



Review and Analysis of the Colorado Science Standards

**Prepared by WestEd as a subcontractor
to the Central Comprehensive Center**

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I. INTRODUCTION AND OVERVIEW

Colorado has an education improvement agenda, which over the past few years has been encoded into state law, Colorado's Achievement Plan for Kids (Senate Bill 08-212), which calls for the development of rigorous standards for students. The Colorado Department of Education (CDE) engaged in a year-long process to update its academic standards in English language proficiency and ten content areas, including science. The science standards were developed during the 2009-10 school year, with full implementation in 2013-14. A new state science assessment measuring the Colorado Science Standards was administered online for the first time in spring 2014 to students in 5th and 8th grades, and will be administered in fall 2014 to 12th grade students.

The Colorado Department of Education remains committed to providing rigorous academic standards of the highest quality. On April 10, 2013, the final version of the Next Generation Science Standards (NGSS) was released. The Colorado Department of Education conducted its own review/comparison of Colorado Science Standards to the NGSS. CDE then requested that third-party experts to conduct a formal study to identify the quality of the science standards being implemented and assessed during the 2013-14 school year, and to determine how and to what degree Colorado's current science standards compare with NGSS as well as the science standards of higher-performing countries and states. This will be considered the first step in the standards review cycle. The CDE requested assistance from WestEd (a subcontractor to the Central Comprehensive Center) in designing and conducting a crosswalk/study that would inform CDE regarding the alignment to or gaps between the Colorado Science Standards and the NGSS and in addressing any changes to the current standards that may be considered in the future.

Based on the request from CDE, WestEd and the Colorado Department agreed on the following scope of work:

WestEd would:

- Review Colorado science standards
 - *Depth & Breadth:* Do the CAS-S grade level expectations and evidence outcomes describe sufficient and appropriate depth and breadth of content within each standard, with respect to comparable NGSS performance expectations? If not, what content is missing? Are the grade level expectations and evidence outcomes free from extraneous content? If not, what content is extraneous?
 - *Coherence:* Are the CAS-S grade level expectations and evidence outcomes for each standard situated appropriately within the grade spans, with respect to comparable NGSS performance expectations and external referents? Do the grade level expectations and evidence outcomes begin and end at appropriate points in the content?
 - *Rigor:* Do the CAS-S grade level expectations and evidence outcomes describe content and skill expectations of a reasonable and appropriate level for this grade span, with respect to comparable NGSS performance expectations and external referents? Do the standards, grade level expectations, and evidence outcomes communicate an appropriate level of rigor?

- Develop a crosswalk comparing Colorado’s Science Standards with other science standards referents: the Next Generation Science Standards and with standards of specific higher-performing countries/states to be named;
- Provide a gap analysis, identifying specific content missing in the Colorado’s Science Standards in relation to the referents;
- Provide information and considerations for the state to use and refer to when it engages in its next update of the state’s science standards to include the overall strengths and limitations of Colorado’s Science Standards with particular attention paid to the organization/structure, content, and rigor of the standards;
- Articulate options that would address the gaps in Colorado’s Science Standards including the affordances and limitations of each;
- Deliver report including findings and considerations by July 2014; Identify additional information that CDE could use when conducting the next revision of its science standards and plans for assessment in this content area.

CDE would:

- Provide WestEd with information related to Colorado’s science standards;
- Partner with WestEd in the design, development and implementation of the crosswalk analysis;
- Partner with WestEd in determining which states and countries will be used for comparative purposes (in addition to NGSS).

The findings and recommendations from this review are intended to inform decision-making by the CDE during its science standards revision process. Periodic standards review is critical to help ensure that the content (skills, knowledge) students are expected to learn reflects the changing priorities, needs, and values of the state and society more broadly, and continues to prepare students for the challenges they will face in successive grades or post-secondary endeavors.

Overview of Methodology

The standards review involves the following two components:

- Review of CAS-S with NGSS to determine the degree to which the standards demonstrate alignment with respects to depth & breadth, coherence, and rigor.
- Review and comparison of respected external referent standards to better understand overall strengths and limitations of the CAS-S, with particular attention paid to the organization/structure and content of the standards

Key to the review, across all components listed, are the objective, third-party analysis and subsequent observations and recommendations related to reviewing the alignment of the CAS-S to NGSS. Outcomes of the review are intended to inform and guide the work of those revising Colorado’s science standards.

The WestEd analysts who conducted the alignment review possess extensive knowledge and skills in standards review and development, in their respective science topic areas, K–12 curriculum, instruction, assessment, and alignment, as well as experience in the classroom. These analysts were trained in specific protocols designed to (1) articulate and operationalize the criteria and processes used to judge alignment quality and (2) ensure the accuracy and consistency of the application of the criteria across science topic areas and grades. The protocols and related criteria were applied systematically to each CAS-S content area standard in comparison to NGSS.

For the review of internal quality, the specific criteria applied to the analysis of each standard included *Depth & Breadth*, *Coherence*, and *Rigor*. The alignment to NGSS was rated holistically in considering each criterion (Depth & Breadth, Coherence, Rigor) according to the following designations: Fully, Partially, No.

For the analysis of the external referent standards, the following criteria were used:

- *Organization/Structure*: Similarities and differences in grade articulation, hierarchy of standards, number of standards, and design/format.
- *Content*: Similarities and differences in standards scope and sequence, grade spans, and wording.

For each criterion (Organization/Structure, Content), analysts recorded a holistic rating reflecting the similarity of the external referent standards to the CAS-S (i.e., as Similar or Different).

The outcomes of this analysis have implications for CDE’s consideration during its CAS-S revision process. It is intended to provide the CDE with an objective analysis, observations, and recommendations that can inform and guide the work of those revising Colorado’s science standards.

Organization of the Report

This report presents the methodology, findings, and recommendations from the crosswalk and alignment review. The complete report is organized as follows:

- Section I: Background. The background and purpose for the study.
- Section II: Methodology. The processes used and criteria applied during each step in the crosswalk and alignment review are described.
- Section III: Alignment Review Findings and Recommendations. Study findings analysis, and specific recommendations for alignment are presented.
- Section IV: References. References and documents reviewed in the analysis.
- Section V: Appendices. Alignment ratings and comments from analysts are provided for each standard in all grades for each science topic area.

II. METHODOLOGY

This section describes the research-based processes and protocols used during WestEd’s crosswalk of the Colorado Academic Standards for science (CAS-S) with the recently released Next Generation Science Standards. Findings from the crosswalk were used to develop observations of the current CAS-S and objective recommendations for improvement of the content of the CAS-S. These recommendations are intended to help guide decision-making during the standards revision process.

Training and Calibration Procedures

Using their collective expertise and experience, WestEd analysts were asked to systematically apply protocols developed specifically to conduct a crosswalk of CAS-S with NGSS. These protocols helped to (1) articulate and operationalize the criteria and processes used to judge alignment with NGSS and (2) ensure the accuracy and consistency of the application of the criteria across grade spans and content areas. Training and calibration training was facilitated by WestEd project leaders. Training and calibration of analysts ensured that approved procedures were implemented and the judgment criteria applied accurately and consistently throughout the course of the study, within and across content areas. In all components, the WestEd analysts who conducted the work possess extensive knowledge and skills in standards review and development, in NGSS, K–12 curriculum, instruction, assessment, and alignment, as well as experience in the classroom. Prior to training, WestEd analysts independently reviewed all relevant standards, related documents, and external referents for their respective science and engineering content areas. During training, the WestEd facilitator guided analysts in a review of all procedures, evaluation criteria, format for the rating sheets, and the appropriate unit of analysis for the content area. The facilitator then guided analysts as they applied the review criteria to a few standards to verify their understanding of the criteria and procedures. In each content area, analysts discussed their decisions and rationale for each judgment with the facilitators. The facilitators examined the analyst’s judgments, and if they did not concur with the rating, they provided additional guidance to recalibrate the analyst. This step was repeated, with ongoing calibration, until analysts’ decisions were fully aligned with their facilitator’s judgments.

Alignment Review of the Colorado Academics Standards for Science with NGSS

For this step, analysts were asked to apply a protocol focused on conducting a crosswalk of the CAS-S with the recently released Next Generation Science Standards. The CAS-S is organized into Grade Level Expectations (GLE) articulated across individual grades from preschool-grade 5 and in middle and high school. The unit of analysis and reporting for this step was the CAS-S Grade Level Expectation at each grade span, along with the Evidence Outcomes (EO) and Nature of Science (NOS) statements that accompany each Grade Level Expectation in a content area standard. These three statements were used to interpret the state’s intent with regard to the

development and application of the knowledge and skills described in the standards. Each content area standard was reviewed and compared with appropriate Performance Expectations and Science Practices from the NGSS.

