EQuIP Rubric for Lessons & Units: Science

Introduction

The Educators Evaluating the Quality of Instructional Products (EQuIP) Rubric for science provides criteria by which to measure the alignment and overall quality of lessons and units with respect to the Next Generation Science Standards (NGSS). The purpose of the rubric and review process is to: (1) provide constructive criterion-based feedback to developers; (2) review existing instructional materials to determine what revisions are needed; and (3) identify exemplars/models for teachers' use within and across states.

To effectively apply this rubric, an understanding of the National Research Council's *A Framework for K–12 Science Education and the Next Generation Science Standards*, including the NGSS shifts (appendix A of the NGSS), is needed. Unlike the EQuIP Rubrics for mathematics and ELA, there is not a column in the science rubric for shifts. Over the course of the rubric development, writers and reviewers noted that the shifts fit naturally into the other three columns. For example, the blending of the three-dimensions, or three-dimensional learning, is addressed in each of the three columns; coherence and connections to the Common Core State Standards are addressed in the first column; deeper understanding and application of content are addressed in the second column. Each column includes criteria by which to evaluate the integration of engineering, when included in a lesson or unit, through practices or disciplinary core ideas. Another difference between the EQuIP Rubrics from mathematics and ELA is in the name of the columns; the rubric for science refers to them simply as *columns*, whereas the math and ELA rubrics refer to the columns as dimensions. This distinction was made because the Next Generation Science Standards already uses the term *dimensions* to refer to practices, disciplinary core ideas, and crosscutting concepts.

The architecture of the NGSS is significantly different from other sets of standards. The three dimensions, crafted into performance expectations, describe what is to be assessed following instruction and therefore are the measure of proficiency. A lesson or unit may provide opportunities for students to demonstrate performance of practices connected with their understanding of core ideas and crosscutting concepts as foundational pieces. This three-dimensional learning leads toward eventual mastery of performance expectations. In this scenario, quality materials should clearly describe or show how the lesson or unit works coherently with previous and following lessons or units to help build toward eventual mastery of performance expectations. The term *element* is used in the rubric to represent the relevant, bulleted practices, disciplinary core ideas, and crosscutting concepts that are articulated in the foundation boxes of the standards as well as the in the NGSS appendices on each dimension. Given the understanding that a lesson or unit may include the blending of practices, disciplinary core ideas, and crosscutting concepts that are not identical to the combination of practices, disciplinary core ideas, and crosscutting concepts in a performance expectation, the new term *elements* was needed to describe these smaller units of the three dimensions. Although it is unlikely that a single lesson would provide adequate opportunities for a student to demonstrate proficiency on every dimension of a performance expectation, high-quality units are more likely to provide these opportunities to demonstrate proficiency on one or more performances expectations.

There is a recognition among educators that curriculum and instruction will need to shift with the adoption of the NGSS, but there is currently a lack of high-quality, NGSS-aligned materials. The power of the rubric is in the feedback it provides curriculum developers and the productive conversations educators have while evaluating materials (i.e., the review process). For curriculum developers, the rubric and review process provide evidence on the quality and alignment of a lesson or unit to the NGSS. Additionally, the rubric and review process generate feedback on how materials can be further improved and more closely aligned to the NGSS. As more NGSS lessons and units are developed, this rubric may change to meet the evolving needs of supporting both educators in evaluating materials and developers in the modification and creation of materials. Additionally, support materials will be developed to complement the use of this rubric, such as a professional development guide, a criterion discussion guide, and publishers' criteria that will be more focused on textbooks and comprehensive curriculums.

Directions

The first step in the review process is to become familiar with the rubric, the lesson or unit, and the practices, disciplinary core ideas, and crosscutting concepts targeted in the lesson or unit. The three columns in the rubric correspond to: alignment to the NGSS, instructional supports, and monitoring student progress. Specific criteria within each column should be considered separately as part of the complete review process and are used to provide sufficient information for determination of overall quality of the lesson or unit.

Also important to the review process is feedback to the developer of the resource. For this purpose a set of response forms is included so that the reviewer can effectively provide criterion-based observations and suggestions for improvement for each column. The response forms correspond to the criteria of the rubric. Evidence for each criterion must be identified and documented and criterion-based feedback should be given to help improve the lesson or unit.

