NGSS Matrix of Standards by Discipline and Grade Level

		Life Science	Earth & Space Science	Physical Science	Engineering & Technology
Elementary School	K	K.OTE Organisms and Their Environments	K.WEA Weather	K.SPM Structure and Properties of Matter	*In grades K-5, the core ideas for Engineering, Technology, and the Application of Science are included in the Life Science, Earth & Space Science, and Physical Science standards*
	1	1.SF Structure and Function	1.PC Patterns and Cycles	1.LS Light and Sound	
	2	2.IOS Interdependence of Organisms and their Surroundings	2.ECS Earth's Changing Surface	2.SPM Structure, Properties, and Interactions of Matter 2.PP Pushes and Pulls	
	3	3.EIO Environmental Impacts on Organisms 3.SFS Structure, Function, and Stimuli	3.WCI Weather, Climate, and Impacts	3.IF Interactions of Forces	
	4	4.LCT Life Cycles and Traits	4.PSE Processes that Shape the Earth	4.E Energy 4.WAV Waves	
	5	5.MEE Matter and Energy in Ecosystems	5.ESI Earth Systems and Their Interactions 5.SSS Stars and the Solar System	5.SPM Structure, Properties, and Interactions of Matter	
Middle School		MS.LS-SFIP Structure, Function, and Information Processing MS.LS-GDRO Growth, Development, and Reproduction of Organisms MS.LS-MEOE Matter and Energy in Organisms and Ecosystems MS.LS-IRE Interdependent Relationships in Ecosystems MS.LS-NSA Natural Selection and Adaptations	MS.ESS-SS Space Systems MS.ESS-HE History of Earth MS.ESS-EIP Earth's Interior Processes MS.ESS-ESP Earth's Surface Processes MS.ESS-WC Weather and Climate MS.ESS-HI Human Impacts	MS.PS-SPM Structure and Properties of Matter MS.PS-CR Chemical Reactions MS.PS-FM Forces and Motion MS.PS-IF Interactions of Forces MS.PS-E Energy MS.PS-WER Waves and Electromagnetic Radiation	MS.ETS-ED Engineering Design MS.ETS-ETSS Links Among Engineering, Technology, Science and Society
High School		HS.LS-SFIP Structure, Function, and Information Processing HS.LS-MEOE Matter and Energy in Organisms and Ecosystems HS.LS-IRE Interdependent Relationships in Ecosystems HS.LS-NSE Natural Selection and Evolution HS.LS-IVT Inheritance and Variation of Traits	HS.ESS-SS Space Systems HS.ESS-HE History of Earth HS.ESS-ES Earth's Systems HS.ESS-CC Climate Change HS.ESS-HS Human Sustainability	HS.PS-SPM Structure and Properties of Matter HS.PS-CR Chemical Reactions HS.PS-NP Nuclear Processes HS.PS-FM Forces and Motion HS.PS-IF Interactions of Forces HS.PS-E Energy HS.PS-FE Forces and Energy HS.PS-W Waves HS.PS-ER Electromagnetic Radiation	HS.ETS-ED Engineering Design HS.ETS-ETSS Links Among Engineering, Technology, Science and Society

Code for Topic Name

System Architecture

Assessable Component

MS.ESS-SS Space Systems

Students who demonstrate understanding can:

a. **Construct explanations for the occurrences of day/night cycles, seasons, tides, eclipses, and lunar phases based on patterns of the observed motions of celestial bodies.** [Assessment Boundary: Kepler's Laws of orbital motion are not used as the basis for evidence at this level.]

b. **Obtain, evaluate, and communicat… …ansion and scale of the universe to support the Big Bang theory.** [Clarify… …qualitative discussions of the cosmic background radiation, the motions of galaxies away from each… …ydrogen and helium in the universe.]

c. **Construct and use models to descr… …h respect to the size and structure of the solar system, Milky Way Galaxy, and universe.** [Assessment Boundary: Mathematical models are not expected; use AU for Solar System scale; use light years for universal scale.]

d. **Use models to support explanations of the composition, structure, and formation of the solar system from a disk of dust and gas drawn together by gravity.**

Lettered Performance Expectations

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Foundation Boxes

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to explain, explore, and predict more abstract phenomena and design systems.

