

Alignment of Ocean Literacy Framework to the NGSS for Grades K-2

Standards by Disciplinary Core Idea (DCI)	OLP 1	OLP 2	OLP 3	OLP 4	OLP 5	OLP 6	OLP 7	Specific DCI & Performance Expectations (PE)
K-2-ETS1 Engineering Design						3	3	ETS1.A, B, C
K-ESS2 Earth's Systems			4			2		ESS2.D, E; ESS3.C
K-ESS3 Earth and Human Activity				2	2	1	2	ESS3.A, B, C
K-LS1 From Molecules to Organisms: Structures and Processes					3	3		LS1.C
K-PS2 Motion and Stability: Forces and Interactions		3						PS2.B
K-PS3 Energy			4					PS3.B
1-ESS1 Earth's Place in the Universe								
1-LS1 From Molecules to Organisms: Structures and Processes					3			LS1.A, B, C
1-LS3 Heredity: Inheritance and Variation of Traits					4			LS3.A, B
1-PS4 Waves and Their Applications in Technologies for Information Transfer							3	PS4.C
2-ESS1 Earth's Place in the Universe		3						ESS1.C
2-ESS2 Earth's Systems	1	1						ESS2.A, B, C
2-LS2 Ecosystems: Interactions, Energy, and Dynamics					3			LS2.A
2-LS4 Biological Evolution: Unity and Diversity					1			LS4.D
2-PS1 Matter and Its Interactions	3							PS1.A

RATING SCALE for Alignment of Ocean Literacy Framework to Next Generation Science Standards (NGSS)

1	<p>Verbatim or nearly verbatim language in both OL Framework (Guide or Scope & Sequence) and NGSS</p> <p><i>This rating is self-explanatory. The connection and alignment should be obvious and not in need of any explanation.</i></p>
2	<p>Understanding these Ocean Literacy Principles and/or Fundamental Concepts is essential to helping students to achieve full understanding of these DCIs and/or PEs.</p> <p><i>This rating is given for all the DCIs that have a terrestrial bias or ignore the uniqueness of ocean systems, such as: decomposition breaks things down into soil; references to only terrestrial habitats, ecosystems and food webs, etc. This rating says that a learner cannot achieve full understanding of the DCI without understanding the ocean component of the concept, e.g., you don't fully understand primary productivity if you don't understand chemosynthesis; you don't fully understand decomposition if you only understand how it relates to soil, but not to detritus and marine snow in the water column; you don't fully understand food webs and trophic levels unless you understand about microbes in the ocean because they play a very different role than plants do on land. The ocean "examples" are more than just examples; they illustrate different aspects of the concept than the terrestrial examples do.</i></p>
3	<p>Examples from the Ocean Literacy Framework (not just any ocean examples) are excellent for teaching and understanding these DCIs and/or PEs</p> <p><i>This rating is given when an Ocean Literacy Framework example could be used to explain a general science DCI and/or PE, but using that example to explain that concept is not essential to ocean literacy, nor is it essential to understanding DCI, such as, ocean waves, as mentioned in some OLPs, are good examples of the physical properties of waves.</i></p>
4	<p>These DCIs and/or PEs are building blocks or foundational ideas that help students to understand these Ocean Literacy Principles and/or Fundamental Concepts</p> <p><i>This rating is given for general science concepts that help students understand the mechanisms behind OL concepts, such as, force and motion helping to explain currents or phase change, and conservation of matter helping to explain the water cycle.</i></p> <p>Examples of a 4:</p> <p>K-PS2 Motion and Stability: Forces and Interactions. Ocean Literacy Essential Principle 2: These basic ideas are important conceptual building blocks that help us understand waves, erosion, and landforms of the coast.</p> <p>1-LS3 Heredity: Inheritance and Variation of Traits. Ocean Literacy Essential Principle 5: DCI introduces concept of inheritance and variation and provides introduction to the concept of diversity described in OLP 5A & C.</p>
[blank]	<p>[blank] No substantive or helpful relationship</p> <p><i>No rating is given when there does not appear to be any plausible, helpful, or meaningful relationship between the OL Principles and/or Fundamental Concepts and the DCIs and/or PEs.</i></p> <p>Example of a 5:</p> <p>K-PS2 Motion and Stability: Forces and Interactions Ocean Literacy Essential Principle 5: No relationship</p>

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Explanation for Ratings

K-2-ETS1 Engineering Design

OLP 6. This is a 3 because humans need to be able to design solutions to both keep the ocean healthy, and to utilize ocean resources to improve our lives. Humans' interconnections with the ocean provide many examples (OLP 6b, d, g; K-2 S&S 6C strand) that illustrate and optimize the need for design solutions (DCI ETS1.A, B, C).

OLP 7. This is a 3 because the ocean provides many examples (OLP 7d, e, f; K-2 S&S B.2, 4) of engineering challenges (DCI ETS1.A, B,C) related to ocean exploration and opportunities ahead.

K-ESS2 Earth's Systems

OLP 3. This is a 4 because students need to understand what weather is and that weather changes (DCI ESS2.D) in order to understand what causes weather (OLP 3a,d; K-2 S&S 3A).

OLP 6. This is a 2 because student understanding of biogeology and human impacts on Earth systems (DCI ESS2.E, ESS3.C) would be incomplete without inclusion of ways humans impact the ocean. People change the environment, e.g., pollution, physical modifications (OLP 6d, f; K-2 S&S 6B, C), as they engage in activities to live comfortably. Everyone can make choices to reduce their impact, and be responsible for caring for the ocean (OLP 6g).

