National Aeronautics and Space Administration

The Search for Life

Common Core Middle School Alignment Document

The Search for Life

Middle School Common Core State Standards Alignment

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 Mathematics*

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 Common Core State Standards.
- You will know that you have achieved these instructional objectives if students demonstrate the related **learning outcomes (LO),** also aligned with the Common Core State Standards.
- You will know the level to which your students have achieved the learning outcomes by using the suggested **rubrics**.

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 Common Core State Standards. 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.**	**ELA STANDARDS:** • **Text Types and Purposes CCSS.ELA-LITERACY.WHST.6-8.1**

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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 Common Core State Standards.

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.

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

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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 Common Core State Standards Alignment

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

Common Core State Standards	
Instructional Objective	**Writing Standards for Literacy in Science and Technical Subjects (6-8)**
IO1: **Construct an argument about the constraints and limitations regarding the search for life in the universe using evidence from Earth's rock record.**	**Text Types and Purposes:** **CCSS.ELA-LITERACY.WHST.6-8.1** Write arguments focused on discipline-specific content. a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from or supports the argument presented.

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(N) Teacher Resource. The Search for Life Common Core State Standards Alignment Rubric

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

Common Core State Standards

	Expert	Proficient	Intermediate	Beginner
CCSS.ELA.LITERACY.WHST.6-8.1	Introduces claim clearly, provides counter-claim, and groups related information logically; Develops the claim with facts, definitions, concrete details, or other examples related to the claim; Links ideas using words, phrases, and clauses; Uses domain-specific vocabulary to support the claim and evidence; Provides a concluding statement related to the explanation.	Introduces claim clearly, provides a counter-claim, and groups related information logically; Develops the claim with details or other examples related to the claim; Uses domain-specific vocabulary to support the claim and evidence; Provides a concluding statement related to the explanation.	Introduces claim, provides a general observation; Develops the claim with details, or other examples related to the claim; Links ideas using words or phrases; Uses domain-specific vocabulary to support the claim.	Introduces claim; attempts to provide details or unrelated examples; Uses day to day vocabulary to support the claim.

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