Alignment Review Criteria. WestEd analysts applied general evaluation criteria to this review of standards. The general criteria, explained in greater detail below, were depth & breadth, coherence, and rigor. These criteria, supported by research and best practices at the state and local levels, (see, for example, Webb, 1997, Rabinowitz, Roeber, Schroeder, & Sheinker, 2006, among others), were adapted through discussions with the CDE to ensure the information in the findings would be appropriate for Colorado’s context, and thus maximally useful. Criteria for each dimension were designed as responses to holistic questions of sufficiency and appropriateness that were applied by analysts as they reviewed each CAS-S GLE and EO statement.

- *Depth & Breadth:* Do the CAS-S GLE and EO statements describe sufficient and appropriate depth and breadth of content within each standard, with respect to comparable NGSS performance expectations? If not, what content is missing? Are the GLE and EO statements free from extraneous content? If not, what content is extraneous?
- *Coherence:* Are the CAS-S GLE and EO statements for each standard situated appropriately within the grade spans, with respect to comparable NGSS performance expectations? Do the GLE and EO statements for each standard begin and end at appropriate points in the content?
- *Rigor:* Do the CAS-S GLE and EO statements describe content and skill expectations of a reasonable and appropriate level for this grade span, with respect to comparable NGSS performance expectations? Do the standards, grade level expectations, and evidence outcomes communicate an appropriate level of rigor?

For each CAS-S GLE and EO statement, analysts independently determined if there was a corresponding NGSS Performance Expectation (PE), and to what degree each statement was aligned to the PE. Rating sheets were used to guide the analysis and reporting of holistic findings. The GLE and EO statements were rated as meeting each criterion using the following holistic designations and scale: “Fully” (F); “Partially” (P); “No” (N). In any instances where a GLE or EO statement aligned completely with a specific NGSS Performance Expectation, it was noted with an F for that PE. In any instances where a GLE or EO statement aligned with only a part of a specific NGSS Performance Expectation, it was noted with a P for that PE. GLE and EO statements that were rated as P were noted by an asterisk if there was partial alignment with a corresponding, grade-appropriate PE, along with a comment as to which criterion (Depth & Breadth or Rigor) was most significant in determining the P rating. If the P rating was indicated in any instance when a GLE or EO statement was aligned, either completely or partially, with a PE in a different grade span, the P rating is noted with “Coherence” in the comment box. In any instances where a GLE or EO statement was not aligned with a specific NGSS Performance Expectation, it was noted with an N for that PE. For each GLE and EO statement, if no

corresponding PE was found, the N rating was accompanied by a comment of “Not found in NGSS.” Comments noting significant gaps were also provided, as appropriate.

In addition to determining if each GLE and EO statement was aligned to an NGSS PE, any PE that was not addressed at all in the CAS-S was also noted. PEs that are not addressed in the CAS-S are noted under the MISSING section for each grade span/science content area in the Appendix. General areas of NGSS that are not addressed in any notable way are also discussed in the findings and recommendations section.

For each CAS-S NOS statement, analysts independently determined if there was a corresponding Science and Engineering Practice from NGSS and noted which Science and Engineering practice is was aligned to. In some cases, an NOS statement could be aligned with more than one NGSS Science and Engineering Practice.

Comparison of Colorado’s Model Content Standards to External Referents

Analysts systematically reviewed sets of external referent standards vis-à-vis the CAS-S using the criteria described below. The unit of analysis and reporting for this step of work was the CAS-S content area standard, specifically the GLE, EO, and NOS statements. The GLE, EO, and NOS statements for each content area standard were used to interpret the state’s intent with regard to the development and application of the knowledge and skills described in the standards. The unit of analysis for the external referents was the most comparable level in each set of referent standards. For the purposes of review and presentation, data were organized using the current structure and sequence of the CAS-S.

The External Referents. CDE selected the external referents to which the CAS-S would be compared. Included in the selection criteria was whether the standards were from states or countries respected for their strong overall academic performance and quality of their standards. To enable maximal usefulness in guiding standards revisions, sets of standards were sought that would be relevant in all content areas. Additionally, it was hoped that by reviewing each set of external referent standards for multiple science content areas, the comparison would benefit from any cross-content elements or guiding philosophies that might not be apparent in any one science content area. To this end, they selected standards from the following entities:

- From another state: Massachusetts, Virginia
- From another country: Finland

Criteria Used for Comparative Analyses. The external referent comparison was intended to serve as a holistic review of the similarities and differences between each external referent and the CAS-S in its current 2010 form, as compared to similar analyses completed prior to the last revisions. These data may be used to inform the CDE during the upcoming CAS-S revision process. Specifically, comparisons were documented for two criteria, organization/structure and content. Analysts’ considerations for judging each are defined as follows:

- *Organization/Structure.* Analysts' considerations related to standards organization and structure included similarities and differences in grade articulation (standards articulated by individual grade, grade-span, course, etc.; cross-grade strands versus no repetition of content), hierarchy of standards (number of levels in standards, e.g., strand, standard, benchmark, indicator), number of standards (number of strands, standards, indicators), design/format (organization and structure of standards), and ways in which intended knowledge and skills are communicated.
- *Content.* Analysts' considerations related to standards content included similarities and differences in standards scope and sequence (the depth and breadth of content described in the standards), grade spans (the sequencing and distribution of content within and across the grade spans), and wording (specificity of language; focus on action verbs, knowledge, etc.).

Holistic Rating Scale. For each criterion, analysts recorded a holistic rating reflecting the similarity of the external referent standards to the CAS-S. These ratings were as follows:

- *Similar* — Referent standards are mostly similar to CAS-S in substantive ways
- *Different* — Referent standards are mostly different from CAS-S in substantive ways

In order to arrive at these holistic ratings, analysts recorded descriptive comments on the specific similarities and differences between the CAS-S and referent standards. Comments included rationale and evidence to support their judgments and conclusions about the impact or relative importance of the differences (or in some cases, similarities). It is important to note that the referents have similarities and differences among one another, as well as with CAS-S. However, no one approach is intended to be presented as necessarily more or less effective than another. Differences in structure or content of a state or country's standards may be qualitative, but may also be attributable to differences in history, purpose, and/or context. Thus, the implication is that a variety of approaches and combinations of approaches may be considered, should they be determined to be appropriate for Colorado.

III. ALIGNMENT REVIEW FINDINGS AND RECOMMENDATIONS

This section contains findings and recommendations related to the NGSS alignment review and the external referent reviews for the analysis of the CAS-S. Detailed review criteria can be found in the Methodology section of this report. A brief description of the criteria and guiding questions also are provided here for convenience.

Alignment Review – GLE and EO Statements

As described in the Methodology section of this report, the CAS-S GLE and EO statements were reviewed for their quality according to three specific criteria: depth & breadth; coherence; and rigor, in comparison to Performance Expectations provided in the Next Generation Science Standards. The scale used for evaluating each criterion was as follows: Fully (F), Partially (P), or No (N). General findings from these analyses are presented in Table 1 and specific alignment data can be found in the Appendices.

Table 1. Alignment of CAS-S Grade Level Expectations and Evidence Outcomes Statements with NGSS Performance Expectations

Grade Span	Fully (#)	Partially (#)	No (#)	NGSS Grade-Aligned PEs Not Addressed (#/Total)
Preschool	0	4	12	N/A
Kindergarten	0	1	14	3/10
First Grade	7	4	9	6/9
Second Grade	4	11	6	8/11
Third Grade	3	3	6	11/15
Fourth Grade	3	5	19	8/14
Fifth Grade	2	17	5	8/13
Middle School - PS	4	37	13	8/19
Middle School - LS	37	12	10	7/21
Middle School - ES	28	14	13	2/19
High School - PS	21	6	9	11/24
High School - LS	27	16	19	4/24
High School - ES	21	13	10	4/19

As evidenced in Table 1, there are a significant number of CAS-S GLE and EO statements that are not aligned partially or fully to a specific NGSS Performance Expectation at that grade level. Most noticeably, preschool, kindergarten, first, third, and fourth grades are particularly poor in their alignment, with more statements that are not aligned than are either fully or partially aligned. Middle school alignment is, however, much higher than in the elementary grades, although physical science alignment is noticeably lower than life or earth science. The situation is reversed at the high school level, where more physical science and earth science GLE and EO statements are aligned with NGSS, but life science has a lower level of alignment.

The alignment review also indicates that there are significant gaps between what is called for in the NGSS PEs versus what is addressed in the CAS-S GLE and EO statements at any grade level (Table 1, far right column). For example, in first, second, and third grades, at least 2/3 of the NGSS PEs for that grade are not addressed in the CAS-S GLE or EO statements at any grade level. Additionally, over half of the third and fourth grade NGSS PEs are not addressed in the

CAS-S at any grade. Coverage of NGSS PEs is significantly improved in middle school, although physical science and life lagged noticeably, with at least 1/3 of the NGSS PEs going unaddressed. Similarly in high school, the number of physical science PEs that are unaddressed (almost half) is noticeably higher than in life science and earth science. At almost every grade span, there are entire sets of Performance Expectations that are not addressed in the CAS-S.

