More like this</p> <p>Evidence this criterion IS designed into this instructional materials program</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>Shows Promise?</p>
		<p><input type="checkbox"/></p>

Tool 1C: PEEC Prescreen Response Form (Three Dimensions for Instruction and Assessment)

This tool is used during Phase 1: PEEC Prescreen to collect and organize data that describes how a single instructional materials program integrates the three dimensions for instruction and assessment.

Integrating the Three Dimensions for Instruction and Assessment: The instructional materials program requires student performances that integrate elements of the SEPs, CCCs, and DCIs to make sense of phenomena or design solutions to problems, and the learning sequence elicits student artifacts that show **direct, observable evidence** of three-dimensional learning.

NGSS designed programs will look <i>less</i> like this:	NGSS designed programs will look <i>more</i> like this:
Students learn the three dimensions in isolation from each other (e.g., a separate lesson or activity on science methods followed by a later lesson on science knowledge).	<p>The learning sequence is designed to build student proficiency in at least one grade-appropriate element from each of the three dimensions.</p> <p>The three dimensions intentionally work together to help students explain a phenomenon or design solutions to a problem.</p> <p>All three dimensions are <i>necessary</i> for sense-making and problem-solving.</p>
Teachers assume that correct answers indicate student proficiency without the student providing evidence or reasoning.	Teachers deliberately seek out <i>student artifacts</i> that show direct, observable evidence of learning, building toward all three dimensions of the NGSS at a grade-appropriate level.

<p>NGSS designed programs will look <i>less</i> like this:</p>	<p>NGSS designed programs will look <i>more</i> like this:</p>
<p>Teachers measure only one dimension at a time (e.g., separate items for measuring SEPs, DCIs, and CCCs).</p>	<p>Teachers use tasks that ask students to explain phenomena or design solutions to problems, and that reveal the level of student proficiency in <i>all three dimensions</i>.</p>

<p>Less Like This</p> <p>Evidence this criterion IS NOT designed into this instructional materials program.</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>More like this</p> <p>Evidence this criterion IS designed into this instructional materials program</p> <p>What was in the materials, where was it, and why is this evidence?</p>	<p>Shows Promise?</p>
		<p><input type="checkbox"/></p>

Tool 2: PEEC Prescreen: Recommendation for Review?

This tool is used by a reviewer upon completion of PEEC Phase 1: Prescreen to document their final recommendation for an instructional materials program.

Reviewer Name or ID: _____ Grade: _____ Lesson/Unit Title: _____

Reminder

The purpose of the PEEC Prescreen is to give a quick look at an instructional materials program. There are significant aspects of what would be expected in a fully-vetted program designed for the NGSS that are not addressed in this tool and it should not be used to fully vet resources or claim that the programs are designed for NGSS

Overall Screening Summary

Recommendation

I recommend this resource to be evaluated by the full PEEC rubric: _____

Tool 3: Unit Selection Table

This tool is used by a group of reviews to select matching or similar units to review from multiple instructional materials programs.

Unit Target	<p>What commonality makes the units comparable?</p> <p>(i.e., they address similar DCI-related topics (clarify which ones); they are designed to have students make sense of a similar phenomenon (clarify what makes the phenomenon similar); the unit is the best example of engineering integration in the program, etc.)</p>		
Unit Description	Instructional Materials Program Name	Unit (title and page numbers)	Why this unit?

Tool 4: EQUiP Rubric Data Summary

This tool is used to summarize the results of the EQUiP Review for Science analysis of a given unit in one instructional materials program as part of PEEC Phase 2: Unit Evaluation.

Innovation	EQUiP Criterion	Evidence of Quality?	Unit Evaluation (summary)
Making Sense of Phenomena and Designing Solutions to Problems	I. A. Explaining Phenomena/Designing Solutions	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.
Three-Dimensional Learning	I. B. Three Dimensions	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials incorporate the innovation.
	I. C. Integrating the Three Dimensions	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials partially incorporate the innovation.
	III. A. Monitoring 3D Student Performances	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials do not incorporate the innovation.
	III. B. Formative	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	

Innovation	EQIP Criterion	Evidence of Quality?	Unit Evaluation (summary)
	III. C. Scoring Guidance	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	
	III. E. Coherent Assessment System	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	
Building K–12 Progressions	I. D. Unit Coherence	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials incorporate the innovation.
	II. C. Building Progressions	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials partially incorporate the innovation.
	II. F. Teacher Support for Unit Coherence	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials do not incorporate the innovation.
Alignment with English language arts and Mathematics	I. F. Math and ELA	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.