- Use and/or construct models to predict, explain, and/or collect data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs. (c),(d)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles,…

- Base… …today as the… …e to do so in t…

Obtaining… …ating Informati…

Obtaining, evaluating, and communicating information in 6–8 builds on 3–5 and progresses to evaluate the merit and validity of ideas and methods.

- Read critically using scientific knowledge and reasoning to evaluate data, hypotheses, conclusions, and competing information. (b)

Lowercase letters designate which of the performance expectations use this practice

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (a)
- The universe began with a period of extreme and rapid expansion known as the Big Bang. Nearly all observable matter in the universe is hydrogen or heliu… …ich formed in the first minutes after the Big Ban… (b)
- Earth… …s solar system are part of the Milky Way *galaxy, which is one of many galaxies in the universe.* (c)

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids t… …sun by its gravitation… …ears to have forme… …drawn together b…
- This model… …tides, eclipses of… …apparent motions of… …the stars. (a)
- Earth's spi… …short-term) but tilted relative to its orbit around the sun; the differential intensity of sunlight on different areas of Earth over the year is a result of that tilt, as are the seasons that result. (a)

PS2.C: Stability and Instability in Physical Systems

- A system can be changing but have a stable repeating cycle of changes; such observed regular patterns allow predictions about the system's future (e.g., Earth orbiting the sun). (a)

Lowercase letters designate which of the performance expectations incorporate this disciplinary core idea

Crosscutting Concepts

Patterns

Macroscopic patterns are related to the nature of microscopic and atomic-level structure. Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. Patterns can be used to identify cause and effect relationships. Graphs and charts can be… …*to identify patterns in data.* (a),(d)

Scale, Proportion, and Quantity

Time, space, and energy phenomena can be observed at various scales using models to study systems that are… …obse… …desi… …scal…

Prop… …spee… …trav… …diffe… …information about the magnitude of properties and processes. Scientific relationships can be represented through the use of algebraic expressions and equations. (c)

Lowercase letters designate which of the performance expectations incorporate this crosscutting concept

Connections Boxes

Connections to other DCIs in this grade-level: **MS.LS-GDRO, MS.PS-FM, MS.PS-IF, MS.PS-E**