Table 2. Area of Partial Alignment of CAS-S Grade Level Expectations and Evidence Outcomes Statements with NGSS Performance Expectations

Grade Span	Depth & Breadth	Coherence	Rigor
Preschool	0	4	0
Kindergarten	0	0	1
First Grade	0	4	4
Second Grade	0	10	2
Third Grade	0	3	0
Fourth Grade	0	5	2
Fifth Grade	0	17	11
Middle School - PS	28	7	8
Middle School - LS	6	0	6
Middle School - ES	1	0	13
High School - PS	2	0	4
High School - LS	2	14	0
High School - ES	0	0	13

It is interesting to note that in the elementary grade spans, areas of partial alignment are entirely due to issues of coherence (wrong grade level) or rigor. As shown in Table 2, the majority of GLE and EO statements with partial alignment were due to issues with coherence, meaning they were aligned with NGSS PEs in a different grade level. The remaining partial alignment ratings were due to issues with rigor. The situation in middle school was less clear. Overall, coherence was much better than for elementary grades. For physical science, the majority of partial alignments were due to issues with depth & breadth. Life science was split between depth & breadth and rigor, while the vast majority of the earth science ratings coming from issues with rigor. At the high school level, coherence was the reason for the vast majority of the partial alignment ratings for life science, while rigor was the only reason for earth science partial alignments. High school physical science partial ratings were split between depth & breadth and rigor.

Illustrative Example #1

The CAS-S second grade life science content area standard provides a helpful illustrative example for understanding partial alignments. The GLE statement #1 for second grade (*Organisms depend on their habitat's nonliving parts to satisfy their needs*) and the associated EO statements are fully aligned with NGSS PE 2-LS2-1 (*Plan and conduct an investigation to determine if plants need sunlight and water to grow*), but go beyond the NGSS PE by discussing all organisms, not just plants. The GLE and EO statements are also partially aligned with NGSS PE K-ESS3-1 (*Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live*), which discusses the needs of plants AND animals and their habitats. Given the partial alignment with a NGSS PE from a different grade, the CAS-S GLE and EO statements were given a P rating and a coherence comment.

Illustrative Example #2

Another illustrative example of partial alignment comes in the earth science content areas for both middle school and high school. At both levels, the CAS-S GLE and EO statements are largely on a level that is less rigorous than corresponding PEs in NGSS. For example, CAS-S earth science GLE statement #3 for sixth grade (*Earth's natural resources provide the foundation for human society's physical needs. Many natural resources are nonrenewable on human timescales, while others can be renewed or recycled*) and associated EO statements are partially aligned with NGSS middle school PEs LS-ESS3-1 (*Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes*) and LS-ESS3-4 (*Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems*) in that both sets of statements focus on human activities and nonrenewable resources, but the NGSS statements are more rigorous with their focus on systems, processes, and impacts.

Similarly, the high school earth science GLE statement #2 (*As part of the solar system, Earth interacts with various extraterrestrial forces and energies such as gravity, solar phenomena, electromagnetic radiation, and impact events that influence the planet's geosphere, atmosphere, and biosphere in a variety of ways*) and associated EO statements are partially aligned with NGSS PEs HS-ESS1-1 (*Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation*) and HS-ESS1-6 (*Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history*), but lack the rigor associated with the NGSS PEs.

Illustrative Example #3

Middle school earth science also provides an illustrative example for how difficult it can sometimes be to determine if there is not an alignment. The CAS-S middle school GLE statement #3 for eighth grade (*The solar system is comprised of various objects that orbit the Sun and are classified based on their characteristics*) addresses some of the same content areas as the NGSS MS-ESS1 target, Earth's Place in the Universe, but it is noticeably different upon close inspection. Whereas the CAS-S GLE and associated EO statements focus on students being able to identify components of the solar system, explain how it was formed, and recognize how models can be used to understand orbital paths, the NGSS PEs ask students to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons; describe the role of gravity in the motions within the solar system; and use data to determine scale properties of objects in the solar system. In this case, the overlap between the content area is not enough to consider even a partial alignment.

Alignment Review – NOS Statements

As described in the Methodology section of this report, the CAS-S NOS statements were reviewed for alignment with one of the eight Science Practices described in the NGSS. General findings from these analyses are presented in Table 2 and specific alignment data can be found in the Appendices.

Table 3. Alignment of CAS-S Nature of Science Statements with NGSS Science Practices

Grade Span	NOS Statements Aligned with NGSS Practices
Preschool	5/14
Kindergarten	6/11
First Grade	5/9
Second Grade	6/10
Third Grade	5/7
Fourth Grade	9/13
Fifth Grade	14/15
Middle School - PS	25/26
Middle School - LS	17/19
Middle School - ES	18/18
High School - PS	14/17
High School - LS	14/20
High School - ES	14/17

Compared to the alignment of GLE and EO statements with NGSS PEs, the CAS-S Nature of Science statements are noticeably more aligned with the NGSS Science Practices. NOS statements in the elementary grades were more likely to not be aligned with a Science Practice, particularly in preschool, in comparison to middle school and high school NOS statements. This finding makes sense given the relatively low level of attention that science is often given in elementary classrooms. Teachers are often times uncomfortable or unfamiliar with presenting lessons that address science practices and more often focus on content instead. Middle and high school science teachers are more likely to be credentialed in science and are better prepared to present lessons that address the science practices.

Alignment Review – Engineering Design Process and Practices

It should also be noted that during the CAS-S/NGSS crosswalk, particular attention was paid to any mention of engineering design processes or practices. In its current form, the CAS-S makes very little mention of the engineering design process or practices, and particularly not in any way that is aligned to what is specified in NGSS. There are a handful of references to specific engineering disciplines, such as bioengineering, and to specific technological products or designed systems, such as energy generating technology or water filtration systems, but these are mentioned almost exclusively in the “Relevance and Application” section of a content area standard and are largely unsupported by specific references in the GLE, EO, or NOS statements. Additionally, most references to specific engineering concepts in CAS-S ask students to understand the criteria, constraints, and rationale used by scientists and engineers to solve a problem or develop a product, but do not require any use of the engineering design process or

practices to design, develop, test, and apply a solution to a problem. This is the most critical element of the inclusion of engineering in NGSS, getting students to think and work in ways that reflect how real world scientists and engineers design products and solve problems.

Alignment Review – Comparison to External Referents

As described in the Methodology section of this report, analysts reviewed three sets of content standards to serve as an external referent comparison with the CAS-S. The following documents were used as external referent standards for the science review:

- Massachusetts Science and Technology/Engineering Curriculum Framework (October 2006)
- Science Standards of Learning for Virginia Public Schools (January 2010)
- National Core Curriculum for Basic Education 2004 (Finland)
- National Core Curriculum for Upper Secondary Schools 2003 (Finland)

With respect to the external referents, the comparison with CAS-S has had some noticeable changes since the last CAS revision in 2010. As described in the Methodology section, the external referent standards were reviewed for two broad criteria, organization/structure and content. Each criterion contained several subcategories about which analysts recorded observations before determining a final overall holistic rating of mostly similar (Similar) or mostly different (Different). Findings from these analyses are presented below.

Table 4. Comparison Ratings for External Referents.

Rating Category	Massachusetts	Virginia	Finland
Organization/ Structure	Similar	Similar	Different
Content	Similar*	Similar**	Different

As indicated by the ratings in the table, Massachusetts and Virginia each differ from Colorado in either Organization/Structure or Content, while Finland remains more different in both areas. The analyses below highlight various similarities and differences between the CAS-S and each external referent. It is important to note that the referents continue to have similarities and differences among one another, as well as with CAS-S. Differences in structure or content of a state or country’s standards may be qualitative, but may also be attributable to differences in history, purpose, and/or context. Therefore, a variety of structural and content factors should be considered when making comparisons between the external referents and CAS-S.

Organization and Structure. Massachusetts and Finland continue to specify their science standards by grade level range (e.g., K–2, 3–5, 6–8). In contrast, Colorado and Virginia specify science content standards by individual grade for kindergarten through grade eight (CO) and six (VA), and then by grade level range for high school (CO) or middle school and high school (CO), similar to NGSS. In contrast to Colorado, all three external referents organize the science content, at some level, by topical or thematic strands, again, similar to NGSS. For example, some of the Massachusetts topical strands include *The Earth in the Solar System*, *Properties of Matter*, and *Motion and Forces*, while Virginia features strands such as *Living Systems*, *Interrelationships in Earth/Space Systems*, and *Force, Motion, and Energy*.

Content. Changes in the Content comparison have arisen due to the 2010 CAS revision. The CAS-S now consists of three broad standards (Physical Science, Life Science, and Earth Systems Science), which is largely aligned with Massachusetts and Virginia. For the physical science domain, Massachusetts, Virginia, and Finland specify separate content standards for physics and chemistry courses at the high school grade level range. Colorado, Massachusetts, and Virginia, cover the large domain for Earth and space science content. However, the Virginia Earth and space science coverage only extends through the middle school grade level range. For Finland, Earth and space science content is very limited and much less focused.

