Science Program Rubric

Introduction

The New Jersey Student Learning Standards for Science (NJSLS-S) have been the academic target in grades 6-12 since September 2016. After a three year transition period, science in kindergarten through grade five will be based on the NJSLS-S in September 2017. The implementation of the standards is only milestone in a long process of transforming teaching, learning, and assessment necessary for our students to meet the new challenges. The Science Program Rubric is designed to help teams of educators answer the following questions. *To what extent is the science program consistent with the letter, spirit, and intent of the New Jersey Student Learning Standards for Science?;* and *What should our goal(s) be for continued improvement?* Table 1 (see page 2) outlines the criteria that can be used to help answer the aforementioned questions. Pages 3 -9 provide more detailed information about each criteria and what it looks like in a classroom. The value of this resource comes from the professional discourse surrounding the evidence that is uncovered through the non-evaluative process.

The Science Program Rubric is a non-evaluative tool that can be used in a variety of ways. For example, one school district may choose to partner with a neighboring district(s) to conduct peer reviews. Partnering to conduct peer reviews allows for powerful professional development opportunities and provide district leadership with an unbiased analysis of what the district is doing well and where there are opportunities for growth. Administrators may choose to ask in-house faculty to use the rubric to self-assess their progress for ensuring that the science program supports all students in developing toward proficiency with all of the science standards. A third school district may choose to use the rubric as part of their preparation for a Quality Single Accountability Continuum (QSAC) monitoring visit. The rubric and professional discussions about the evidence focus the conversations on quality rather than compliance.

This document is part of a family of resources that are designed to support the transition to the new science standards. Each tool is designed for a specific purpose but they are all grounded the *Framework for K-12 Science Education* (2012) and the NJSLS-S. The other documents in the family of tools include:

- Science Instruction Companion to the Danielson Framework provides science specific indicators for evaluating science instruction;
- NGSS Lesson Screener provides criteria for an informal review (no scoring) of a lesson or short unit's coherence with the NJSLS-S;
- EQuIP Rubric for Lessons and Units: Science provides detailed criteria to measure the degree to which lessons and units are designed for the NJSLS-S;
- Primary Evaluation of Essential Criteria (PEEC) provides criteria to evaluate curriculum materials such as science kits, textbook series, or online programs.

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Table 1: Criteria for an Effective Science Program

A. All Standards, All Students: The science program ensures that ALL students are provided appropriate learning opportunities for ALL of the standards. This includes but is not limited to, students with disabilities, economically disadvantages, English Language Learners, and students who have been identified as gifted.

B. Explaining Phenomena or Designing Solutions: The units focus on supporting students to make sense of engaging and authentic phenomena or design solutions to real-world problem.

C. Three Dimensional: The units help students develop and use multiple grade-appropriate elements of the science and engineering practices (SEP), disciplinary core ideas (DCI), and crosscutting concepts (CCC), which are deliberately selected to aid student sense-making of phenomena or designing of solutions.

D. Integrating the Three Dimensions for Instruction and Assessment: The units require student performances that integrate elements of the SEPs, CCCs, and DCIs to make sense of phenomena or design solutions to problems, and the learning tasks elicit student artifacts that show direct, observable evidence of three-dimensional learning.

E. Relevance and Authenticity: The units motivate student sense-making or problem-solving by taking advantage of student questions and prior experiences in the context of the students' home, neighborhood, and community as appropriate.

F. Student Ideas: The units provide opportunities for students to express, clarify, justify, interpret, and represent their ideas (i.e., making thinking visible) and to respond to peer and teacher feedback.

G. Building on Students' Prior Knowledge: The units identify and build on students' prior learning in all three dimensions in a way that is explicit to both the teacher and the students.

Each of the following pages provide more detailed information about a specific criteria and what it looks like in a classroom.

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Criterion A. All Standards, All Students

Guiding Question: To what extent does the science program ensures that ALL students are provided appropriate learning opportunities for ALL of the standards. This includes, but is not limited to, students with disabilities, economically disadvantages, English Language Learners, and students who have been identified as gifted?

NJSLS-S designed programs do *not* look like this:	**NJSLS-S designed Science Programs look *more* like this:**
The curriculum is based on the table of contents from science instructional materials.	Districts designed new science curricula by analyzing the new science standards and then intentionally selecting the instructional tasks and resources needed to move students toward proficiency.
Students learn science when time allows.	The district has a balanced curriculum in which all disciplines (e.g. Science, Social Studies, Visual and Performing Arts, and World Languages) are afforded adequate time and resources.
High School students take only biology, chemistry, and physics and not provided instruction in Earth and space science.	Regardless of course title, students have an opportunity to demonstrate proficiency with <u>all</u> of the Physical Science, Life Science and Earth and Space Science standards.
The curriculum is *aligned* to the standards.	• Science units in grades K-8 identify the previous learning and future learning for each unit. • High school science courses identify previous learning using the NJSLS-S and future learning referencing AP or IB course information for each course. • Accommodations for Access and Equity are part of the planning, not an add on.

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Criterion B. Explaining Phenomena or Designing Solutions

Guiding Question: To what extent do the units focus on supporting students to make sense of engaging and authentic phenomena or design solutions to real-world problem?

NJSLS-S designed units look *less* like this:	**NJSLS-S designed units look *more* like this:**
Explaining phenomena and designing solutions 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 purpose and focus of the units are to support students in making sense of phenomena and/or designing solutions to problems. The entire lesson 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 NJSLS-S.
A different, new, or unrelated phenomenon is used to start every lesson/unit.	Lessons/units work together in a coherent storyline to help students make sense of phenomena.
Teachers tell students about an interesting phenomenon or problem in the world.	Students get direct (preferably firsthand, or through media representations) experience with a phenomenon or problem that is relevant to them and is developmentally appropriate.
Phenomena are brought into the lessons/units after students develop the science ideas so students can apply what they learned.	The development of science ideas is anchored in explaining phenomena or designing solutions to problems.

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Criterion C. Three Dimensional

Guiding Question: To what extent do the units help students develop and use multiple grade-appropriate elements of the science and engineering practices (SEP), disciplinary core ideas (DCI), and crosscutting concepts (CCC), which are deliberately selected to aid student sense-making of phenomena or designing of solutions?

NJSLS-S designed units look *less* like this:	**NJSLS-S designed units look *more* like this:**
A single practice element shows up throughout lessons.	Units help students use multiple (e.g., 2–4) practice elements as appropriate in their learning.
The units 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 NJSLS-S Appendices F &G).	Specific grade-appropriate elements of SEPs and CCCs (from NJSLS-S 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 lesson.
The SEPs and CCCs can be inferred by the teacher (not necessarily the students) from the lesson materials.	Students explicitly use the SEP and CCC elements to make sense of the phenomenon or to solve a problem.
Engineering lessons focus on trial and error activities that don’t require science or engineering knowledge.	Engineering tasks require 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.

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Criterion D. Integrating the Three Dimensions for Instruction and Assessment

Guiding Question: To what extent do the units require student performances that integrate elements of the SEPs, CCCs, and DCIs to make sense of phenomena or design solutions to problems, and the learning tasks elicit student artifacts that show direct, observable evidence of three-dimensional learning?

NJSLS-S designed units look *less* like this:	**NJSLS-S designed units look *more* 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).	• The units are designed to build student proficiency in at least one grade-appropriate element from each of the three dimensions. • The three dimensions intentionally work together to help students explain a phenomenon or design solutions to a problem. • All three dimensions are <u>necessary</u> for sense-making and problem-solving.
Teachers assume that correct answers indicate student proficiency without the student providing evidence or reasoning.	Teachers deliberately seek out <u>student artifacts</u> that show direct, observable evidence of learning, building toward all three dimensions of the NJSLS-S at a grade-appropriate level.
Teachers measure only one dimension at a time (e.g., separate items for measuring SEPs, DCIs, and CCCs).	Teachers use tasks that ask students to explain phenomena or design solutions to problems, and that reveal the level of student proficiency in <u>all three dimensions</u>.
English language arts and/or mathematics are added onto units.	Students are using grade appropriate English language arts and mathematics to make sense of phenomena or when designing a solution.

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Criterion E. Relevance and Authenticity

Guiding Question: To what extent do the units motivate student sense-making or problem-solving by taking advantage of student questions and prior experiences in the context of the students' home, neighborhood, and community*?*

NJSLS-S designed units look *less* like this:	**NJSLS-S designed lessons/units look *more* like this:**
The units teach a topic adults think is important.	The units motivate student sense-making or problem-solving
The units focus on examples that some of students in the class understand.	The units provide support to teachers for making connections to the lives of <u>every</u> student in the class.
Driving questions are given to students.	Student questions, prior experiences, and diverse backgrounds related to the phenomenon or problem are used to drive the units and the sense-making or problem-solving.
The units tell the students what they will be learning.	The units provide support to teachers or students for connecting students' own questions to the targeted materials.

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Criterion F. Student Ideas

Guiding Question: To what extent does the lesson provide opportunities for students to express, clarify, justify, interpret, and represent their ideas (i.e., making thinking visible) and to respond to peer and teacher feedback?

NJSLS-S designed units look *less* like this:	**NJSLS-S designed units look *more* like this:**
The teacher is the central figure in classroom discussions.	• Classroom discourse focuses on explicitly expressing and clarifying student reasoning • Students have opportunities to share ideas and feedback with each other directly.
Student artifacts only show answers.	Student artifacts include elaborations (which may be written, oral, pictorial, and digital) of reasoning behind their answers, and show how students' thinking has changed over time.
The teacher's guide focuses on what to tell the students.	The unit provides items, tasks, and/or prompts to teachers for eliciting student ideas.

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Criterion G. Building on Students' Prior Knowledge

Guiding Question: To what extent does the units identify and build on students' prior learning in all three dimensions in a way that is explicit to both the teacher and students?

NJSLS-S designed units look *less* like this:	**NJSLS-S designed units look *more* like this:**
The unit content builds on students' prior learning, but only for DCIs.	The unit content builds on students' prior learning in all three dimensions.
The unit does not include support to teachers for identifying students' prior learning.	The lesson provides explicit support to teachers for identifying students' prior learning and accommodating different entry points, and describes how the lesson will build on the prior learning.
The unit assumes that students are starting from scratch in their understanding.	The unit explicitly works together with students' foundational knowledge and practice from prior grade levels.

Bibliography

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