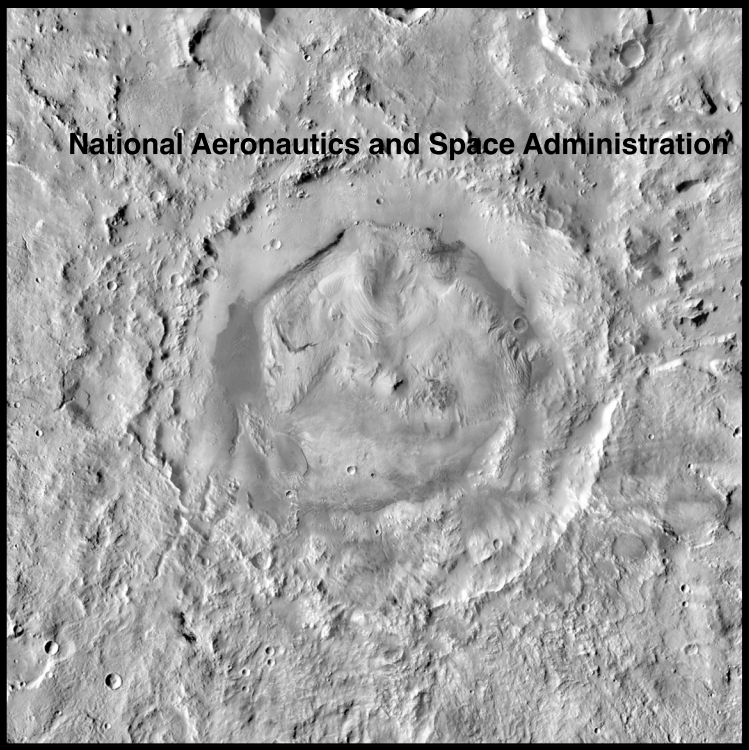
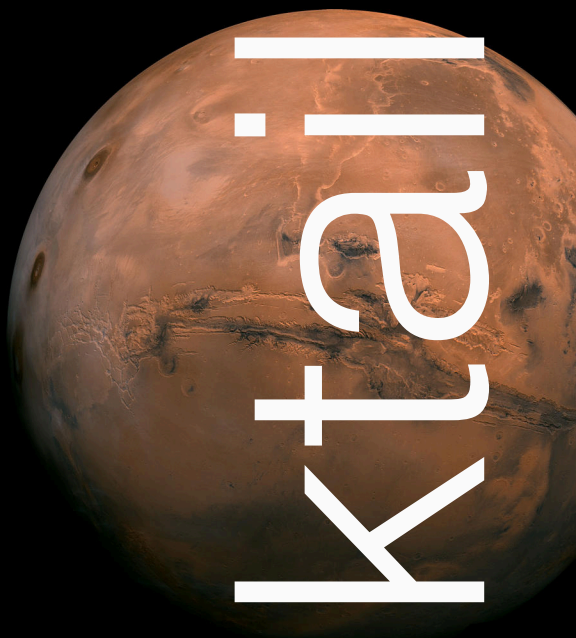


National Aeronautics and Space Administration



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High School NRC Framework Alignment Document

Mystery of Blacktail Canyon

High School NRC Framework for Science Education Alignment Document

WHAT STUDENTS DO: Explore a virtual field trip of the Grand Canyon.

Students will explore Grand Canyon, AZ using a virtual field trip (VFT). They will observe the rock record and what these rocks tell us about the life and environments of the past. Then they will apply investigation techniques to the search for life in the solar system.

NRC FRAMEWORK/NGSS CORE & COMPONENT QUESTIONS	INSTRUCTIONAL OBJECTIVES (IO)
HOW AND WHY IS EARTH CONSTANTLY CHANGING? *NRC Core Question: ESS2: Earth's Systems* **Why do the continents move, and what causes earthquakes and volcanoes?** *NRC ESS2.B: Plate Tectonic and Large-Scale System Interactions* **How do the properties and movement of water shape Earth's surface and affect its systems?** *NRC ESS2.C: The Roles of Water in Earth's Surface Processes* **HOW CAN THERE BE SO MANY SIMILARITIES AMONG ORGANISMS YET**	*Students will be able to* **IO1: Construct an explanation for why multiple missions are sent to a variety of locations on planetary bodies to investigate their geologic history and search for signatures of life.**

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SO MANY DIFFERENT KINDS OF PLANTS, ANIMALS, AND MICROORGANISMS? HOW DOES THE BIODIVERSITY AFFECT HUMANS?