While it is possible for the rubric to be applied by an individual, the quality review process works best with a team of reviewers, as a collaborative process, with the individuals recording their thoughts and then discussing with other team members before finalizing their feedback. Discussions should focus on understanding all reviewers' interpretations of the criteria and the evidence they have found. The goal of the process is to eventually calibrate responses across reviewers and to move toward agreement about quality with respect to the NGSS. Commentary needs to be constructive, with all lessons or units considered "works in progress." Reviewers must be respectful of team members and the resource contributor. Contributors should see the review process as an opportunity to gather feedback rather than to advocate for their work. All observations and suggestions for improvement should be criterion-based and have supporting evidence from the lesson or unit cited.

Note: This rubric will eventually have scoring guidelines for each column, as well as for an overall rating. However, given the current lack of high quality, NGSS-aligned materials, rather than focusing on ratings at this point in time, the focus should be on becoming familiar with the rubric and using it to provide criterion-based feedback to developers and make revisions to existing materials.

Step 1 – Review Materials

The first step in the review process is to become familiar with the rubric, the lesson or unit, and the practices, disciplinary core ideas, and crosscutting concepts targeted in the lesson or unit.

- Review the rubric and record the grade and title of the lesson or unit on the response form.
- Scan to see what the lesson or unit contains, what practices, disciplinary core ideas, and crosscutting concepts are targeted, and how it is organized.
- Read key materials related to instruction, assessment, and teacher guidance.

Step 2 – Apply Criteria in Column I: Alignment to the NGSS

The second step is to evaluate the lesson or unit using the criteria in the first column, first individually and then as a team.

- Closely examine the lesson or unit through the "lens" of each criterion in the first column of the response form.
- Individually check each criterion on the response form for which clear and substantial evidence is found and record the evidence and criterion-based suggestions for specific improvements that might be needed to meet criteria.
- As a team, discuss criteria for which clear and substantial evidence is found, as well as criterion-based suggestions for specific improvements that might be needed to meet criteria.

If the lesson or unit is not closely aligned to the Next Generation Science Standards, it may not be appropriate to move on to the second and third columns. Professional judgment should be used when weighing the individual criterion. For example, a lesson without crosscutting concepts explicitly called out may be easier to revise than one without appropriate disciplinary core ideas; such a difference may determine whether reviewers believe the lesson merits continued evaluation or not.

Step 3 – Apply Criteria in Columns II and III: Instructional Supports and Monitoring Student Progress

The third step is to evaluate the lesson or unit using the criteria in the second and third columns, first individually and then as a group.

- Closely examine the lesson or unit through the "lens" of each criterion in the second and third columns of the response form.
- Individually check each criterion on the response form for which clear and substantial evidence is found and record the evidence and criterion-based suggestions for specific improvements that might be needed to meet criteria.
- As a team, discuss criteria for which clear and substantial evidence is found, as well as criterion-based suggestions for specific improvements that might be needed to meet criteria.

When working in a group, teams may choose to compare ratings after each column or delay conversation until each person has rated and recorded input for the two remaining columns. Complete consensus among team members is not required but discussion is a key component of the review process.

EQuIP Rubric for Lessons & Units: Science

I. Alignment to the NGSS	II. Instructional Supports	III. Monitoring Student Progress

The lesson or unit aligns with the conceptual shifts of the NGSS:
o Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions.
  o Provides opportunities to use specific elements of the practice(s) to make sense of phenomena or design solutions.
  o Provides opportunities to construct and use specific elements of the disciplinary core idea(s) to make sense of phenomena or design solutions.
  o Provides opportunities to construct and use specific elements of the crosscutting concept(s) to make sense of phenomena or design solutions.
 	
A unit or longer lesson:
o Lessons fit together coherently, build on each other, and help students develop proficiency on a targeted set of performance expectations.
o Develops connections between different science disciplines by the use of crosscutting concepts and/or develops connections between different science disciplines by using disciplinary core ideas where appropriate.
o Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.
	The lesson or unit supports instruction and learning for all students:
	o Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world and that provide students with a purpose (e.g., making sense of phenomena or designing solutions).
	  o Provides students with multiple phenomena (either firsthand experiences or through representations) that support students in engaging in the practices.
	  o Engages students in multiple practices that blend and work together with disciplinary core ideas and crosscutting concepts to support students in making sense of phenomena or designing solutions.
	  o When engineering performance expectations are included, they are used along with disciplinary core ideas from physical, life, or earth and space sciences.
	o Develops deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts by identifying and building on students' prior knowledge.
	o Uses scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning.
	o Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate to support student's three-dimensional learning.
	o Provides guidance for teachers to support differentiated instruction in the classroom so that every student's needs are addressed by:
	  o Connecting instruction to the students' home, neighborhood, community and/or culture as appropriate.
	  o Providing the appropriate reading, writing, listening, and/or speaking modifications (e.g., translations, picture support, graphic organizers) for students who are English language learners, have special needs, or read well below the grade level.
	  o Providing extra support for students who are struggling to meet the performance expectations.
	  o Providing extensions consistent with the learning progression for students with high interest or who have already met the performance expectations.
	