Massachusetts. The Massachusetts science standards are unchanged since the last revisions to the CAS-S. Massachusetts does have a revised draft version currently under review, which attempts to align more closely with NGSS. That draft is currently undergoing public comment and revision, with plans to adopt a final version for the 2015-16 school year.

The organization and content of the Massachusetts Science and Technology/Engineering Curriculum Framework continue to clearly reflect the intent to articulate the guidelines for learning, teaching, and assessment in science and technology/engineering. The Framework is an expansive document that includes “What it Looks Like in the Classroom” scenarios imbedded in the presentation of the learning standards. In addition, the Framework provides several appendices addressing related topics such as additional learning activities, safety practices, dissection, and curriculum review resources.

The Massachusetts framework presents the standards in table format. Each table shows the learning standard and associated Ideas for Developing Investigations and Learning Experiences. In some cases, an additional column shows Suggested Extensions to Learning in Technology/Engineering.

Both Colorado and Massachusetts organize the standards by similar grade spans. At the highest level of organization for content, the Colorado and Massachusetts documents are very similar. Both cover the three large domains of scientific understanding: physical science, life science, and Earth and space science. At the high school grade span, Massachusetts divides the physical science domain into two distinct courses: Chemistry and Physics. Also at the high school grade span, Massachusetts defines a set of Mathematical Skills relevant to each science course and defines a common set of four Scientific Inquiry Skill Standards.

*At all grade spans, Massachusetts includes an additional large domain covering Technology/Engineering. Massachusetts is the only set of standards in this study, along with NGSS, to include a large domain for Technology/Engineering. This reflects Massachusetts’ understanding that although science and technology/engineering have different goals, they are closely related in many fields.

Massachusetts continues to divide each large domain into smaller subtopics at each grade span. In many cases, the subtopic titles are unique at each grade span, but reflect related content that is grade span appropriate. In general, the individual Massachusetts standards tend to have greater specificity and detail than the individual Colorado grade level expectations. A comparison between the number of Colorado grade level expectations and the number of Massachusetts standards reflects the differences in specificity and detail. Colorado has 82 benchmarks across all

grade spans. In contrast, Massachusetts has over thrice that amount with 307 standards across all grade spans.

Virginia. The stated goal of the Science Standards of Learning for Virginia Public Schools is to identify the academic content for essential components of the science curriculum at different grade levels. **Virginia differs from Colorado in that its standards at K-6 are grouped into a range of content strands (Scientific Investigation, Reasoning, and Logic; Force, Motion, and Energy; Matter; Life Processes; Living Systems; Interrelationships in Earth/Space Systems; Earth Patterns, Cycles, and Change; and Earth Resources). These strands, with the exception of Scientific Investigation, Reasoning, and Logic, however, largely reflect the same content as the CAS-S strands for Physical, Life, and Earth Systems. At the high school grade span, Virginia does not include the Earth and space science domain. Also at the high school grade span, Virginia divides the physical science domain into two distinct courses: Chemistry and Physics. Of particular note is that Virginia continues to identify grade specific science standards for kindergarten through grade six. Colorado and Virginia organize the standards by similar grade spans for the middle school and high school grade spans. The middle school grade span is 6–8 for Colorado and 7–8 for Virginia.

At grades K–6, Virginia organizes the content by the topical content strands, which provide a continuum through these grades and are represented indirectly throughout the middle school and high school grade spans. The proper unit of analysis is between the Colorado grade level expectations and the Virginia standards. Virginia presents each standard statement followed by a lettered list of key concepts. In general, the key concept statements for each Virginia standard tend to provide greater specificity than the analogous Colorado grade level expectations.

Finland. Finland’s science standards remain unchanged since the 2010 CAS-S revisions, with a more holistic and general approach versus specific content standards. Finland is, however, currently undergoing a revision process with final adoption scheduled for 2016-17.

The Finland National Core Curriculum for Pre-primary Education and National Core Curriculum for Basic Education covers science content through grade 9, and the National Core Curriculum for Upper Secondary School covers science content through the high school grade span. At grades 1–4, the science content is defined under the domain for Environmental and Natural Studies. At the 5–6, 7–9, and high school grade spans, the content is defined for the domains of Biology, Geography, Physics, and Chemistry (Biology and Geography and Physics and Chemistry are combined at the 5–6 grade span).

The stated objectives for instruction in biology and geography include emphasizing responsibility, the protection of nature, the preservation of living environments, and the student’s growth as an active citizen committed to a sustainable lifestyle. The stated objectives for instruction in physics and chemistry include developing understandings that allow students to make everyday choices, particularly in matters related to the protection of the environment and the use of energy resources.

The Finland Core Curriculum continues to focus more directly on environmental topics (the content domain) and seeks to develop student attitudes that value environmental protection and sustainable development (the affective domain). In comparison, the CAS-S integrates content

addressing environmental topics (the content domain) throughout the curriculum but with a less direct focus as uniquely environmental topics. The Finland curriculum also places particular emphasis on the ecosystems and adaptations of organisms found in Finland and the Nordic countries, human biology and health, and cultural geography.

At the highest level of organization for content, both Colorado and Finland cover the following three large domains of scientific understanding from grade 1 through the high school grade span: physical science, life science, and Earth systems science. At the 7–9 and high school grade spans, Finland divides the physical science domain into two distinct courses—Chemistry and Physics. At all grade spans, Finland continues to divide each major topic or course into two sections: Objectives and Core Contents. Additionally, at grade spans 1–4 and 5–6, Finland defines a set of Descriptions of Good Performance. At the 7–9 grade span, Finland defines a set of Final Assessment Criteria. For Finland, the Core Contents and Descriptions for Good Performance/Final Assessment Criteria are organized by content strands (e.g., Organisms and living environments, Substances around us, Scales and structures, Motion and Force). The content strands are further defined by sets of bulleted statements. For making content comparisons, the Colorado grade level expectations are somewhat similar to the Finland bulleted statements. However, the content specificity of the bulleted statements differs greatly across the Finland grade spans, so making direct comparisons to the CAS-S is somewhat limited.

For the physical science domain at the middle school grade span, the Finland curriculum places earlier and greater emphasis on chemical phenomena, including reactivity of elements, chemical bonds, and simple reaction equations. For the Earth and space science domain, the depth and breadth of the CAS-S are represented in a limited and much less focused way in the Finland curriculum throughout the grade spans. In the Finland curriculum, the most thorough coverage of the more traditional Earth and space science concepts is at the high school grade span in the Geography course where aspects of physical geography are addressed. In the Finland curriculum, some Earth and space science concepts are imbedded in various topics or courses throughout the grade spans. The Finland curriculum also has a very strong emphasis on physical and cultural geography (particularly for Finland and the Nordic countries) and on geographic skills, which are not addressed in the Colorado standards.

Observations For Consideration

There are numerous areas where noticeable differences between CAS-S and NGSS can be observed. It is in these areas that we anticipate the most discussion in considering revisions to the CAS-S and provide observations for consideration.

1. **Engineering.** The most noticeable difference between CAS-S and NGSS is the inclusion of engineering design throughout NGSS, including content and practices. CAS-S offers very little engineering in its current form. If Colorado is to consider adding engineering to the CAS, which would seem appropriate considering the recent national focus on engineering and technology (including the recent addition of Technology and Engineering Literacy to the NAEP assessment portfolio), it has a couple of good models to use. First is the NGSS itself. NGSS provides clear performance expectations for engineering design at each grade span and integrates engineering content with practices. The second model comes from the Massachusetts Framework. It also includes detailed

engineering/technology learning standards for each grade span, with additional examples of learning activities. The Massachusetts engineering/technology standards are, however, presented in much greater detail than in NGSS and may not be at the appropriate grain size for CAS-S.

2. **Integration.** A hallmark feature of NGSS is the introduction of Performance Expectations, which integrate the Science and Engineering Practices, Disciplinary Core Ideas, and Cross-Cutting Concepts from the Framework for K-12 Science Education into one integrated target for NGSS-aligned assessments. The CAS-S content area standards are structured in a slightly different way, featuring Grade Level Expectations, Evidence Outcomes, and Nature of Science statements, with the EO and NOS statements being used independently for assessment. This results in an inherent difference in how the two different standards are structured, and how assessment would be conducted for each.
3. **Elementary Gaps and Coherence.** Alignment of CAS-S and NGSS at the elementary level is particularly problematic in that there are significant gaps in what is presented in each set of standards. These gaps consist primarily of topics that are covered in one set of standards and not in the other, or where the same topic is covered but in different grades. Any desire to align CAS-S and NGSS more closely at the elementary grades will require some significant retooling of the content areas covered. Some easy fixes could come from moving topics from one grade to another, but in areas where the gap is complete, the CAS-S would need to be significantly restructured to reflect more of the the topics covered in NGSS.
4. **Middle and High School Depth & Breadth and Rigor.** There are a number of areas where alignment between CAS-S and NGSS at the middle and high school levels could be improved, but that would require significant retooling of the CAS-S along the lines of depth & breadth and rigor. As illustrated in the previous examples, there are a number of instances where the two sets of standards cover similar content areas, but the level of depth & breadth or rigor would need to be adjusted to bring them into alignment.
5. **Human Activity.** In NGSS, considerable attention is paid to the influence and impacts of human activity on the natural world, including human-developed technology, and the impacts of the natural world on humans. CAS-S covers the role of humans and technology in the natural world to a more limited extent. This difference in the coverage of human activity and technology, more than any other factor, is the most common reason for the content gaps in the alignment between CAS-S and NGSS.