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

How does the environment influence populations of organisms over multiple generations?

NRC LS4.C: Adaptation

What is biodiversity, how do humans affect it, and how does it affect humans?

NRC LS4.D: Biodiversity and Humans

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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/mystery-blacktail-canyon/ for access to the digital learning experience, lesson plans, standards alignment documents, and additional resources.

Instructional objectives and learning outcomes are aligned with

- 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 NRC questions, instructional objectives, learning outcomes, and educational standards.

- Your **instructional objectives (IO)** for this lesson align with the NRC Framework.
- You will know that you have achieved these instructional objectives if students demonstrate the related **learning outcomes (LO),** also aligned with the NRC Framework.
- 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 the NRC Framework. 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 NRC Framework for K-12 Science Education.

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 NRC Framework for K-12 Education. For convenience, a quick view follows:

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HOW AND WHY IS EARTH CONSTANTLY CHANGING?

NRC Core Question: ESS2: Earth's Systems

Why do the continents move, and what causes earthquakes and volcanoes?

NRC ESS2.B: Plate Tectonic and Large-Scale System Interactions

How do the properties and movement of water shape Earth's surface and affect its systems?

NRC ESS2.C: The Roles of Water in Earth's Surface Processes

HOW CAN THERE BE SO MANY SIMILARITIES AMONG ORGANISMS YET SO MANY DIFFERENT KINDS OF PLANTS, ANIMALS, AND MICROORGANISMS? HOW DOES THE BIODIVERSITY AFFECT HUMANS?

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

How does the environment influence populations of organisms over multiple generations?

NRC LS4.C: Adaptation

What is biodiversity, how do humans affect it, and how does it affect humans?

NRC LS4.D: Biodiversity and Humans

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Instructional Objective *Students will be able to*	**Learning Outcomes** *Students will demonstrate the measurable abilities*	**Standards** *Students will address*
IO1: Construct an explanation for why multiple missions are sent to a variety of locations on planetary bodies to investigate their geologic history and search for signatures of life.	**LO1a:** **Discuss and compare explanations for the observed change in rock patterns and the connections those patterns reveal between the Great Unconformity (earth science) and the Cambrian Explosion (life science).** **LO1b:** **Investigate the changing geologic patterns of the Grand Canyon and then integrate information from virtual media to make an inference about the processes that occurred here.** **LO1c:** **Explain the importance of collecting data from multiple sites to piece together the geologic history and evolution of life on a global scale.**	**PRACTICES:** **1. Constructing Explanations and Designing Solutions** **2. Obtaining, Evaluating, and Communicating Information** **DISCIPLINARY CORE IDEAS:** **ESS2.B: Plate Tectonics and Large Scale System Interactions** **ESS2.C: The Roles of Water in Earth's Surface Processes** **LS4.C: Adaptation** **LS4.D: Biodiversity and Humans** **CROSSCUTTING CONCEPTS:** **1. Patterns** **2. Scale, Proportion, and Quantity** **3. Stability and Change** **4. Science is a Way of Knowing**

