National Aeronautics and Space Administration



The Search for Life

Next Generation Science Standards Middle School Alignment Document

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Middle School Next Generation Science Standards Alignment Document



WHAT STUDENTS DO: Explore the key moments in Earth's biogeological history.

Students travel back in geologic time to explore some of the major historical events of Earth in an attempt to understand the search for life on other planets in the universe.

NRC FRAMEWORK/NGSS CORE & COMPONENT QUESTIONS

WHAT IS THE UNIVERSE AND WHAT IS EARTH'S PLACE IN IT?

NGSS Core Question: ESS1: Earth's Place in the Universe

How do people reconstruct and date events in Earth's planetary history?

NGSS ESS1.C: The History of Planet Earth

HOW CAN THERE BE SO MANY SIMILARITIES AMONG ORGANISMS YET SO MANY DIFFERENT KINDS OF PLANTS, ANIMALS, AND MICROORGANISMS?

NGSS Core Question: LS4: Biological Evolution: Unity and Diversity

What evidence shows different species are related?

NGSS LS4.A: Evidence of Common Ancestry and Diversity

INSTRUCTIONAL OBJECTIVES (IO)

Students will be able to

IO1: Construct an argument about the constraints and limitations regarding the search for life in the universe using evidence from Earth's rock record.

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1.0 About This Activity

How Students Learn: Science in the Classroom (Donovan & Bransford, 2005) advocates the use of a research-based instructional model for improving students' grasp of central science concepts. Based on conceptual-change theory in science education, the 5E Instructional Model (BSCS, 2006) includes five steps for teaching and learning: Engage, Explore, Explain, Elaborate, and Evaluate. The Engage stage is used like a traditional warm-up to pique student curiosity, interest, and other motivation-related behaviors and to assess students' prior knowledge. The Explore step allows students to deepen their understanding and challenges existing preconceptions and misconceptions, offering alternative explanations that help them form new schemata. In Explain, students communicate what they have learned, illustrating initial conceptual change. The Elaborate phase gives students the opportunity to apply their newfound knowledge to novel situations and supports the reinforcement of new schemata or its transfer. Finally, the Evaluate stage serves as a time for students' own formative assessment, as well as for educators' diagnosis of areas of confusion and differentiation of further instruction. The 5E stages can be cyclical and iterative.

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2.0 Instructional Objectives, Learning Outcomes, Standards, & Rubrics

Visit https://infiniscope.org/lesson/stories-in-rock/ for access to the digital learning experience, lesson plans, standards alignment documents, and additional resources.

Instructional objectives and learning outcomes are aligned with

- Achieve Inc.'s, *Next Generation Science Standards (NGSS)*
- National Research Council's, *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*
- National Governors Association Center for Best Practices (NGA Center) and Council of Chief State School Officers (CCSSO)'s, *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects*

The following chart provides details on alignment among the core and component NGSS questions, instructional objectives, learning outcomes, and educational standards.

- Your **instructional objectives (IO)** for this lesson align with the NRC Framework and NGSS.
- You will know that you have achieved these instructional objectives if students demonstrate the related **learning outcomes (LO),** also aligned with the NRC Framework and NGSS.
- You will know the level to which your students have achieved the learning outcomes by using the suggested **rubrics**.

Important Note: This lesson is color-coded to help teachers identify each of the three dimensions of NGSS. The following identifying colors are used: Practices are blue, Cross-Cutting Concepts are green, and Disciplinary Core Ideas are orange.

This color-coding is consistent with the NGSS Performance Expectations and Foundation Boxes.

Quick View of Standards Alignment:

This alignment document provides full details of the way in which instructional objectives, learning outcomes, 5E activity procedures, and rubric assessments were derived through, and align with the Next Generation Science Standards (NGSS). For convenience, a quick view follows:

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WHAT IS THE UNIVERSE AND WHAT IS EARTH'S PLACE IN IT?

NGSS Core Question: ESS1: Earth's Place in the Universe

How do people reconstruct and date events in Earth's planetary history?

NGSS ESS1.C: The History of Planet Earth

HOW CAN THERE BE SO MANY SIMILARITIES AMONG ORGANISMS YET SO MANY DIFFERENT KINDS OF PLANTS, ANIMALS, AND MICROORGANISMS?

NGSS Core Question: LS4: Biological Evolution: Unity and Diversity

What evidence shows different species are related?