Innovation	EQuIP Criterion	Evidence of Quality?	Unit Evaluation (summary)
All Standards, All Students	II. A. Relevance and Authenticity	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.
	II. B. Student Ideas	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	
	II. E. Differentiated Instruction	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	
	II. G. Scaffolded Differentiation over Time	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	
	III. D. Unbiased tasks/item	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	
	III. F. Opportunity to Learn	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive	

Narrowing the Field?

Depending on how many programs made it to this phase of the analysis, the EQuIP Rubric for Science evaluations may be used to continue to narrow the field of instructional materials programs being evaluated. After consensus reports have been generated for each unit, the review team should evaluate whether or not all programs are worthy of further review. Unless the separation in quality is very small, it is recommended that only the top two or three programs continue to the final phase of the PEEC process.

Tool 5A: Program Level Evaluation Innovation 1: Making Sense of Phenomena and Designing Solutions to Problems

This tool is to be used to collect evidence and make claims about how an instructional materials program addresses NGSS Innovation 1: Making Sense of Phenomena and Designing Solutions to Problems.

Directions

Using the sampling evaluation plan, record evidence of where the innovation has been *clearly* incorporated into the materials as well as instances where it does not appear to have been incorporated. Your evidence should include page numbers, a brief description of the evidence, and an explanation of how it either supports or contradicts the claim.

Claim	Evidence	Sufficient evidence to support the claim?
From the student's perspective, most learning experiences are focused on making sense of phenomena and designing solutions to problem.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence to support the claim?
<p>Guidance is provided to teachers to support students in making sense of phenomena and designing solutions to problems.</p>	<p>What to look for as evidence:</p> <p>One phenomena/problem or a series of related phenomena/problem drive instruction and help maintain a focus for all the lessons in a sequence.</p> <p>Guidance is provided to the teacher for how each of the lessons supports students in explaining the phenomena or solving the problem</p> <p>Teaching strategies are provided to use student sense-making and solution-designing as a mechanism for making their three-dimensional learning visible.</p>	<p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Inadequate</p> <p><input type="checkbox"/> Adequate</p> <p><input type="checkbox"/> Extensive</p>

Summary and Recommendations

1. Based on the evidence collected, to what degree to the materials incorporate this innovation over the course of the program?

- Materials incorporate the innovation.
- Materials partially incorporate the innovation.
- Materials do not incorporate the innovation.

2. Reviewer Notes/Comments

3. If this innovation is only partially incorporated, suggest additional professional learning or other support that would be needed for teachers to use the materials in a way that incorporated the innovation in their instruction.

Tool 5B: Program Level Evaluation Innovation 2: Three-Dimensional Learning

This tool is to be used to collect evidence and make claims about how an instructional materials program addresses NGSS Innovation 2: Three-Dimensional Learning.

Directions

Using the sampling evaluation plan, record evidence of where the innovation has been *clearly* incorporated into the materials as well as instances where it does not appear to have been incorporated. Your evidence should include page numbers, a brief description of the evidence, and an explanation of how it either supports or contradicts the claim.

Claim	Evidence	Sufficient evidence to support the claim?
Student sense-making of phenomena and/or designing of solutions requires student performances that integrate grade-appropriate elements of the SEPs, CCCs, and DCIs.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence to support the claim?
<p>Teacher materials communicate the deliberate and intentional design underpinning the selection of three-dimensional learning goals across the program.</p>		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
<p>Student materials include accessible and unbiased formative and summative assessments that provide clear evidence of students' three-dimensional learning.</p>	<p>What to look for as evidence in the student materials:</p> <ul style="list-style-type: none"> • Materials regularly elicit direct, observable evidence of three-dimensional learning (SEP, DCI, CCC); • Materials include authentic and relevant tasks that require students to use appropriate elements of the three dimensions; • Provide a range of item formats, including construct-response and performance tasks, which are essential for the assessment of three-dimensional learning consonant with the framework and the NGSS. 	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence to support the claim?
<p>Over the course of the program, a system of assessments coordinates the variety of ways student learning is monitored to provide information to students and teachers regarding student progress for all three dimensions of the standards.</p>	<p>What to look for as evidence in the assessment system:</p> <ul style="list-style-type: none"> • consistent use of pre-, formative, summative, self- and peer-assessment measures that assess three-dimensional learning, • consistent support for teachers to adjust instruction based on suggested formative classroom tasks; and • support for teachers and other leaders to make program level decisions based on unit, interim, and/or year long summative assessment data. 	<p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Inadequate</p> <p><input type="checkbox"/> Adequate</p> <p><input type="checkbox"/> Extensive</p>
<p><i>When appropriate</i>, links are made across the science domains of life science, physical science and Earth and space science.</p>	<p>What to look for as evidence:</p> <ul style="list-style-type: none"> • Disciplinary core ideas from different disciplines are used together to explain phenomena. • The usefulness of crosscutting concepts to make sense of phenomena or design solutions to problems across science domains is highlighted. 	<p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Inadequate</p> <p><input type="checkbox"/> Adequate</p> <p><input type="checkbox"/> Extensive</p>

Summary and Recommendations

1. Based on the evidence collected, to what degree do the materials incorporate this innovation over the course of the program?