K-ESS3 Earth and Human Activity

OLP 4. This is a 2 because understanding the natural resources that living things need (DCI ESS3.A) is not complete without knowing that life as we know it does not exist without water (K-2 S&S 4A). Almost all the water on Earth is in the ocean (K-2 S&S 4B), and the ocean provided and c

OLP 5. This is a 2 because understanding the natural resources that living things need (DCI ESS3.A) is not complete without considering the ocean as an environment and habitat where organisms live (K-2 S&S 5B).

OLP 6. This is a 1 because human activities to live comfortably (DCI ESS3.B, C) involve use of resources from the ocean (K-2 S&S 6A, B; OLP 6b, c), and thus have an impact on the ocean (K-2 S&S 6C). Everyone can make choices to reduce their impact, and be responsible for caring for the ocean (K-2 S&S 6C; OLP 6g).

OLP 7. This is a 2 because understanding that life on Earth depends on the ocean (OLP 7a; K-2 S&S 7A), and that people explore the ocean (K-2 S&S 7B) are essential to understanding the natural resources that living things need to survive (DCI ESS3.A). Exploring the ocean helps us understand the health of the ocean, and helps us find new medicines, food for humans, and new resources for energy for human activities (K-2 S&S 7B2).

K-LS1 From Molecules to Organisms: Structures and Processes

OLP 5. This is a 3 because the ocean (OLP 5b, d; K-2 S&S 5B.2) provides many important examples of the organization for matter and energy flow in organisms (DCI LS1.C).

OLP 6. This is a 3 because recognizing the ocean as a fundamental source of food and water (OLP 6a, b; K-2 S&S 6A.2-3) is a good example of how all animals need food, and all plants and algae need water and light to live and grow (DCI LS1.C).

K-PS2 Motion and Stability: Forces and Interactions

OLP 2. This is a 3 because water in motion carries Earth materials from one place to another, especially in the coastal zone, leading to erosion and accretion (OLP 2c; K-2 S&S 2A). This is an important example of when objects touch or collide, they push on one another and can change motion (DCI PS2.B).

K-PS3 Energy

OLP 3. This is a 4 because students need to understand that sunlight warms Earth's surface (DCI PS3.B) in order to understand that the ocean absorbs heat energy from the Sun (OLP 3b).

1-ESS1 Earth's Place in the Universe

No alignment between OL and NGSS.

1-LS1 From Molecules to Organisms: Structures and Processes

OLP 5. This is a 3 because there is a greater diversity of organisms in the ocean than are found on land (K-2 S&S 5A; OLP 5a, c, d). The variety of different structures and behaviors that marine organisms have to help them survive (K-2 S&S 5A.4) provide unique and important examples for understanding structure and function (DCI LS1.A), growth and development of organisms (DCI LS1.B), and how organisms process information for growth and survival (DCI LS1.C).

1-LS3 Heredity: Inheritance and Variation of Traits

OLP 5. This is a 4 because inheritance of traits and variation of traits (DCI LS3.A, B) are building blocks for understanding the great diversity of organisms in the ocean (K-2 S&S 5A; OLP 5a, c).

1-PS4 Waves and Their Applications in Technologies for Information Transfer

OLP 7. This is a 3 because existing ocean technology for exploration and communication, including sensors, such as side-scan, multi-beam, and lidar that rely on sound waves for information transfer, are expanding our ability to explore the ocean and provide novel examples of information technologies and instrumentation (DCI PS4.C).

2-ESS1 Earth's Place in the Universe

OLP 2. This is a 3 because the DCI, OLP, and S&S encourage direct examination of evidence to make Earth processes visible. Accretion, erosion, and associated coastline changes (OLP 2c; K-2 S&S 2A) are important examples for illuminating Earth events and timescales (DCI ESS1.C). Observing or experimenting with currents, waves, erosion, and deposition provide natural starting points for understanding these concepts.

2-ESS2 Earth's Systems

OLP 1. This is a 1 because the OLP (1a, e, g) describes and elaborates the concept that water is found in the oceans (sic), rivers, lakes, and ponds (DCI ESS2.C). In order for students to understand that maps show where things are located and that one can map the shapes and kinds of land and water in any area (DCI ESS2.B), they must understand that the ocean is the defining feature on the planet (OLP 1a; K-2 S&S 1B). Geologic features on the ocean floor (plains, valleys, mountains, volcanoes), which are shown on bathymetric maps and are similar to those on land (OLP 1b; K-2 S&S 1D), provide important and unique examples of the shapes and kinds of land and water in any area (DCI ESS2.B).

OLP 2. This is a 1 because the concept that moving water can change the shape of the land is nearly identical in the DCI (ESS2.A), OLP (2c), and S&S (K-2 S&S 2A).

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

OLP 5. This is a 3 because photosynthetic microbes in the ocean (OLP 5b) are examples of primary producers that depend on water and light to grow (DCI LS2.A).

2-LS4 Biological Evolution: Unity and Diversity

OLP 5. This is a 1 because the DCI introduces the concept of many different kinds of organisms living in many different places on land and water (DCI LS4.D), which is essentially the concept represented in Ocean Literacy Framework (OLP 5a-g, i; K-2 S&S 5A, B) related to the diversity of life and ecosystems in the ocean.

2-PS1 Matter and Its Interactions

OLP 1. This is a 3 because understanding the unique structure and properties of seawater (OLP 1e; K-2 S&S 1A) are important and instructive examples of how matter has different observable structure and properties (DCI PS1.A). The freezing point of seawater (OLP 1e) is a good example of how the heating or cooling of a substance may cause changes that can be observed (DCI PS1.B).