Articulation to DCIs across grade-levels: **1.PCS, 5.SSS, HS.ESS-SS**

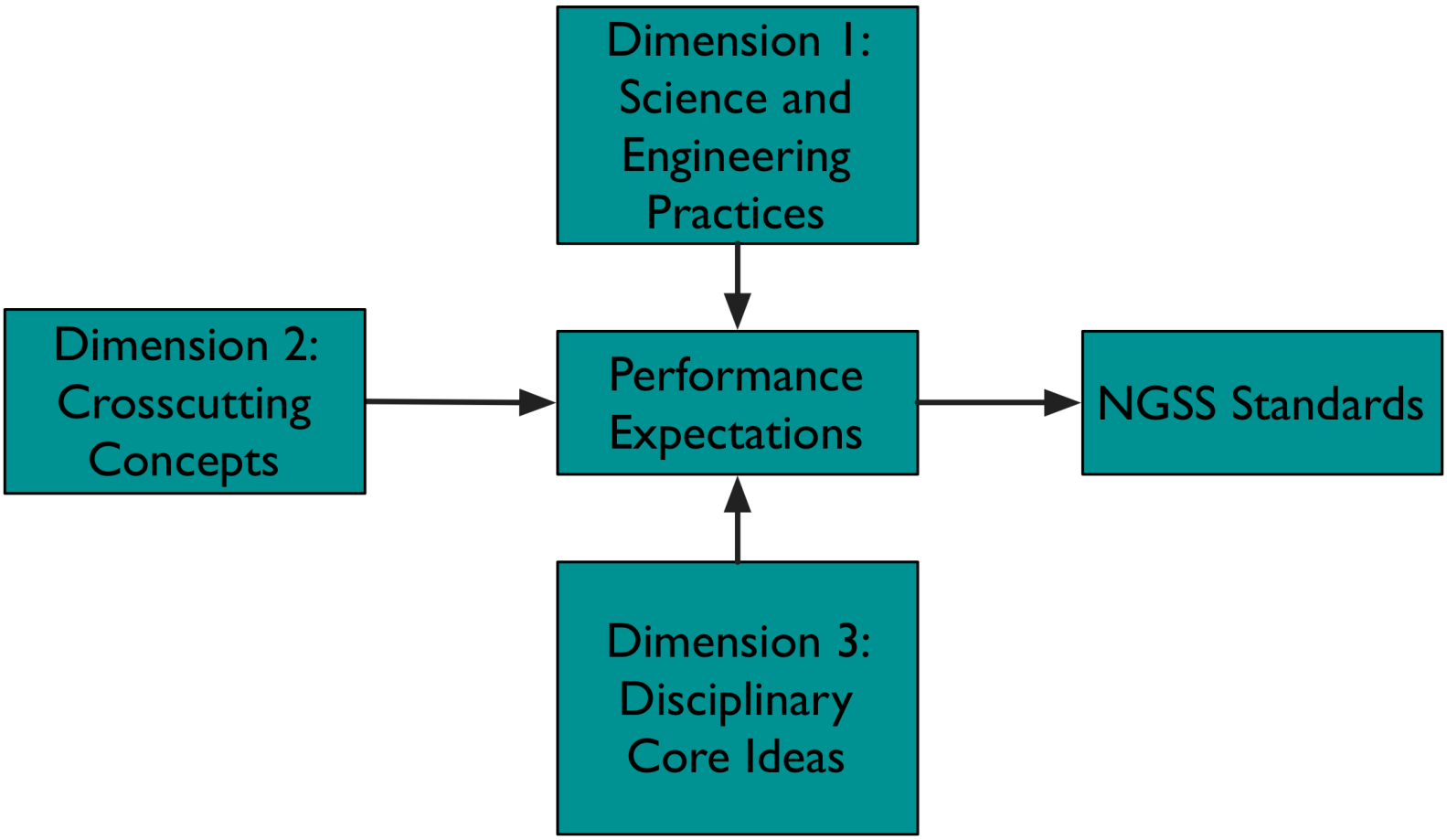
Common Core State Standards Connections: [Note: these connections will be made more explicit and complete in future draft releases]

ELA –

W.6.1 Write arguments to support claims with clear reasons and relevant evidence.
W.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.7.1 Write arguments to support claims with clear reasons and relevant evidence.
W.7.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.
W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Mathematics –

MP.4 Model with mathematics
8.F Use functions to model relationships between quantities


Dimension 1: Science and Engineering Practices
Dimension 2: Crosscutting Concepts
Performance Expectations
NGSS Standards
Dimension 3: Disciplinary Core Ideas