NGSS LS4.A: Evidence of Common Ancestry and Diversity

Instructional Objective *Students will be able to*	**Learning Outcomes** *Students will demonstrate the measurable abilities*	**Standards** *Students will address*
IO1: Construct an argument about the constraints and limitations regarding the search for life in the universe using evidence from Earth's rock record.	**LO1a: Explain how scientists piece together the story of life from the fossil record.** **LO1b: Construct an argument that explains the significance of the K-Pg boundary and the evidence contained in Hell Creek that demonstrates the significance of this boundary.** **LO1c: Construct an explanation for what evidence points to the existence of stromatolites in North Pole Dome, Australia and how they are significant in the story of life on Earth.**	**PRACTICES:** 1. Engaging in Argument from Evidence 2. Constructing Explanations and Designing Solutions 3. Communicate scientific and/or technical information **DISCIPLINARY CORE IDEAS:** ESS1.C: The History of Planet Earth LS4.A: Evidence of Common Ancestry and Diversity ETS1.A: Defining and Delimiting Engineering Problems **CROSSCUTTING CONCEPTS:** 1. Patterns 2. Stability and Change Science is a Way of Knowing Science Addresses Questions About the Natural and Material World Influence of Science, Engineering, and Technology on Society and the Natural World

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3.0 Evaluation/Assessment

Use the *(N) The Search for Life Alignment Rubric* as a formative assessment, allowing students to improve their work and learn from mistakes during class. The rubric evaluates the activities using the Next Generation Science Standards (NGSS).

4.0 References

Achieve, Inc. (2013). *Next generation science standards*. Achieve, Inc. on behalf of the twenty-six states and partners that collaborated on the NGSS.

Bybee, R., Taylor, J., Gardner, A., Van Scotter, P., Carson Powell, J., Westbrook, A., Landes, N. (2006) *The BSCS 5E instructional model: origins, effectiveness, and applications.* Colorado Springs: BSCS.

Donovan, S. & Bransford, J. D. (2005). *How Students Learn: History, Mathematics, and Science in the Classroom.* Washington, DC: The National Academies Press.

Miller, Linn, & Gronlund. (2009). *Measurement and assessment in teaching*. Upper Saddle River, NJ: Pearson.

National Academies Press. (1996, January 1). *National science education standards*. Retrieved February 7, 2011 from http://www.nap.edu/catalog.php?record_id=4962

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards*. Washington, DC: Authors.

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

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(M) Teacher Resource. The Search for Life NGSS Alignment (1 of 3)

You will know the level to which your students have achieved the **Learning Outcomes**, and thus the **Instructional Objective(s)**, by using the suggested **Rubrics** below.

Related Standard(s)

This lesson supports the preparation of students toward achieving Performance Expectations using the Practices, Cross-Cutting Concepts and Disciplinary Core Ideas defined below: (MS-ESS1-4); (MS-LS4-1); (MS-ETS1-1).

Next Generation Science Standards

Instructional Objective	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
IO1: **Construct an argument about the constraints and limitations regarding the search for life in the universe using evidence from Earth's rock record.**	**Engaging in Argument from Evidence** Construct, use, or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) **ETS1.A: Defining and Delimiting Engineering Problems** The more precisely a design task's criteria and	**Science Addresses Questions About the Natural and Material World** Scientific knowledge is constrained by human capacity, technology, and materials. **Influence of Science, Engineering, and Technology on Society and the Natural World** The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

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		constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely (MS-ETS1-1)	

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(M) Teacher Resource. The Search for Life NGSS Alignment (2 of 3)

Next Generation Science Standards

Learning Outcomes	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
LO1a: Explain how scientists piece together the story of life from the fossil record.	**Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)	**Science is a Way of Knowing** Scientific knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.
LO1b: Construct an argument that explains the significance of the K-Pg boundary and the evidence contained in Hell Creek that	**Engaging in Argument from Evidence** Construct, use, or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity**	**Stability and Change** Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

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demonstrates the significance of this boundary.		The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)	
LO1c: **Construct an explanation for what evidence points to the existence of stromatolites in North Pole Dome, Australia and how they are significant in the story of life on Earth.**	**Constructing Explanations and Designing Solutions** Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)	**Patterns** Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

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(M) Teacher Resource. The Search for Life NGSS Individual Activity Alignment (3 of 3)

Next Generation Science Standards Activity Alignments (NGSS)

Activity	Phases of 5E Instructional Model	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
(A) Complex Life in the Universe	**Engage**			
Earth Explorations: **Stories in Rock** **Extinction Story in Hell Creek** **Story of Complex Animals in Nilpena** **Earliest Stories of Life in Australia**	**Explore**	**Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)	**Patterns** Macroscopic patterns are related to the nature of microscopic and atomic-level structure. **Stability and Change** Stability might be disturbed either by sudden events or gradual changes that accumulate over time. **Science is a Way of Knowing** Scientific knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.