IV. REFERENCES AND EXTERNAL REFERENTS

References

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Webb, N. L. (1997). *Criteria for alignment of expectations and assessment in mathematics and science education*. (NISE Research Monograph No. 8). Madison: University of Wisconsin—Madison, National Institute for Science Education. Washington, DC: Council of Chief State School Officers.

Science External Referents

Massachusetts Science and Technology/Engineering Curriculum Framework (December, 2013)

Science Standards of Learning for Virginia Public Schools (January 2010)

National Core Curriculum for Pre-primary Education 2010 (Finland)

National Core Curriculum for Basic Education 2004 (Finland)

National Core Curriculum for Upper Secondary Schools 2003 (Finland)

V. APPENDIX

Preschool

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Planning and carrying out investigations		
NOS 3.	–	–	
NOS 4.	Asking questions		
PS GLE 2.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Planning and carrying out investigations		
NOS 3.	–	–	
LS GLE 1.	K-LS1-1	P	Coherence
EO a.	N/A		
EO b.	N/A		
EO c.	N/A		
EO d.	N/A		
NOS 1.	–	–	
NOS 2.	Planning and carrying out investigations		
LS GLE 2.	N/A	N	Not found in NGSS
EO a.	2-LS2-1	P	Coherence
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
NOS 1.	–	–	
ES GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A		
EO b.	N/A		
EO c.	N/A		
NOS 1.	–	–	
NOS 2.	–	–	
ES GLE 2.	K-ESS2-1 1-ESS1-1*	P P	Coherence Coherence
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Planning and carrying		

	out investigations		
MISSING	N/A	N/A	NGSS does not have any PEs for preschool

Kindergarten

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	–	–	
NOS 3.	Asking questions		
PS GLE 2.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Obtaining, evaluating, and communicating information		
LS GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Engaging in argument from evidence		
NOS 4.	Planning and carrying out investigations		
ES GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	K-PS3-1	P	Rigor
NOS 1.	–	–	
NOS 2.	–	–	
MISSING	K-ESS2-2		CAS-S includes animals adapting to environment in PK and 1 st , but not animals adapting the environment to their

			needs.
	K-PS3-2		CAS-S includes temperature change during different parts of the day in 2 nd , and uneven heating of the Earth's surface by the sun in 5 th - both related to weather.

First Grade

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	2-PS1-1*	P	Rigor, Coherence
EO a.	2-PS1-1*	P	Rigor, Coherence
EO b.	2-PS1-1*	P	Rigor, Coherence
EO c.	2-PS1-1*	P	Rigor, Coherence
NOS 1.	Obtaining, evaluating, and communicating information		
NOS 2.	–	–	
NOS 3.	Planning and carrying out investigations		
LS GLE 1.	1-LS3-1	F	
EO a.	1-LS3-1	F	
EO b.	1-LS3-1	F	
EO c.	1-LS3-1	F	
EO d.	N/A	N	Not found in NGSS
NOS 1.	Analyzing and interpreting data		
NOS 2.	Engaging in argument from evidence		
LS GLE 2.	1-LS1-1	F	
EO a.	N/A	N	Not found in NGSS
EO b.	1-LS1-1	F	
EO c.	1-LS1-1	F	
NOS 1.	Asking questions		
NOS 2.	–	–	
ES GLE 1.	N/A	N	ES GLE 1 does not align to any NGSS PEs
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS

EO e.	N/A	N	Not found in NGSS
EO f.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	–	–	
MISSING	1-PS4-1 1-PS4-2 1-PS4-3 1-PS4-4		CAS-S in 1 st grade does not address Waves and their Applications in Technologies for Information Transfer at all from NGSS
	1-LS1-2		CAS-S includes discussion of animal characteristics that solve problems in 1 st , but does not link them to possible human problems/solutions
	1-ESS1-2		CAS-S includes night/day temperature change as related to weather in 2 nd , but does not link amount of daylight to time of year

Second Grade

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	K-PS2-1	P	Coherence
EO a.	4-PS3-3	P	Coherence, Rigor
EO b.	K-PS2-2	P	Coherence
NOS 1.	–	–	
NOS 2.	–	–	
NOS 3.	Planning and carrying out investigations		
LS GLE 1.	K-ESS3-1* 2-LS2-1	P F	Coherence
EO a.	K-ESS3-1* 2-LS2-1	P F	Coherence
EO b.	K-ESS3-1* 2-LS2-1	P F	Coherence
EO c.	K-ESS3-1* 2-LS2-1	P F	Coherence
EO d.	N/A	N	Not found in NGSS

NOS 1.	–	–	
NOS 2.	Constructing explanations		
LS GLE 2.	4-LS1-1	P	LS GLE 2 combines several concepts found in NGSS
EO a.	K-ESS3-1*	P	Coherence
EO b.	N/A	N	
NOS 1.	–	–	
NOS 2.	Engaging in argument from evidence		
ES GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	K-PS3-1	P	Coherence, Rigor
EO c.	K-ESS3-2	P	Coherence
NOS 1.	Asking questions		
NOS 2.	Engaging in argument from evidence		
NOS 3.	Planning and carrying out investigations		
MISSING	2-PS1-1 2-PS1-2 2-PS1-4 2-LS2-2 2-LS4-1 2-ESS2-1 2-ESS2-2 2-ESS2-3		CAS-S in 2 nd grade does not address Matter and its Interactions; Biological Evolution: Unity and Diversity; Earth’s Place in the Universe; or Earth’s Systems from NGSS
	2-PS1-3		CAS-S discusses mixtures and solutions in 5 th , and how weight/mass remain constant, but not transformations
	2-ESS1-1		CAS-S does not include anything on timescale of Earth's processes

Third Grade

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	2-PS1-4*	P	Coherence
EO a.	2-PS1-4*	P	Coherence

EO b.	2-PS1-4*	P	Coherence
EO c.	N/A	N	Not found in NGSS
NOS 1.	Asking questions Planning and carrying out investigations		
NOS 2.	–	–	
NOS 3.	Engaging in argument from evidence		
LS GLE 1.	3-LS1-1	F	
EO a.	3-LS1-1	F	
EO b.	3-LS1-1	F	
EO c.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	–	–	
ES GLE 1.	N/A	N	ES GLE 1 does not align to any NGSS PEs
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	Developing and using models		
MISSING	3-LS2-1 3-LS3-1 3-LS4-1 3-ESS2-1		CAS-S in 3 rd grade does not address Motion and Stability: Forces and Interactions; Ecosystems: Interactions, Energy, and Dynamics; Heredity: Inheritance and Variation of Traits; Biological Evolution: Unity and Diversity; Earth’s Systems; or Earth and Human Activity from NGSS
	3-PS2-1		CAS-S discusses force and motion in 2 nd , but not equal and opposite forces
	3-PS2-2		CAS-S includes predicting motion in 2 nd , but does not

			mention patterns
	3-PS2-3 3-PS2-4		CAS-S does not discuss magnets as part of force and motion
	3-LS3-2		CAS-S does include adaptation and differences in environment in 1 st and 2 nd
	3-LS4-2		CAS-S discusses adaptation for survival in 1 st , but not that it provides a competitive advantage
	3-LS4-3		CAS-S does include adaptation and differences in environment in 1 st and 2 nd
	3-LS4-4		CAS-S does not include this type of long-range change over time
	3-ESS2-2		CAS-S does not mention different climate regions
	3-ESS3-1		CAS-S discusses severe weather in 2 nd , but not ways to mitigate it

Fourth Grade

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	4-PS3-2	F	
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Asking questions Planning and carrying out investigations		
NOS 2.	Developing and using models		

NOS 3.	Developing and using models		
NOS 4.	–	–	
LS GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	3-LS3-1	P	Coherence
EO d.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Engaging in argument from evidence		
LS GLE 2.	3-LS4-1	P	Coherence
EO a.	4-ESS1-1	F	
EO b.	4-ESS1-1	F	
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	–	–	
NOS 3.	–	–	
LS GLE 3.	5-LS2-1*	P	Rigor, Coherence
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	5-LS2-1*	P	Rigor, Coherence
EO e.	N/A	N	Not found in NGSS
EO f.	N/A	N	Not found in NGSS
NOS 1.	Developing and using models		
NOS 2.	Developing and using models		
ES GLE 1.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	MS-ESS1-1*	P	Coherence
EO d.	N/A	N	Not found in NGSS
NOS 1.	Developing and using models		
NOS 2.	Developing and using models		
MISSING			CAS-S in 4 th grade does not address Waves and their Applications in Technologies for Information Transfer; From Molecules to