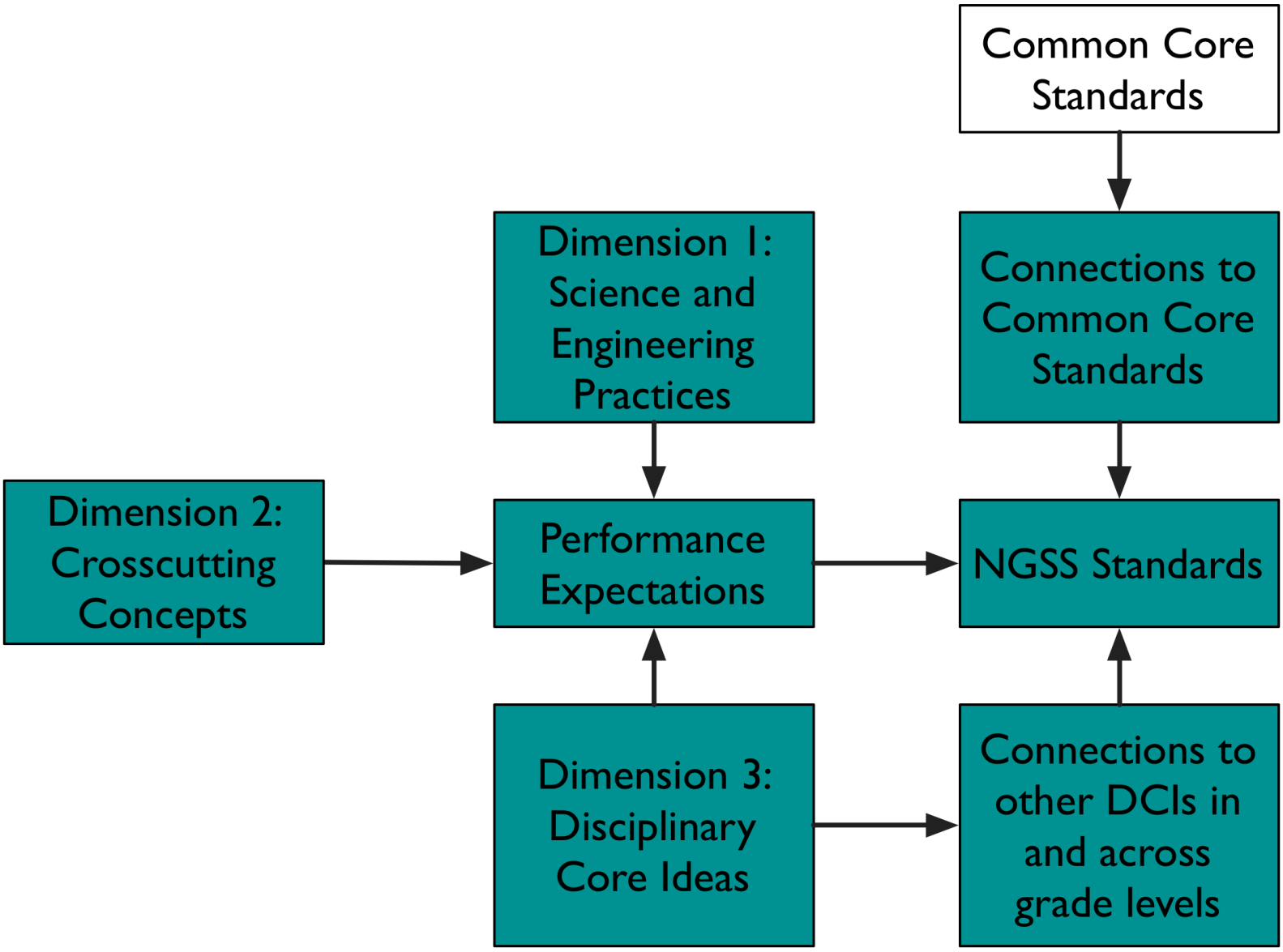
Next Generation Science Standards - Framework and Performance Expectations - May 2012