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(B) Stories in Rock **(C) Visiting Deep Time** **(D) Extinction Story in Hell Creek** **(E) Classifying Organisms by Phylogeny** **(F) Stromatolites**	**Explain**	**Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)	**Patterns** Macroscopic patterns are related to the nature of microscopic and atomic-level structure. **Stability and Change** Stability might be disturbed either by sudden events or gradual changes that accumulate over time. **Science is a Way of Knowing** Scientific knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.
Constraints discussion	**Elaborate**	**Communicate scientific and/or technical information** Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.	**ETS1.A: Defining and Delimiting Engineering Problems** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely (MS-ETS1-1)	**Science Addresses Questions About the Natural and Material World** Scientific knowledge is constrained by human capacity, technology, and materials. **Influence of Science, Engineering, and Technology on Society and the Natural World** The uses of technologies and

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				limitations on their use Lo2are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.
(G) Searching for Life in the Universe	**Evaluate**	**Engaging in Argument from Evidence** Construct, use, or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**ESS1.C: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) **LS4.A: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) **ETS1.A: Defining and Delimiting Engineering Problems** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely (MS-ETS1-1)	**Science Addresses Questions About the Natural and Material World** Scientific knowledge is constrained by human capacity, technology, and materials. **Influence of Science, Engineering, and Technology on Society and the Natural World** The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

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(N) Teacher Resource. The Search for Life NGSS Alignment Rubric (1 of 2)

Related Rubrics for the Assessment of Learning Outcomes Associated with the Above Standard(s):

Next Generation Science Standards Alignment (NGSS)

Learning Outcome	Expert	Proficient	Intermediate	Beginner
LO1a: Explain how scientists piece together the story of life from the fossil record.	Accurately describes the process of radiometric dating ***and*** superposition to establish age ranges for rock layers ***and*** the fossils they contain.	Describes the process of radiometric dating ***and*** superposition to establish age ranges for rock layers ***or*** the fossils they contain.	Describes the process of radiometric dating ***or*** superposition to establish age ranges for rock layers ***or*** the fossils they contain.	Discusses personal beliefs regarding the story of life.
LO1b: Construct an argument that explains the significance of the K-Pg boundary and the evidence contained in Hell Creek that demonstrates the significance of this boundary.	Accurately explains the major extinction event from 66 million years ago that marks the end of dinosaurs and the rise of mammals. Cites ***all evidence*** presented, including the layer of clay containing iridium, which supports the asteroid impact hypothesis, a triceratops below the iridium layer, and small mammals and reptiles below and above the boundary.	Accurately explains the major extinction event from 66 million years ago that marks the end of dinosaurs and the rise of mammals. Cites ***some evidence*** such as the layer of clay containing iridium, which supports the asteroid impact hypothesis, a triceratops below the iridium layer, and small mammals and reptiles below and above the boundary.	Explains the major extinction event from 66 million years ago that marks the end of dinosaurs and the rise of mammals. Cites ***one piece of evidence*** such as the layer of clay containing iridium, which supports the asteroid impact hypothesis, a triceratops below the iridium layer, and small mammals and reptiles below and above the boundary.	Explains the major extinction event from 66 million years ago that marks the end of dinosaurs and the rise of mammals.
LO1c: Construct an explanation for what evidence points to the existence of stromatolites in North Pole Dome, Australia and how they are significant in the story of life on Earth.	Accurately describes the process involved in fossilizing stromatolite communities and the observation of these laminated structures in North Pole Dome. The description includes the significance of their photosynthetic abilities and their connection to oxygen in the early atmosphere.	Describes the observation of laminated structures in North Pole Dome known as stromatolites. The description includes the significance of their photosynthetic abilities and their connection to oxygen in the early atmosphere.	Describes the observation of laminated structures in North Pole Dome known as stromatolites. The description includes that they were photosynthetic communities.	Describes the observation of laminated structures in North Pole Dome known as stromatolites.

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(N) Teacher Resource. The Search for Life NGSS Alignment Rubric (2 of 2)

Related Rubrics for the Assessment of Instructional Objective Associated with the Above Standard(s):

Next Generation Science Standards Alignment (NGSS)

Instructional Objective	Expert	Proficient	Intermediate	Beginner
IO1: Construct an argument about the constraints and limitations regarding the search for life in the universe using evidence from Earth's rock record.	Constructs an argument which supports the claim that we are more likely to find organisms like stromatolite forming microbes in our search for life because a larger portion of the bullseye representing geologic time is that type of life. ***Many limitations/constraints*** are discussed in depth regarding in the search for intelligent life.	Constructs an argument which supports the claim that we are more likely to find organisms like stromatolite forming microbes in our search for life because a larger portion of the bullseye representing geologic time is that type of life. ***One limitation/constraint*** is discussed in depth regarding the search for intelligent life.	Constructs an argument which supports the claim that we are more likely to find organisms like stromatolites in our search for life because a larger portion of the bullseye representing geologic time is that type of life.	Constructs an argument which supports the claim that we are likely to find ***any form of life other than*** organisms such as stromatolite forming microbes in our search for life.

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