

National Aeronautics and Space Administration



red rocks

High School CCSS Alignment Document



Red Rocks

High School Common Core State Standards Alignment Document



WHAT STUDENTS DO: Explore red rocks of Earth to explain why Mars is red.

Students will explore Karijini Gorge in Australia and Oak Creek Canyon in Sedona, AZ searching for clues to the environments that formed the red rocks there. They will observe these rock formations at a variety of scales to gather these clues. Finally, they will apply their understanding of red rock formation to answer the question “Why is Mars red?”

NRC FRAMEWORK/NGSS CORE & COMPONENT QUESTIONS

HOW AND WHY IS EARTH CONSTANTLY CHANGING?

NGSS Core Question: ESS2: Earth Systems

How do Earth’s major systems interact?

NGSS ESS2.A: Earth Materials and Systems

INSTRUCTIONAL OBJECTIVES (IO)

Students will be able to

IO1: Interpret evidence in the rocks of Mars at a variety of scales to explain the presence of iron oxide and what it tells us about water in the ancient/present Martian environment.

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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

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*
- Partnership for 21st Century Skills, *A Framework for 21st Century Learning*

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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HOW AND WHY IS EARTH CONSTANTLY CHANGING?
 NGSS Core Question: ESS2: Earth Systems

How do Earth’s major systems interact?
 NGSS ESS2.A: Earth Materials and Systems

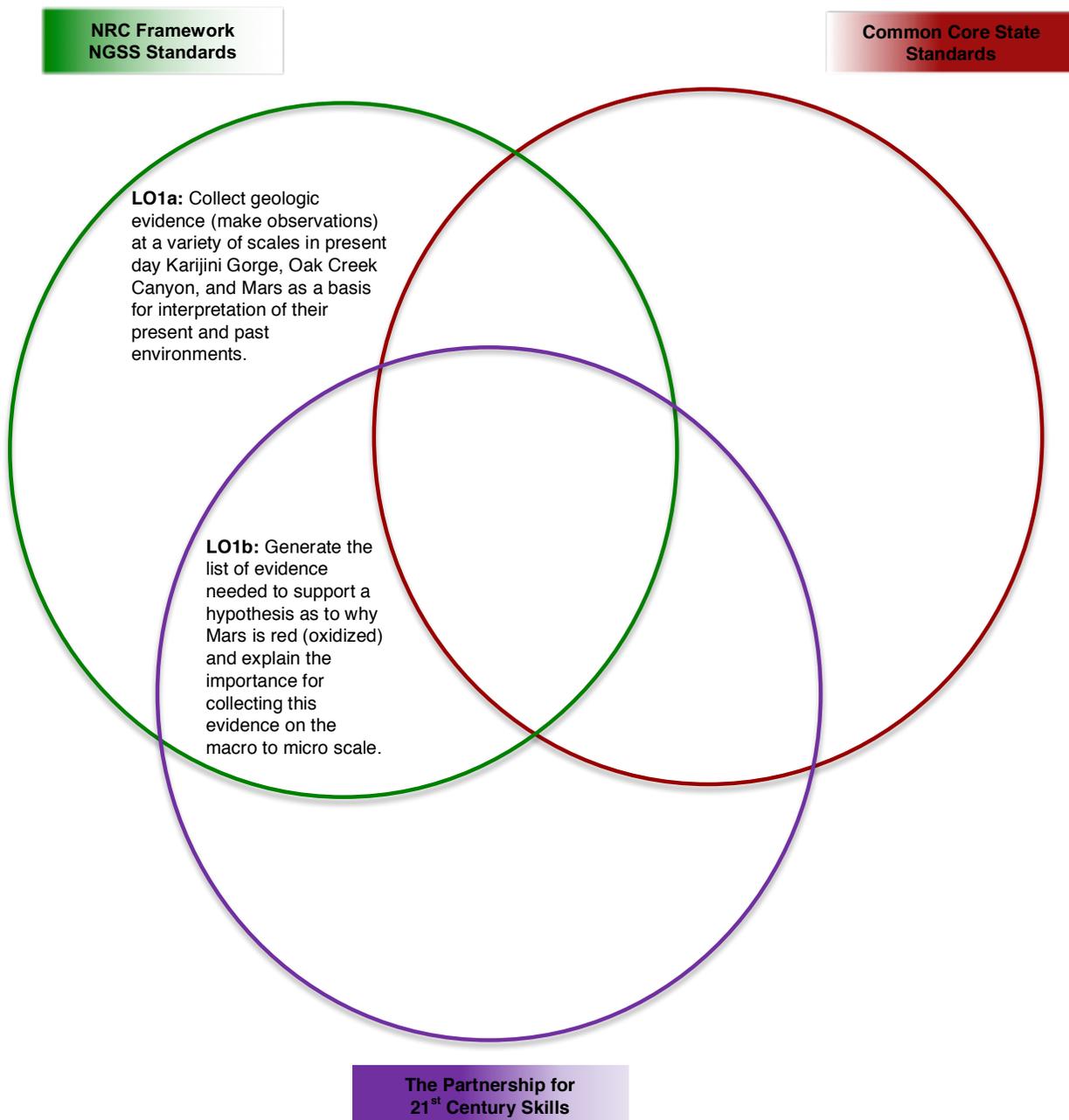
Instructional Objective <i>Students will be able to</i>	Learning Outcomes <i>Students will demonstrate the measurable abilities</i>	Standards <i>Students will address</i>
<p>IO1: Interpret evidence in the rocks of Mars at a variety of scales to explain the presence of iron oxide and what it tells us about water in the ancient/present Martian environment.</p>	<p>LO1a: Collect geologic evidence (make observations) at a variety of scales in present day Karijini Gorge, Oak Creek Canyon, and Mars as a basis for interpretation of their present and past environments.</p> <p>LO1b: Generate the list of evidence needed to support a hypothesis as to why Mars is red (oxidized) and explain the importance for collecting this evidence on the macro to micro scale.</p>	<p>WRITING STANDARDS FOR LITERACY IN SCIENCE AND TECHNICAL SUBJECTS:</p> <ul style="list-style-type: none"> • Text Types and Purposes CCSS.ELA-LITERACY.WHST.9-10.1 CCSS.ELA-LITERACY.WHST.11-12.1