- Materials incorporate the innovation.
- Materials partially incorporate the innovation.
- Materials do not incorporate the innovation.

2. Reviewer Notes/Comments

3. If this innovation is only partially incorporated, suggest additional professional learning or other support that would be needed for teachers to use the materials in a way that incorporated the innovation in their instruction.

Tool 5C: Program Level Evaluation Innovation 3: Building Progressions

This tool is to be used to collect evidence and make claims about how an instructional materials program addresses NGSS Innovation 3: Building Progressions.

Directions

Using the sampling evaluation plan, record evidence of where the innovation has been *clearly* incorporated into the materials as well as instances where it does not appear to have been incorporated. Your evidence should include page numbers, a brief description of the evidence, and an explanation of how it either supports or contradicts the claim.

Claim	Evidence	Sufficient evidence to support the claim?
Students engage in the science and engineering practices with increasing grade-level appropriate complexity over the course of the program.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence to support the claim?
Students utilize the crosscutting concepts with increasing grade-level appropriate complexity over the course of the program.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
The disciplinary core ideas are presented in a way that is scientifically accurate and grade level appropriate.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
Teacher materials make it clear how each of the three dimensions <i>builds progressively over the course of the program</i> in a way that gives students multiple opportunities to demonstrate proficiency in the breadth of the performance expectations addressed in the program.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence to support the claim?
<p>Each unit builds on prior units by addressing questions raised in those units, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences.</p>	<p>What to look for as evidence: for each of the units, look at the transitions into and out of the units. Are the units linked together from a student's perspective?</p>	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
<p>Teacher materials clearly explain the design principles behind the sequencing of the storyline.</p>		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
<p>Student materials engage students with the nature of science and engineering, technology, and applications of science over the course of the program.</p>		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence to support the claim?
Teacher materials make connections to the nature of science; engineering, technology, and applications of science over the course of the program.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Summary and Recommendations

1. Based on the evidence collected, to what degree to the materials incorporate this innovation over the course of the program?

- Materials incorporate the innovation.
- Materials partially incorporate the innovation.
- Materials do not incorporate the innovation.

2. Reviewer Notes/Comments

3. If this innovation is only partially incorporated, suggest additional professional learning or other support that would be needed for teachers to use the materials in a way that incorporated the innovation in their instruction.

Tool 5D: Program Level Evaluation Innovation 4: Alignment with English Language Arts and Mathematics

This tool is to be used to collect evidence and make claims about how an instructional materials program addresses NGSS Innovation 4: Alignment with English-Language Arts and Mathematics.

Directions

Using the sampling evaluation plan, record evidence of where the innovation has been *clearly* incorporated into the materials as well as instances where it does not appear to have been incorporated. Your evidence should include page numbers, a brief description of the evidence, and an explanation of how it either supports or contradicts the claim.

Claim	Evidence	Sufficient evidence of quality?
Materials engage students with English language arts in developmentally appropriate ways (supporting state English-language arts standards)		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence of quality?
Materials engage students with mathematics in developmentally appropriate ways (supporting state mathematics standards)		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
Teacher materials make connections to state mathematics and English-language arts standards and incorporate teaching strategies that support this student learning where appropriate.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Summary and Recommendations

1. Based on the evidence collected, to what degree to the materials incorporate this innovation over the course of the program?

- Materials incorporate the innovation.
- Materials partially incorporate the innovation.
- Materials do not incorporate the innovation.

2. Reviewer Notes/Comments

3. If this innovation is only partially incorporated, suggest additional professional learning or other support that would be needed for teachers to use the materials in a way that incorporated the innovation in their instruction.

Tool 5E: Program Level Evaluation Innovation 5: All Standards, All Students

This tool is to be used to collect evidence and make claims about how an instructional materials program addresses NGSS Innovation 5: All Standards, All Students.