	A unit or longer lesson:
	o Provides guidance for teachers throughout the unit for how lessons build on each other to support students developing deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts over the course of the unit.
		The lesson or unit supports monitoring student progress:
		o Assessments are aligned to the three-dimensional learning.
		o Elicits direct, observable evidence of students' performance of practices connected with their understanding of core ideas and crosscutting concepts.
		o Formative assessments of three-dimensional learning are embedded throughout the instruction.
		o Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students.
		o Assessing student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.
		
		A unit or longer lesson:
		o Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning.
		o Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback.

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Response Form

Reviewer Name or ID: **Grade:**
Science Lesson/Unit Title:

I. Alignment to the NGSS

The lesson or unit aligns with the conceptual shifts of the NGSS:

Criteria	Specific evidence from materials under review	Suggestions for improvement
☐ Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions. o Provides opportunities to use specific elements of the practice(s) to make sense of phenomena or design solutions. o Provides opportunities to construct and use specific elements of the disciplinary core idea(s) to make sense of phenomena or design solutions. o Provides opportunities to construct and use specific elements of the crosscutting concept(s) to make sense of phenomena or design solutions.		

A unit or longer lesson:

Criteria	Specific evidence from materials under review	Suggestions for improvement
☐ Lessons fit together coherently, build on each other, and help students develop proficiency on a targeted set of performance expectations.		
☐ Develops connections between different science disciplines by the use of crosscutting concepts and/or develops connections between different science disciplines by using disciplinary core ideas where appropriate.		
☐ Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.		

Summary of Observations and Suggestions for Improvement:

If the lesson or unit is not closely aligned to the Next Generation Science Standards, it may not be appropriate to move on to the second and third columns. Professional judgment should be used when weighing the individual criterion. For example, a lesson without crosscutting concepts explicitly called out may be easier to revise than one without appropriate disciplinary core ideas; such a difference may determine whether reviewers believe the lesson merits continued evaluation or not.

II. Instructional Supports

The lesson or unit supports instruction and learning for all students:

Criteria	Specific evidence from materials under review	Suggestions for improvement
☐ Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world and that provide students with a purpose (e.g., making sense of phenomena or designing solutions). o Provides students with multiple phenomena (either firsthand experiences or through representations) that support students in engaging in the practices. o Engages students in multiple practices that blend and work together with disciplinary core ideas and crosscutting concepts to support students in making sense of phenomena or designing solutions. o When engineering performance expectations are included, they are used along with disciplinary core ideas from physical, life, or earth and space sciences.		
☐ Develops deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts by identifying and building on students' prior knowledge.		
☐ Uses scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning.		
☐ Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate to support student's three-dimensional learning.		
☐ Provides guidance for teachers to support differentiated instruction in the classroom so that every student's needs are addressed by: o Connecting instruction to the students' home, neighborhood, community and/or culture as appropriate. o Providing the appropriate reading, writing, listening, and/or speaking modifications (e.g., translations, picture support, graphic organizers) for students who are English language learners, have special needs, or read well below the grade level. o Providing extra support for students who are struggling to meet the performance expectations. o Providing extensions consistent with the learning progression for students with high interest or who have already met the performance expectations.		

A unit or longer lesson:

Criteria	Specific evidence from materials under review	Suggestions for improvement
☐ Provides guidance for teachers throughout the unit for how lessons build on each other to support students developing deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts over the course of the unit.		

Summary of Observations and Suggestions for Improvement:

III. Monitoring Student Progress

The lesson or unit supports monitoring student progress:

Criteria	Specific evidence from materials under review	Suggestions for improvement
☐ Assessments are aligned to the three-dimensional learning.		
☐ Elicits direct, observable evidence of students' performance of practices connected with their understanding of core ideas and crosscutting concepts.		
☐ Formative assessments of three-dimensional learning are embedded throughout the instruction.		
☐ Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students.		
☐ Assessing student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.		

A unit or longer lesson:

Criteria	Specific evidence from materials under review	Suggestions for improvement
☐ Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning.		
☐ Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback.		

Summary of Observations and Suggestions for Improvement:

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Response Form

Reviewer Name or ID: **Grade:**
Science Lesson/Unit Title:

Overall Summary Comments: