

Science Standards March 2018 DRAFT – Expert Panel Review

Reviewer Name: Lisa Elfring

Introduction Section

As you conduct your review of the introduction, please consider the following questions.

- A. Does the introduction provide sufficient information and guidance on how to read the standards?

Yes. It was helpful to have the reminder that the standards provide what a student should know and be able to do. It is tempting to jump from standard to curriculum and I appreciated the reminder to curb this tendency.

- B. Does the introduction provide sufficient information on how the standards are structured?

Yes, generally. I was pleasantly surprised at the clarity and depth of the introduction. I still find the High-school numbering system to be mystifying, but I was able to refer back to the Intro to try to decipher it.

- C. Is there anything missing that should be included in the introduction?

Honestly, I found this section to be really clear. I cannot think of anything that should be included.

Please provide feedback on the Introduction section. Include strengths and well as suggestions for refinements.

Strengths:

- Clear overview and graphics (ie, Figure 1) of the overlap between the core ideas, science and engineering practices, and cross-cutting concepts.
- Small number of core ideas for knowing and using science. I referred back to this table a lot to make sure I was relating the standards to the appropriate core ideas.
- Table provides assumptions about time expectations for science instruction, by grade level. This kind of a tool can be important when teachers need to defend their curricular decisions. The statement that students who are far below grade level may require more time is also important.
- Safety expectations are part of these standards. This is important.
- Guidance in coding the standards was important.

Weaknesses:

- I am still not sure I understand why the high-school system requires “plus” standards for college-prep courses. But, I do see that the plus standards are deeper applications of the core standards. The coding seems overly complicated, but I am sure it is important to maintain clarity.

Appendix Section

As you conduct your review of the appendices, please consider the following questions.

- A. Do the appendices provide sufficient information and guidance on implementing the standards?

Not completely, but in the absence of complete curriculum, I don’t think this would be possible.

Because equity and diversity in science are key guiding principles, I would suggest that this section be moved to the first of the appendices. This section is also written in a very passive way in some portions. My tracked changes are contained in Appendix 5 in the draft standards, which I will include with this review document.

- B. Is there anything missing that should be included in the appendices?

No.

- C. Is there anything that should be removed from the appendices?

No. I found the sections on Crosscutting Concepts and Science/Engineering Practices to be very helpful and I can imagine they would be even more so for a practicing classroom teacher.

Please provide feedback on the Appendix section. Include strengths and well as suggestions for refinements.

Standards Section by Grade Level

As you conduct your review of the grade band/level standards, please consider these questions.

- A. Does the introductory information for the grade band and for each grade level provide enough context to understand how the standards connect within the grade and between grades within each band?
- B. Does each standard clearly state what students should know and be able to do?
- C. Can the standard be measured?
- D. Are there any ambiguous or unclear words/phrases?

- E. Do the standards in each section have appropriate **breadth**?
- F. Do the standards in each section have appropriate **depth of content and rigor** for the grade level?
- G. Is there meaningful alignment and development of skills/knowledge within each grade and from one grade band/grade level to the next?

1. Please provide feedback on Kindergarten-Grade 2 Band:

A. Please provide feedback on Kindergarten:

K.L1U1.5	
Obtain, evaluate, and communicate how the human body has different systems that carry out life processes.	Commented [LE1]: Obtain, evaluate, and communicate evidence that?
<p>In this standard and many of the others in the primary bands, "how" seems to indicate a mechanism. "That" seems to be more aligned with the knowledge being used.</p> <p>K.L2U2.6: in the Key concepts, the properties listed as nonliving properties (properties (air, food, water, energy) are also requirements for living systems. Language is confusing.</p>	
	Commented [LE2]: Living systems require an input of energy, air, food, water. Rephrase?

B. Please provide feedback on Grade 1:

1.P3U1.3	
Plan and carry out investigations which demonstrate how equal forces can balance objects and how that unec objects, making them change their speed, direction, or shape.	Commented [LE3]: to Commented [LE4]: that Commented [LE5]: that
1.E1U1.5	
Obtain, evaluate, and communicate information about the properties of earth materials.	Materials such as water Commented [LE6]: These are not concepts, but a list of objects. What properties or concepts are students required to understand?
1.L2U1.8	
Construct an explanation describing how organisms obtain resources from the environment including materia organisms.	Commented [LE7]: that

C. Please provide feedback on Grade 2:

2.P1U2.1	
Plan and carry out an investigation to determine that matter has mass, takes up space, and is recognized by its observable properties; use the collected evidence to develop and support an explanation.	Physical properties such as, length, volume, texture, size, shape, color, temperature Commented [LE8]: Of what?
2.P1U2.2	
Plan and carry out investigations to gather evidence to support an explanation on how heating or cooling can cause a transformation (solid, liquid, gas).	Refer to standard Commented [LE9]: How or that? Commented [LE10]: phase
2.L2U1.10	
Construct a model representing how life on Earth depends on energy from the Sun and energy from other org	Commented [LE11]: that

2. Please provide feedback on Grade 3-5 Band:

A. Please provide feedback on Grade 3:

3.L1U1.5	
Obtain, evaluate, and communicate how the human body has different systems that carry out life processes.	Commented [LE12]: Obtain, evaluate, and communicate evidence THAT

B. Please provide feedback on Grade 4:

4.P4U2.1	
Develop and use a model to demonstrate how a system transfers energy from one object to another even wh	Commented [LE13]: that
4.E1U4.9	
Construct and support an evidence-based argument about the impact of water's availability on life.	Commented [LE14]:

C. Please provide feedback on Grade 5:

Introduction: In this grade level, students will develop a basic understanding of conservation of matter, forces, patterns of Sun, moon, and stars, and genetic inheritance.

Commented [LE15]: stars

5.P1U1.1

Analyze and interpret data to explain that matter of any type can be subdivided into particles too small to see. Properties change or reactions occur, the amount of matter stays the same.

Commented [LE16]: What data can 5th graders be provided with to allow them to come up with the concept of the atom? This expectation seems unrealistic.

5.L3U1.9

Obtain, evaluate, and communicate information about patterns between the offspring of plants and animals (including humans) and construct an explanation on how genetic information is passed from one generation to the next.

Commented [LE17]: of

Commented [LE18]: What information and patterns will allow students to explain HOW genetic information is transmitted from one generation to the next? I can easily see them using evidence to look at some traits that ARE transmitted.

3. Please provide feedback on Grade 6-8 Band:

A. Please provide feedback on Grade 6:

6.P1U1.1

Analyze and interpret data to show how changes in states of matter are caused by different rates of movement of particles in gases (Kinetic Theory).

Commented [LE19]: that

6.P1U1.2

Plan and carry out an investigation to demonstrate how variations in temperature and/or pressure affect changes in states of matter.

Commented [LE20]: that

6.E1U1.6

Investigate and construct an explanation demonstrating how radiation from the Sun provides energy and is at the surface and atmosphere.

Commented [LE21]: that

B. Please provide feedback on Grade 7:

7.P2U1.1

Collect and analyze data demonstrating how electric and magnetic forces can be attractive or repulsive and cause motion.

Commented [LE22]: that

C. Please provide feedback on Grade 8:

8.P1U2.1

Develop and use a model to demonstrate how atoms and molecules can be combined or rearranged in chemical compounds with the total number of each type of atom conserved. Commented [LE23]: that

8.E1U1.6

Develop and use a model of Earth's geological column to **communicate** relative ages of rock layers and fossils. Commented [LE24]: Develop and use a model of a stratigraphic column, the use of fossils in biostratigraphy and geologic cross sections to communicate the Law of Superposition and the relative ages of rock layers.

4. Please provide feedback on the High School Standards:

A. Please provide feedback on high school core standards:

B. Please provide feedback on high school plus standards:

Standards Section organized by Core Idea/learning progression

You have also been provided with each standard organized by core idea to review and provide feedback on the development of the learning progression for each core idea. As you conduct your review of the progression, please consider the following questions.

- A. Does the standard address meaningful content within both core ideas?
- B. Do the standards within each progression have appropriate **depth of content and rigor**?
- C. Is there meaningful alignment and development of skills/knowledge within each grade and from one grade band/grade level to the next for each progression?

5. Please provide feedback on Core Ideas for Physical Science: **Outside my area of expertise.**

A. Please provide feedback on the progression for P1:

HS+C.P1U1.9

Plan and conduct investigations to gather evidence of the relationships between kinetic molecular theory and gas laws.