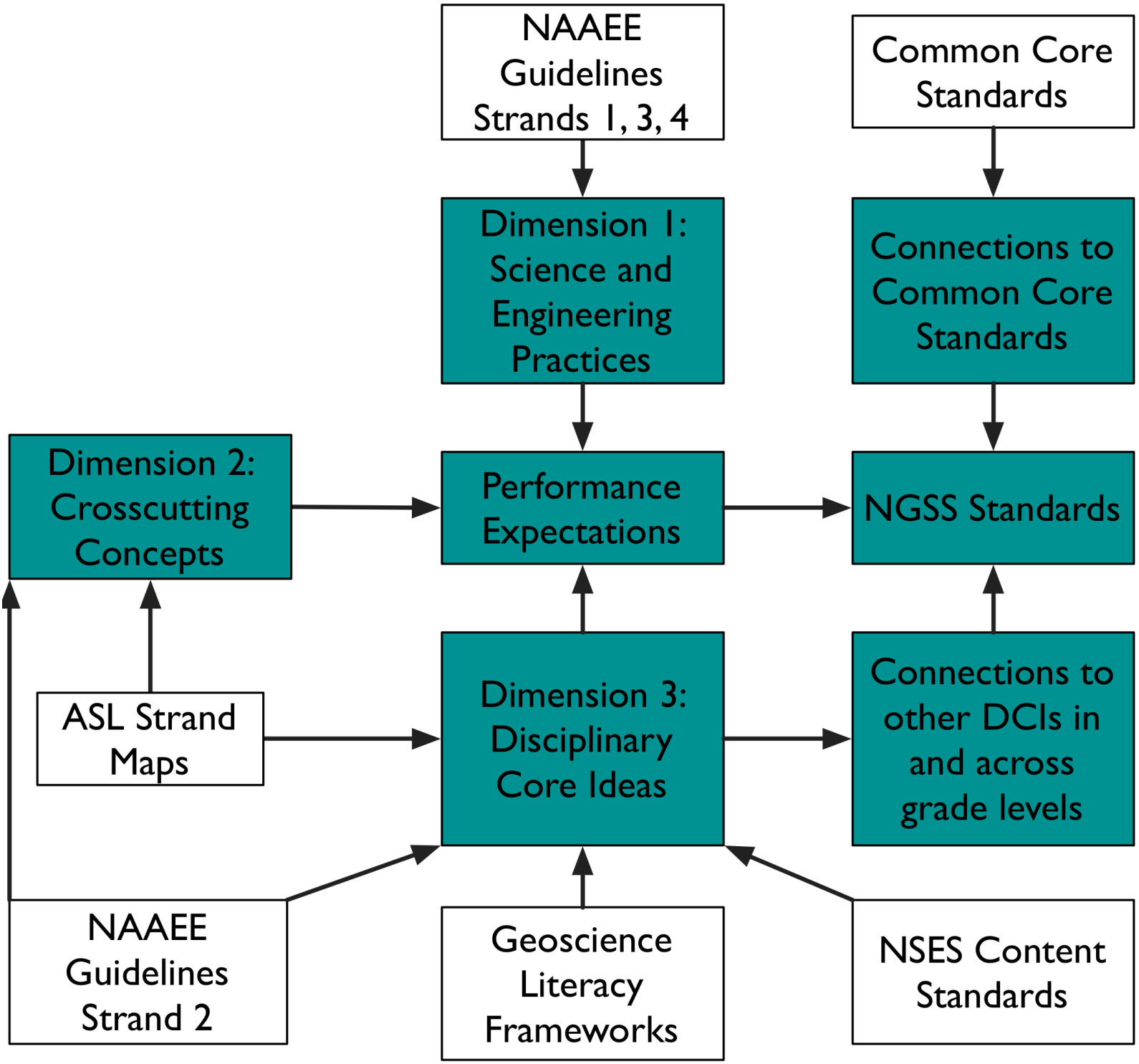
Dimension 1: Science and Engineering Practices (SEPs)
SEP1. Asking questions (for science) and defining problems (for engineering)
SEP2. Developing and using models
SEP3. Planning and carrying out investigations
SEP4. Analyzing and interpreting data
SEP5. Using mathematics and computational thinking
SEP6. Constructing explanations (for science) and designing solutions (for engineering)
SEP7. Engaging in argument from evidence
SEP8. Obtaining, evaluating, and communicating information

Dimension 2: Crosscutting Concepts (CCs)
CC1. Patterns
CC2. Cause and Effect: Mechanism and Prediction
CC3. Scale, Proportion, and Quantity
CC4. Systems and System Models
CC5. Energy and Matter: Flows, Cycles, and Conservation
CC6. Structure and Function
CC7. Stability and Change

Performance Expectations

Dimension 3: Disciplinary Core Ideas (DCI)
Physical Sciences
PS 1: Matter and its interactions PS 2: Motion and stability: Forces and interactions PS 3: Energy PS 4: Waves and their applications in technologies for information transfer
Life Sciences
LS 1: From molecules to organisms: Structures and processes LS 2: Ecosystems: Interactions, energy, and dynamics LS 3: Heredity: Inheritance and variation of traits LS 4: Biological Evolution: Unity and diversity
Earth and Space Sciences
ESS 1: Earth's place in the universe ESS 2: Earth's systems ESS 3: Earth and human activity
Engineering, Technology, and the Applications of Science
ETS 1: Engineering design ETS 2: Links among engineering, technology, science, and society


Common Core Standards
Dimension 1: Science and Engineering Practices
Connections to Common Core Standards
Dimension 2: Crosscutting Concepts
Performance Expectations
NGSS Standards
Dimension 3: Disciplinary Core Ideas
Connections to other DCIs in and across grade levels


NAAEE Guidelines Strands 1, 3, 4
Common Core Standards
Dimension 1: Science and Engineering Practices
Connections to Common Core Standards
Dimension 2: Crosscutting Concepts
Performance Expectations
NGSS Standards
ASL Strand Maps
Dimension 3: Disciplinary Core Ideas
Connections to other DCIs in and across grade levels
NAAEE Guidelines Strand 2
Geoscience Literacy Frameworks
NSES Content Standards