Directions

Using the sampling evaluation plan, record evidence of where the innovation has been *clearly* incorporated into the materials as well as instances where it does not appear to have been incorporated. Your evidence should include page numbers, a brief description of the evidence, and an explanation of how it either supports or contradicts the claim.

Claim	Evidence	Sufficient evidence of quality?
Students have substantial opportunities to express and negotiate their ideas, prior knowledge, and experiences as they are using the three dimensions of the NGSS to make sense of phenomena and design solutions to problems.		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence of quality?
<p>Teacher materials anticipate common student ideas and include guidance to surface and challenge student thinking.</p>		<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive
<p>Students regularly engage in authentic and meaningful learning experiences that reflect the practice of science and engineering as experienced in the real world.</p>	<p>What to look for as evidence:</p> <ul style="list-style-type: none"> • Students experience phenomena or design problems as directly as possible (firsthand or through media representations). • Includes suggestions for how to connect instruction to the students' home, neighborhood, community and/or culture as appropriate. • Provides opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience. 	<input type="checkbox"/> None <input type="checkbox"/> Inadequate <input type="checkbox"/> Adequate <input type="checkbox"/> Extensive

Claim	Evidence	Sufficient evidence of quality?
<p>Teacher materials provide guidance for using effective teaching strategies that engage students in real world phenomena and authentic design problems</p>	<p>What to look for as evidence:</p> <ul style="list-style-type: none"> • When phenomena may not be relevant or clear to some students (e.g., crop growth on farms), the materials offer alternate engaging phenomena or problems to the teacher • Varied phenomena 	<p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Inadequate</p> <p><input type="checkbox"/> Adequate</p> <p><input type="checkbox"/> Extensive</p>
<p>Materials provide suggestions for how to attend to students' diverse skills, needs, and interests in varied classroom settings.</p>	<p>What to look for as evidence:</p> <ul style="list-style-type: none"> • Appropriate reading, writing, listening, and/or speaking alternatives (e.g., translations, picture support, graphic organizers, etc.) for students who are English language learners, have special needs, or read well below the grade level. • Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations. • Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts. 	<p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Inadequate</p> <p><input type="checkbox"/> Adequate</p> <p><input type="checkbox"/> Extensive</p>

Summary and Recommendations

1. Based on the evidence collected, to what degree to the materials incorporate this innovation over the course of the program?

- Materials incorporate the innovation.
- Materials partially incorporate the innovation.
- Materials do not incorporate the innovation.

2. Reviewer Notes/Comments

3. If this innovation is only partially incorporated, suggest additional professional learning or other support that would be needed for teachers to use the materials in a way that incorporated the innovation in their instruction.

Tool 6: PEEC Evidence Summary

This tool is to be used summarize evidence collected in all three phases of PEEC.

Directions

Complete the table below by transferring the data from each of the three Phases of PEEC.

	Phase 1	Phase 2	Phase 3
Innovation	Prescreen	Unit Evaluation (EQulP summary)	Program Level Evaluation
Making Sense of Phenomena & Designing Solutions to Problems	Shows Promise? <input type="checkbox"/>	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.

Innovation	Phase 1	Phase 2	Phase 3
	Prescreen	Unit Evaluation (EQUIP summary)	Program Level Evaluation
Three-Dimensional Learning	Shows Promise? <input type="checkbox"/>	<input checked="" type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.
Building K–12 Progressions	n/a	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.

Innovation	Phase 1	Phase 2	Phase 3
	Prescreen	Unit Evaluation (EQIP summary)	Program Level Evaluation
Alignment with English language arts and Mathematics	n/a	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.
All Standards, All Students	n/a	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.	<input type="checkbox"/> Materials incorporate the innovation. <input type="checkbox"/> Materials partially incorporate the innovation. <input type="checkbox"/> Materials do not incorporate the innovation.

Tool 7: Final Evaluation

This tool is used at the end of the PEEC process to make a final recommendation about an instructional materials program.

Directions

Reflect on the summary table and the other evidence collected to make a final claim about whether the instructional materials program is designed to provide adequate and appropriate opportunities for students to meet the performance expectations of the NGSS. Once this claim is established, explain how the data in *Tool 6: Program Level Evaluation Evidence Summary* support this conclusion and highlight the most compelling evidence from each of the phases of PEEC to support the claim. After establishing the evidence for the claim, summarize any recommendations for what would need to happen during implementation of the materials to address any weaknesses that were identified in the analysis.

Claim

Title of instructional materials under review: _____ (does/does not) provide adequate and appropriate opportunities for students to meet the performance expectations of the NGSS.

Evidence-Based Response

Recommendations