Kinetic molecular theory, Amontons' Law, Boyle's Law, Charles' Law, Gay-Lussac's Law, Avogadro's Hypothesis, Ideal Gas Law, Non-Ideal gases, van der Waal's equation, Dalton's Law of Partial Pressures

Commented [LE25]: I do not teach chemistry, so take this with a big crystal of salt. I know all these laws underlie the rates of reaction, but is it realistic to expect that students will come away with an understanding of all these relationships? These ideas are challenging for students at the Intro Chem level in college.

B. Please provide feedback on the progression for P2:

C. Please provide feedback on the progression for P3:

D. Please provide feedback on the progression for P4:

6. Please provide feedback on Core Ideas for Earth/Space Science: **Outside my area of expertise, but my husband is a geologist so when I got confused, he advised me.**

A. Please provide feedback on the progression for E1:

HS.E1U2.13

Evaluate explanations and theories about the

Systems (tectonic, glacial, groundwater, shoreline, (a)eolian, **fluvial**, **lacustrine**, global air circulation); Energy (heat, chemical, radiant, nuclear, elastic, electrical); heat transfer; rock cycle, Plutonic activity; time (geologic, relative, radiometric) (**removed "hydrologic"**)

role of energy and matter in geologic changes over time.

Connections: [7.E1U2.4](#), [7.L2U2.9](#), [8.E1U1.6](#)

B. Please provide feedback on the progression for E2:

7. Please provide feedback on Core Ideas for Life Science:

A. Please provide feedback on the progression for L1: [Progression is logical and clear.](#)
HS+B.L1U1.9

Analyze and interpret data which demonstrates how the properties of water impact [cellular function](#).

HS.L1U2.24 : [added words in red.](#)

Obtain, evaluate, and [communicate](#) information to show that systems of specialized cells within organisms (plant and animal) help them perform the essential functions of life.

Relate cell [and tissue](#) structure to [function](#), organ systems ([cannot jump right from cells to organ systems; there are intermediate levels of biological structure](#))

HS+B.L1U3.14

Possible concepts to explore may include blood disorders, [tumor visualization](#), pacemakers, any medical inventions designed to [detect and/or correct abnormal cell or tissue function.](#) ([detection and visualization are increasingly important technologies that can lead to more effective treatments](#))

Commented [LE26]: Cellular function, or tissue function?
Is this getting at water transport across a biological membrane?

B. Please provide feedback on the progression for L2: Progression is logical and clear, but molecular explanations require prior experience with basic chemistry principles. Given that course ordering is not standardized, how is this dealt with?

HS+B.L2U2.1

Use evidence to construct and revise an explanation regarding how bonds are broken and reformed, resulting in a net transfer of energy within an organism (plants and animals).

C. Please provide feedback on the progression for L3:

HS.L3U1.29

Replication, transcription, translation, somatic, insertion, deletion, inversions, duplication, point, codon (understanding the impacts of mutations requires understanding that changes in transcribed sequences are likely to impact protein structure; mutations in nontranscribed versions, perhaps less so.)

HS.L3U2.26

Develop and use a model to communicate how a cell copies and separates genetic information to make replica new cells during asexual reproduction (mitosis).

Differentiation, multicellular organism, fertilized egg, daughter cells, tissues, organs

Commented [LE27]: Differentiation is not a function of cellular division, in general. Should this be a topic elsewhere?

D. Please provide feedback on the progression for L4:

8. Please provide feedback on Core Ideas for Using Science: Sequence and progression are clear and well-articulated.

A. Please provide feedback on the progression for U1:

B. Please provide feedback on the progression for U2:

C. Please provide feedback on the progression for U3:

D. Please provide feedback on the progression for U4:

9. Please provide any additional comments about this draft that you want the revision committee to consider.

Overall comments: The high-school biology “plus” standards are a very close approximation of the Intro Biology standards for undergraduate students at my university. As far as I can tell, the same might be said of the chemistry “plus” standards. This system would seem to require that students be held to much higher standards than previously, and that students graduate with near college-level understanding. Was this the intent of these new standards? This will be a major change for high-school science teachers and students. How will the students be assessed?