			Organisms; Structures and Processes; Earth's Systems; or Earth and Human Activity from NGSS
	4-PS3-1		CAS-S discusses energy in 2 nd , and electrical energy in 4 th , but not the relationship between speed and energy
	4-PS3-4		CAS-S does not discuss transfer between different forms of energy
	4-ESS3-1		CAS-S briefly mentions that there are renewable energy sources in 4 th , but does not include any detail
	4-PS4-1 4-PS4-3		CAS-S does not discuss wave energy
	4-PS4-2		CAS-S does not discuss light reflection and sight
	4-LS1-2		CAS-S does not discuss information processing
	4-ESS1-1		CAS-S includes fossils in Life Science in 4 th , but not relationship to landscape and time
	4-ESS2-1		CAS-S mentions that earth materials can be broken down in 3 rd , but does not specifically talk about weathering/erosion
	4-ESS2-2		CAS-S discusses Earth's changing surface in 5 th , but not features or maps

Fifth Grade

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	5-PS1-2	F	
EO a.	5-PS1-3	F	
EO b.	N/A	N	Not found in NGSS
NOS 1.	Asking questions Planning and carrying out investigations Constructing explanations		
NOS 2.	Planning and carrying out investigations Obtaining, evaluating, and communicating information		
NOS 3.	Engaging in argument from evidence Obtaining, evaluating, and communicating information		
NOS 4.	Engaging in argument from evidence		
LS GLE 1.	4-LS1-1	P	Coherence
EO a.	4-LS1-1	P	Coherence
EO b.	4-LS1-1	P	Coherence
EO c.	N/A	N	Not found in NGSS
NOS 1.	Engaging in argument from evidence		
LS GLE 2.	MS-LS1-3*	P	Coherence
EO a.	N/A	N	Not found in NGSS
EO b.	MS-LS1-3*	P	Coherence
EO c.	MS-LS1-3*	P	Coherence
EO d.	N/A	N	Not found in NGSS
EO e.	N/A	N	Not found in NGSS
NOS 1.	Engaging in argument from evidence		
NOS 2.	Developing and using models		
ES GLE 1.	4-ESS3-1*	P	Coherence, Rigor
EO a.	4-ESS3-1*	P	Coherence, Rigor
EO b.	4-ESS3-1*	P	Coherence, Rigor
NOS 1.	Engaging in argument from evidence		
NOS 2.	–	–	
ES GLE 2.	4-ESS2-1*	P	Coherence, Rigor
EO a.	4-ESS2-1*	P	Coherence, Rigor
EO b.	4-ESS2-1*	P	Coherence, Rigor

NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Engaging in argument from evidence		
ES GLE 3.	3-ESS2-1	P	Rigor, Coherence
EO a.	3-ESS2-1	P	Rigor, Coherence
EO b.	3-ESS2-1	P	Rigor, Coherence
EO c.	3-ESS2-1	P	Rigor, Coherence
EO d.	3-ESS2-1	P	Rigor, Coherence
NOS 1.	Engaging in argument from evidence		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Engaging in argument from evidence		
MISSING			CAS-S in 5 th grade does not address Motion and Stability: Forces and Interactions; Energy; From Molecules to Organisms: Structures and Processes; Ecosystems: Interactions, Energy, and Dynamics; Earth's Place in the Universe; Earth's Systems; or Earth and Human Activity from NGSS
	5-PS1-1		CAS-S introduces matter in 3 rd but not particles
	5-PS1-4		CAS-S does not discuss creating new substances in the section on mixtures in 5 th
	5-PS3-1		CAS-S does not discuss energy chain from sun through animals
	5-LS1-1		CAS-S discusses

			basic needs and survival in PK and 2 nd , but does not explicitly connect plant growth to air and water.
	5-LS2-1		CAS-S discusses ecosystems in 4 th , but not individual roles and matter
	5-ESS2-1		CAS-S does not discuss these systems
	5-ESS2-2		CAS-S does not discuss the distribution of water on Earth
	5-ESS3-1		CAS-S does not discuss conservation
	5-PS2-1		CAS-S does not discuss gravity
	5-ESS1-1		CAS-S does not discuss solar system distance and brightness
	5-ESS1-2		CAS-S does not discuss light and seasonality

Middle School – Physical Science

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS 6-GLE 1.	5-PS1-1	P	Coherence
EO a.	5-PS1-1	P	Coherence
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Obtaining, evaluating, and communicating information		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Developing and using models		
NOS 4.	Obtaining, evaluating,		

	and communicating information		
PS 6-GLE 2.	MS-PS1-1	F	
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	MS-PS1-1	F	
NOS 1.	Developing and using models		
NOS 2.	Obtaining, evaluating, and communicating information		
PS 6-GLE 3.	MS-PS1-4*	P	Depth & Breadth (Thermal energy)
EO a.	MS-PS1-4	F	
EO b.	MS-PS1-4	F	
NOS 1.	Developing and using models		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Obtaining, evaluating, and communicating information		
PS 6-GLE 4.	N/A	N	Not found in NGSS
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	MS-PS1-2*	P	Depth & Breadth (Chem rxn)
EO e.	N/A	N	Not found in NGSS
NOS 1.	Planning and carrying out investigations Analyzing and interpreting data Using mathematics, information and computer technology, and computational thinking Constructing explanations Engaging in argument from evidence		
NOS 2.	Asking questions Planning and carrying out investigations		
NOS 3.	Planning and carrying out investigations		

PS 7-GLE 1.	5-PS1-3* 5-PS1-4* MS-PS1-2*	P P P	Coherence, Rigor Coherence, Depth & Breadth (New subst) Depth & Breadth (Chem rxn)
EO a.	MS-PS1-2*	P	Depth & Breadth (Chem rxn)
EO b.	MS-PS1-2*	P	Depth & Breadth (Chem rxn)
NOS 1.	Asking questions Planning and carrying out investigations		
NOS 2.	Engaging in argument from evidence		
NOS 3.	Obtaining, evaluating, and communicating information		
NOS 4.	Planning and carrying out investigations Analyzing and interpreting data		
PS 8-GLE 1.	MS-PS2-2*	P	Depth & Breadth (Mass)
EO a.	MS-PS2-2*	P	Depth & Breadth (Mass)
EO b.	MS-PS2-2*	P	Depth & Breadth (Mass)
EO c.	MS-PS2-2*	P	Depth & Breadth (Mass)
NOS 1.	Obtaining, evaluating, and communicating information		
NOS 2.	Obtaining, evaluating, and communicating information		
PS 8-GLE 2.	MS-PS3-2* MS-PS3-3* MS-PS3-5*	P P P	Depth & Breadth (Potential energy) Depth & Breadth (Thermal energy) Depth & Breadth (Thermal energy)
EO a.	MS-PS3-2* MS-PS3-3* MS-PS3-5*	P P P	Depth & Breadth (Potential energy) Depth & Breadth (Thermal energy) Depth & Breadth (Thermal energy)

EO b.	MS-PS3-2* MS-PS3-3* MS-PS3-5*	P P P	Depth & Breadth (Potential energy) Depth & Breadth (Thermal energy) Depth & Breadth (Thermal energy)
EO c.	MS-PS3-2* MS-PS3-3* MS-PS3-5*	P P P	Depth & Breadth (Potential energy) Depth & Breadth (Thermal energy) Depth & Breadth (Thermal energy)
NOS 1.	Engaging in argument from evidence Obtaining, evaluating, and communicating information		
NOS 2.	Engaging in argument from evidence Obtaining, evaluating, and communicating information		
NOS 3.	Asking questions Planning and carrying out investigations		
PS 8-GLE 3.	5-PS1-2 MS-PS1-2*	F P	Coherence Rigor, Depth & Breadth (Chem rxn)
EO a.	MS-PS1-2*	P	Rigor, Depth & Breadth (Chem rxn)
EO b.	MS-PS1-2*	P	Rigor, Depth & Breadth (Chem rxn)
EO c.	5-PS1-2 MS-PS1-2*	F P	Coherence Rigor, Depth & Breadth (Chem rxn)
EO d.	5-PS1-2 MS-PS1-2*	F P	Coherence Rigor, Depth & Breadth (Chem rxn)
EO e.	MS-PS1-2*	P	Rigor, Depth & Breadth (Chem rxn)
NOS 1.	Analyzing and interpreting data		
NOS 2.	Constructing explanations Engaging in argument from evidence		
PS 8-GLE 4.	MS-PS4-1*	P	Rigor