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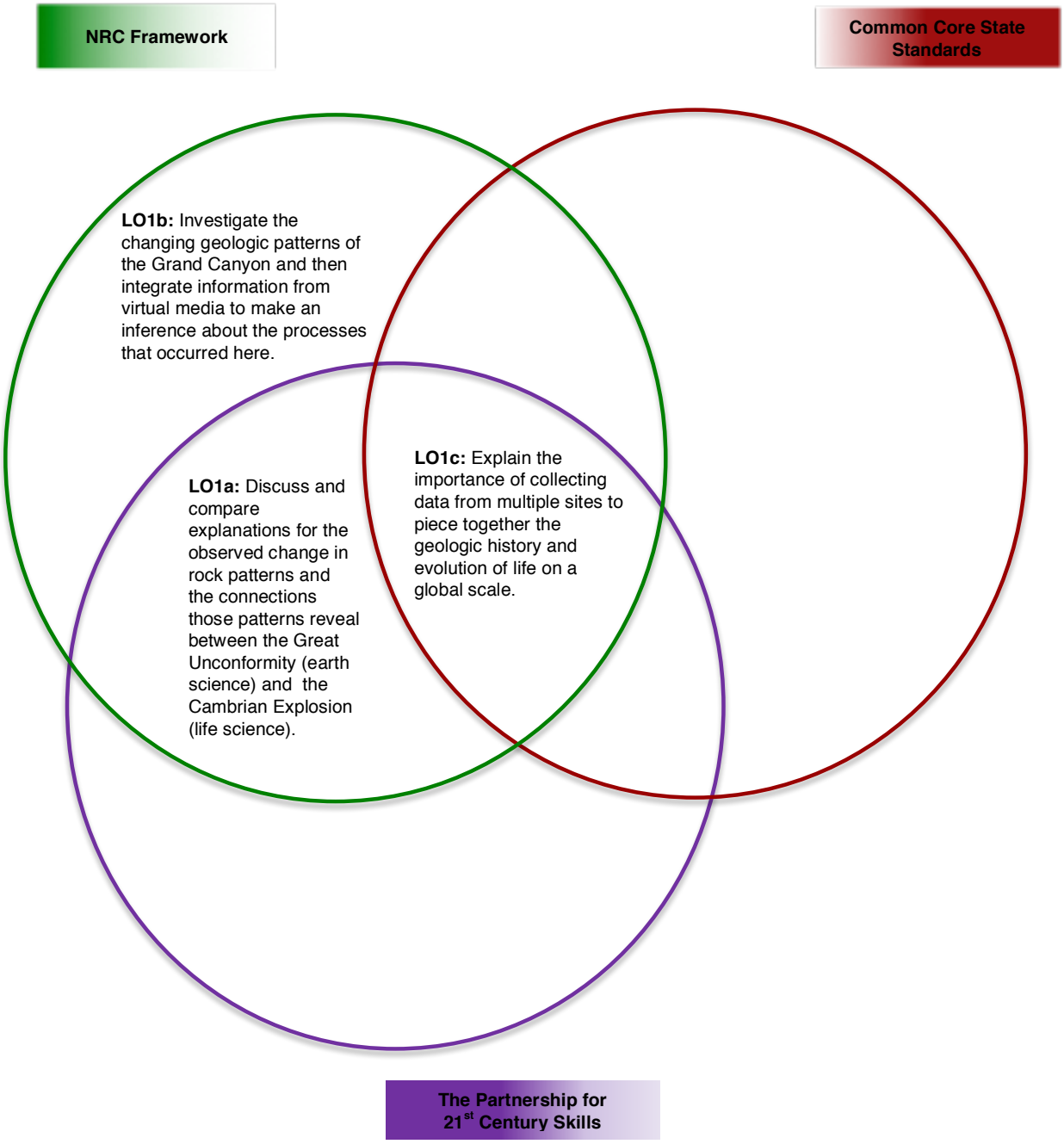
3.0 Learning Outcomes, NRC Framework, Common Core, & 21st Century Skills Connections

The connections diagram is used to organize the learning outcomes addressed in the lesson to establish where each will meet the NRC Framework for K-12 Science Education, Common Core Standards, and the 21st Century Skills and visually determine where there are overlaps in these documents. See Common Core State Standards Alignment Document and 21st Century Skills Alignment for details on their specific alignments.



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4.0 Evaluation/Assessment

Use the *(N) Mystery of Blacktail Canyon 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 NRC Framework for Science Education.

5.0 References

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(M) Teacher Resource. Mystery of Blacktail Canyon NRC Framework (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.

NRC Framework for K-12 Science Education			
Instructional Objective	**Science and Engineering Practices**	**Disciplinary Core Idea**	**Crosscutting Concepts**
IO1: **Construct an explanation for why multiple missions are sent to a variety of locations on planetary bodies to investigate their geologic history and search for signatures of life.**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge. **Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or of media reports of science and discuss the	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one variable on another, for example, or to appreciate the difference between linear growth and

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	validity and reliability of the data, hypotheses, and conclusions.	environment. If members cannot adjust to change that is too fast or too drastic, the opportunity for the species' evolution is lost. **ESS2.B: Plate Tectonics and Large-Scale System Interactions** Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(Grade 8 Benchmark)* **ESS2.C: The Roles of Water in Earth's Surface Processes** The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	exponential growth. As their thinking advances, so too should their ability to recognize and apply more complex mathematical and statistical relationships in science. A sense of numerical quantity is an important part of the general "numeracy" (mathematics literacy) that is needed to interpret such relationships.