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3.0 Learning Outcomes, NRC Framework, NGSS, Common Core, & 21st Century Skills Connections

The connections diagram is used to organize the learning outcomes addressed in the lesson to establish where each will meet the Next Generation Science Standards, Common Core Standards, and the 21st Century Skills and visually determine where there are overlaps in these documents. See NGSS Alignment Document and 21st Century Skills Alignment Document for details on their specific alignments.



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4.0 Evaluation/Assessment

Use the *(N) Red Rocks Alignment Rubric* as a formative and summative assessment, allowing students to improve their work and learn from mistakes during class. The rubric evaluates the activities using the Common Core State Standards.

5.0 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
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- The Partnership for 21st Century Skills (2011). *A framework for 21st century learning*. Retrieved March 15, 2012 from <http://www.p21.org/>

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**(M) Teacher Resource. Red Rocks 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 **Rubrics** below.

 Common Core State Standards		
Instructional Objective	Writing Standards for Literacy in Science and Technical Subjects (9-10)	Writing Standards for Literacy in Science and Technical Subjects (11-12)
IO1: Interpret evidence in the rocks of Mars at a variety of scales to explain the presence of iron oxide and what it tells us about water in the ancient/present Martian environment.	Text Types and Purposes: CCSS.ELA-LITERACY.WHST.9-10.1 Write arguments focused on discipline-specific content. <ol style="list-style-type: none"> Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. Provide a concluding statement or section that follows from or supports the argument presented. 	Text Types and Purposes: CCSS.ELA-LITERACY.WHST.11-12.1 Write arguments focused on discipline-specific content. <ol style="list-style-type: none"> Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. Provide a concluding statement or section that follows from or supports the argument presented.

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(N) Teacher Resource. Red Rocks Common Core State Standards Alignment Rubric

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



Common Core State Standards

	Expert	Proficient	Intermediate	Beginner
CCSS.ELA.LITERACY.WHST.9-12.1	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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