	MS-PS4-2*	P	Depth & Breadth (Materials)
EO a.	N/A	N	Not found in NGSS
EO b.	MS-PS4-2	F	
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Developing and using models		
NOS 2.	–	–	
NOS 3.	Planning and carrying out investigations Analyzing and interpreting data		
MISSING	MS-PS1-3		CAS-S does not discuss synthetic materials
	MS-PS1-5		CAS-S does not discuss conservation of atoms during a chemical reaction
	MS-PS1-6		CAS-S does not discuss the design process or thermal energy change in chemical reactions
	MS-PS2-1		CAS-S does not discuss collisions
	MS-PS2-3		CAS-S does not discuss electric or magnetic forces
	MS-PS2-4		CAS-S does not discuss gravitational forces in middle school
	MS-PS2-5		CAS-S does not discuss fields
	MS-PS3-4		CAS-S discusses temperature and particle motion, but does not include kinetic energy, mass, energy, etc

Middle School – Life Science

Content Area	Comparable NGSS	Alignment Rating	Comments
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Standard	Standard(s)		
LS 6-GLE 1.	MS-LS2-1 MS-LS2-4 MS-LS1-5	F F F	
EO a.	MS-LS2-4	F	
EO b.	N/A	N	Not found in NGSS
EO c.	MS-LS2-1 MS-LS2-4	F F	
EO d.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Developing and using models		
LS 6-GLE 2.	MS-LS1-6*	P	Depth & Breadth (Photosynth)
	MS-LS2-3	F	
EO a.	MS-LS2-3	F	
EO b.	MS-LS2-3	F	
EO c.	MS-LS2-3	F	
NOS 1.	–	–	
NOS 2.	–	–	
NOS 3.	Developing and using models		
LS 7-GLE 1.	MS-LS4-4	F	Depth & Breadth (Behavior)
	MS-LS1-4*	P	
EO a.	MS-LS4-4	F	
EO b.	MS-LS4-4	F	
EO c.	N/A	N	Not found in NGSS
EO d.	MS-LS4-4	F	
NOS 1.	Developing and using models		
NOS 2.	Obtaining, evaluating, and communicating information		
LS 7-GLE 2.	MS-LS1-1 MS-LS1-3	F F	
EO a.	MS-LS1-3	F	
EO b.	MS-LS1-3	F	
EO c.	MS-LS1-3	F	
NOS 1.	Developing and using models		
LS 7-GLE 3.	MS-LS1-1 MS-LS1-2	F F	

EO a.	MS-LS1-2 MS-LS1-3	F F	
EO b.	MS-LS1-2 MS-LS1-3	F F	
EO c.	MS-LS4-4	F	
EO d.	MS-LS4-4	F	
NOS 1.	Obtaining, evaluating, and communicating information		
LS 7-GLE 4.	MS-LS1-6 MS-LS1-7	F F	
EO a.	MS-LS1-6 MS-LS1-7	F F	
EO b.	MS-LS1-6 MS-LS1-7	F F	
EO c.	MS-LS1-6 MS-LS1-7	F F	
NOS 1.	Asking questions		
NOS 2.	Planning and carrying out investigations		
NOS 3.	Constructing explanations Engaging in argument from evidence		
LS 7-GLE 5.	MS-LS4-1* MS-LS4-2	P F	Depth & Breadth (Fossils)
EO a.	MS-LS4-1* MS-LS4-2	P F	Depth & Breadth (Fossils)
EO b.	MS-LS4-1*	P	Depth & Breadth (Fossils)
EO c.	N/A	N	Not found in NGSS
EO d.	MS-LS4-1*	P	Depth & Breadth (Fossils)
NOS 1.	Engaging in argument from evidence		
NOS 2.	Obtaining, evaluating, and communicating information		
LS 8-GLE 1.	N/A	N	PS 8-GLE 1 does not align to any NGSS middle school PEs
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS

EO d.	N/A	N	Not found in NGSS
EO e.	N/A	N	Not found in NGSS
NOS 1.	Obtaining, evaluating, and communicating information		
LS 8-GLE 2.	MS-LS3-2*	P	Rigor
EO a.	MS-LS3-2*	P	Rigor
EO b.	MS-LS3-2*	P	Rigor
EO c.	MS-LS3-2*	P	Rigor
EO d.	MS-LS3-2*	P	Rigor
EO e.	MS-LS3-2*	P	Rigor
NOS 1.	Using mathematics, information and computer technology, and computational thinking		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Developing and using models		
MISSING	MS-LS1-8		CAS-S does not discuss sensory receptors and the brain
	MS-LS2-2		CAS-S does not discuss interactions among organisms across multiple ecosystems
	MS-LS2-5		CAS-S does not discuss biodiversity and ecosystem services
	MS-LS3-1		CAS-S does not discuss effects of mutations in middle school
	MS-LS4-3		CAS-S does not discuss embryology and evolution in middle school
	MS-LS4-5		CAS-S does not discuss humans influence of the Inheritance of traits

	MS-LS4-6		CAS-S does not discuss natural selection and the change in traits over time
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Middle School – Earth Science

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
ES 6-GLE 1.	MS-ESS2-1*	P	Rigor
	MS-ESS2-2	F	
EO a.	MS-ESS2-2	F	
EO b.	MS-ESS2-2	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
NOS 1.	Planning and carrying out investigations Analyzing and interpreting data		
NOS 2.	Developing and using models		
ES 6-GLE 2.	MS-ESS2-4	F	
EO a.	MS-ESS2-4	F	
EO b.	MS-ESS2-4	F	
EO c.	MS-ESS2-4	F	
EO d.	MS-ESS3-3*	P	Depth & Breadth (Monitor/minimize)
EO e.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	Developing and using models		
ES 6-GLE 3.	MS-ESS3-1*	P	Rigor
	MS-ESS3-4*	P	Rigor
EO a.	MS-ESS3-1*	P	Rigor
	MS-ESS3-4*	P	Rigor
EO b.	MS-ESS3-1*	P	Rigor
	MS-ESS3-4*	P	Rigor
EO c.	MS-ESS3-1*	P	Rigor
	MS-ESS3-4*	P	Rigor
EO d.	N/A	N	
NOS 1.	Obtaining, evaluating, and communicating information		
ES 7-GLE 1.	MS-ESS2-2	F	
	MS-ESS2-3	F	
EO a.	MS-ESS2-2	F	
	MS-ESS2-3	F	

EO b.	MS-ESS2-2 MS-ESS2-3	F F	
EO c.	N/A	N	Not found in NGSS
EO d.	MS-ESS2-2 MS-ESS2-3	F F	
NOS 1.	Developing and using models		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Obtaining, evaluating, and communicating information		
ES 7-GLE 2.	MS-ESS1-4	F	
EO a.	N/A	N	Not found in NGSS
EO b.	MS-ESS1-4	F	
EO c.	MS-ESS1-4	F	
EO d.	MS-ESS1-4	F	
NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
ES 8-GLE 1.	MS-ESS2-5	F	
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	MS-ESS2-5	F	
NOS 1.	Developing and using models		
NOS 2.	Obtaining, evaluating, and communicating information		
ES 8-GLE 2.	MS-ESS2-6	F	
EO a.	MS-ESS2-6	F	
EO b.	MS-ESS2-6	F	
EO c.	MS-ESS2-6	F	
NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
ES 8-GLE 3.	MS-ESS1-2* MS-ESS1-3*	P P	Rigor Rigor
EO a.	MS-ESS1-2* MS-ESS1-3*	P P	Rigor Rigor
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS

EO e.	N/A	N	Not found in NGSS
EO f.	N/A	N	Not found in NGSS
NOS 1.	Obtaining, evaluating, and communicating information		
NOS 2.	Obtaining, evaluating, and communicating information		
ES 8-GLE 4.	MS-ESS1-1	F	
EO a.	MS-ESS1-1	F	
EO b.	MS-ESS1-1	F	
EO c.	MS-ESS1-1	F	
NOS 1.	Obtaining, evaluating, and communicating information		
NOS 2.	Obtaining, evaluating, and communicating information		
MISSING	MS-ESS3-2		CAS-S does not discuss future catastrophic events and mitigation technologies
	MS-ESS3-5		CAS-S does not discuss the recent rise in global temperatures

High School – Physical Science

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
PS GLE 1.	HS-PS2-1	F	
EO a.	HS-PS2-1	F	
EO b.	HS-PS2-1	F	
EO c.	HS-PS2-3	F	
EO d.	HS-PS2-4*	P	Depth & Breadth (Electrostatic)
EO e.	N/A	N	Not found in NGSS
NOS 1.	Planning and Carrying Out Investigations		
NOS 2.	Constructing Explanations		
NOS 3.	–	–	
NOS 4.	Using Mathematics and Computational Thinking		
PS GLE 2.	N/A	N	Not found in NGSS

EO a.	N/A	N	Not found in NGSS
EO b.	HS-PS1-3	F	
EO c.	HS-PS1-1	F	
EO d.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Asking questions Planning and carrying out investigations		
PS GLE 3.	HS-PS1-7	P	Depth & Breadth (Atoms)
EO a.	HS-PS1-2 HS-PS1-8	F F	
EO b.	HS-PS1-2	F	
EO c.	N/A	N	Not found in NGSS
EO d.	HS-PS1-7	F	
NOS 1.	Developing and using models		
NOS 2.	Developing and using models		
NOS 3.	Planning and carrying out investigations		
NOS 4.	Engaging in argument from evidence Obtaining, evaluating, and communicating information		
PS GLE 4.	N/A	N	Not found in NGSS
EO a.	HS-PS1-4	F	
EO b.	HS-PS1-3	F	
EO c.	N/A	N	Not found in NGSS
EO d.	HS-PS1-2	F	
EO e.	HS-PS1-2	F	
NOS 1.	–	–	
NOS 2.	Analyzing and interpreting data		
PS GLE 5.	HS-PS3-1* HS-PS3-3*	P P	Rigor Rigor
EO a.	HS-PS3-2	F	
EO b.	HS-PS3-4	F	
EO c.	HS-PS3-2	F	
EO d.	HS-PS3-4	F	
NOS 1.	Engaging in argument from evidence		
NOS 2.	Obtaining, evaluating,		

	and communicating information		
PS GLE 6.	HS-PS3-1* HS-PS3-2*	P P	Rigor Rigor
EO a.	HS-PS3-1	F	
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	HS-PS3-4	F	
EO e.	HS-PS3-1	F	
NOS 1.	Engaging in argument from evidence		
NOS 2.	Asking questions Planning and carrying out investigations		
NOS 3.	Engaging in argument from evidence Obtaining, evaluating, and communicating information		
MISSING	HS-PS1-5		CAS-S does not discuss particle motion and reaction rates
	HS-PS1-6		CAS-S does not discuss chemical equilibrium
	HS-PS1-7		CAS-S does not discuss conservation of atoms during a chemical reaction
	HS-PS1-8		CAS-S does not discuss qualitative changes in the composition of the nucleus of the atom
	HS-PS2-2		CAS-S does not discuss conservation of momentum
	HS-PS2-5		CAS-S does not discuss electric currents and magnetic fields
	HS-PS2-6		CAS-S does not discuss molecular-level structures and

			designed materials
	HS-PS3-5		CAS-S does not discuss objects interacting through electric or magnetic fields
	HS-PS4-1 HS-PS4-2 HS-PS4-3 HS-PS4-4 HS-PS4-5		CAS-S in high school does not address Waves and Their Applications in Technologies for Information Transfer from NGSS

High School – Life Science

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
LS GLE 1.	HS-LS2-4	F	
EO a.	HS-LS2-5*	P	Rigor
EO b.	N/A	N	Not found in NGSS
EO c.	HS-LS2-1 HS-LS2-2 HS-LS2-7	F F F	
EO d.	HS-LS2-4	F	
EO e.	N/A	N	Not found in NGSS
EO f.	N/A	N	Not found in NGSS
EO g.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Engaging in argument from evidence		
NOS 3.	Planning and carrying out investigations		
LS GLE 2.	HS-LS2-1 HS-LS2-2	F F	
EO a.	HS-LS2-7 HS-LS2-8	F F	
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Engaging in argument from evidence		
LS GLE 3.	HS-LS1-6*	P	Rigor

	HS-LS1-7*	P	Rigor
EO a.	HS-LS1-6	F	
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
EO e.	N/A	N	Not found in NGSS
NOS 1.	Engaging in argument from evidence		
LS GLE 4.	HS-LS1-5 HS-LS1-7	F F	
EO a.	N/A	N	Not found in NGSS
EO b.	HS-LS2-4*	P	Depth & Breadth (Quantitative)
EO c.	HS-LS2-5*	P	Depth & Breadth (Energy)
NOS 1.	–	–	
NOS 2.	Obtaining, evaluating, and communicating information		
LS GLE 5.	N/A	N	LS GLE 5 does not align to any NGSS PEs
EO a.	N/A	N	Not found in NGSS
EO b.	N/A	N	Not found in NGSS
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	–	–	
LS GLE 6.	HS-LS1-2	F	
EO a.	HS-LS1-3	F	
EO b.	HS-LS1-2	F	
EO c.	N/A	N	Not found in NGSS
EO d.	HS-LS1-3	F	
NOS 1.	Obtaining, evaluating, and communicating information		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	–	–	
LS GLE 7.	HS-LS1-3	F	

EO a.	HS-LS1-1	F	
EO b.	HS-LS1-1* HS-LS1-4*	P P	Rigor Rigor
EO c.	HS-LS1-7	F	
EO d.	HS-LS3-2	F	
EO e.	HS-LS3-1	F	
NOS 1.	–	–	
NOS 2.	–	–	
LS GLE 8.	HS-LS1-4	F	
EO a.	HS-LS1-4	F	
EO b.	N/A	N	Not found in NGSS
EO c.	HS-LS1-3	F	
EO d.	HS-LS2-3	F	
NOS 1.	Engaging in argument from evidence		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Engaging in argument from evidence		
LS GLE 9.	HS-LS4-3* HS-LS4-4*	P P	Rigor Rigor
EO a.	HS-LS4-1	F	
EO b.	HS-LS4-1	F	
EO c.	HS-LS4-2* HS-LS4-3* HS-LS4-5*	P P P	Rigor Rigor Rigor
EO d.	HS-LS4-2* HS-LS4-3*	P P	Rigor Rigor
EO e.	HS-LS4-2* HS-LS4-3*	P P	Rigor Rigor
NOS 1.	–	–	
NOS 2.	Obtaining, evaluating, and communicating information		
MISSING	HS-LS2-3		CAS-S does not discuss energy in aerobic and anaerobic conditions
	HS-LS2-6		CAS-S does not discuss changing conditions and ecosystems
	HS-LS3-3		CAS-S does not

			discuss probability of expressed traits in a population
	HS-LS4-6		CAS-S does not discuss impacts of human activity on biodiversity

High School – Earth Science

Content Area Standard	Comparable NGSS Standard(s)	Alignment Rating	Comments
ES GLE 1.	HS-ESS1-2* HS-ESS1-6	P F	Rigor
EO a.	HS-ESS1-6	F	
EO b.	N/A	N	Not found in NGSS
EO c.	HS-ESS1-1* HS-ESS1-2*	P P	Rigor Rigor
EO d.	N/A	N	Not found in NGSS
EO e.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Obtaining, evaluating, and communicating information		
ES GLE 2.	HS-ESS1-1* HS-ESS1-6*	P P	Rigor Rigor
EO a.	HS-ESS1-1* HS-ESS1-6*	P P	Rigor Rigor
EO b.	HS-ESS1-1* HS-ESS1-6*	P P	Rigor Rigor
EO c.	HS-ESS1-1* HS-ESS1-6*	P P	Rigor Rigor
EO d.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Obtaining, evaluating, and communicating information		
ES GLE 3.	HS-ESS2-1	F	
EO a.	HS-ESS2-3	F	
EO b.	HS-ESS2-3	F	
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Asking questions		

NOS 3.	Obtaining, evaluating, and communicating information		
NOS 4.	–	–	
ES GLE 4.	HS-ESS2-4	F	
EO a.	HS-ESS2-2	F	
EO b.	HS-ESS2-2	F	
EO c.	HS-ESS2-4	F	
EO d.	HS-ESS2-7	F	
EO e.	HS-ESS2-5	F	
EO f.	HS-ESS3-5	F	
NOS 1.	Developing and using models		
NOS 2.	–	–	
NOS 3.	Obtaining, evaluating, and communicating information		
ES GLE 5.	HS-ESS3-2* HS-ESS3-4*	P P	Rigor Rigor
EO a.	HS-ESS3-2	F	
EO b.	N/A	N	Not found in NGSS
EO c.	HS-ESS3-4	F	
EO d.	N/A	N	Not found in NGSS
NOS 1.	–	–	
NOS 2.	Obtaining, evaluating, and communicating information		
LS GLE 6.	HS-ESS2-5	F	
EO a.	HS-ESS2-5	F	
EO b.	HS-ESS2-6	F	
EO c.	N/A	N	Not found in NGSS
EO d.	N/A	N	Not found in NGSS
NOS 1.	Asking questions		
NOS 2.	Obtaining, evaluating, and communicating information		
NOS 3.	Analyzing and interpreting data Obtaining, evaluating, and communicating information		
LS GLE 7.	HS-ESS3-1	F	
EO a.	HS-ESS3-1	F	

EO b.	HS-ESS3-1	F	
EO c.	HS-ESS3-6	F	
NOS 1.	Obtaining, evaluating, and communicating information		
MISSING	HS-ESS1-3		CAS-S does not discuss how stars produce elements
	HS-ESS1-4		CAS-S does not discuss the motion of orbiting objects in the solar system
	HS-ESS1-5		CAS-S does not discuss the ages of crustal rocks
	HS-ESS3-3		CAS-S does not discuss sustainability of human populations and biodiversity.