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(M) Teacher Resource. Mystery of Blacktail Canyon NRC Framework (2 of 3)

NRC Framework for K-12 Science Education			
Learning Outcomes	**Science and Engineering Practices**	**Disciplinary Core Idea**	**Crosscutting Concepts**
LO1a: **Discuss and compare explanations for the observed change in rock patterns and the connections those patterns reveal between the Great Unconformity (earth science) and the Cambrian Explosion (life science)**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge. **Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or of media reports of science and discuss the validity and reliability of the data, hypotheses, and conclusions.	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Stability and Change** At the high school level, students can model more complex systems and comprehend more subtle issues of stability or of sudden or gradual change over time. Students at this level should also recognize that much of science deals with constructing historical explanations of how things evolved to be the way they are today, which involves

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		too drastic, the opportunity for the species' evolution is lost. **ESS2.B: Plate Tectonics and Large-Scale System Interactions** Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(Grade 8 Benchmark)* **ESS2.C: The Roles of Water in Earth's Surface Processes** The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	modeling rates of change and conditions under which the system is stable or changes gradually, as well as explanations of any sudden change.

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LO1b: **Investigate the changing geologic patterns of the Grand Canyon and then integrate information from virtual media to make an inference about the processes that occurred here.**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge. **Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or of media reports of science and discuss the validity and reliability of the data, hypotheses, and conclusions.	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or too drastic, the opportunity for the species' evolution is lost. **ESS2.B: Plate Tectonics and Large-Scale System Interactions** Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one variable on another, for example, or to appreciate the difference between linear growth and exponential growth. As their thinking advances, so too should their ability to recognize and apply more complex mathematical and statistical relationships in science. A sense of numerical quantity is an important part of the general "numeracy" (mathematics literacy) that is needed to interpret such relationships.

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		for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(Grade 8 Benchmark)* **ESS2.C: The Roles of Water in Earth's Surface Processes** The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	**Stability and Change** At the high school level, students can model more complex systems and comprehend more subtle issues of stability or of sudden or gradual change over time. Students at this level should also recognize that much of science deals with constructing historical explanations of how things evolved to be the way they are today, which involves modeling rates of change and conditions under which the system is stable or changes gradually, as well as explanations of any sudden change.
LO1c: **Explain the importance of collecting data from multiple sites to piece together the geologic history and**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital.	**Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one variable on another, for example, or to appreciate the difference between linear growth and

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evolution of life on a global scale.	refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge.	**LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or too drastic, the opportunity for the species' evolution is lost. **ESS2.B: Plate Tectonics and Large-Scale System Interactions** Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(Grade 8 Benchmark)* **ESS2.C: The Roles of Water in Earth's Surface Processes**	exponential growth. As their thinking advances, so too should their ability to recognize and apply more complex mathematical and statistical relationships in science. A sense of numerical quantity is an important part of the general "numeracy" (mathematics literacy) that is needed to interpret such relationships. **Stability and Change** At the high school level, students can model more complex systems and comprehend more subtle issues of stability or of sudden or gradual change over time. Students at this level should also recognize that much of science deals with constructing historical explanations of how things evolved to be the way they are today, which involves modeling rates of change and conditions under which the system is stable or changes gradually, as well as explanations of any sudden change.

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		The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	

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(M) Teacher Resource. Mystery of Blacktail Canyon NRC Framework Individual Activity Alignment (3 of 3)

NRC Framework for K-12 Science Education				
Activity	**Phases of 5E Instructional Model**	**Science and Engineering Practices**	**Disciplinary Core Idea**	**Crosscutting Concepts**
(A) Mars Mission Table	**Engage**			
***Mystery of Blacktail Canyon* Virtual Field Trip**	**Explore**	**Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or of media reports of science and discuss the validity and reliability of the data, hypotheses, and conclusions.	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one

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			water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	change.
(B) Tying Geology and Biology Together	**Explore and Explain**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge. **Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one variable on another, for example, or to appreciate the

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			sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	
(C) Search for Missing Time	**Elaborate**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge. **Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or of media reports of science and discuss the validity and reliability of the data, hypotheses, and conclusions.	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one variable on another, for example, or to appreciate the difference between linear growth and exponential growth. As their thinking advances, so too should their ability to

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			the viscosities and melting points of rocks.	
(D) Missing Time on Mars Evaluation	**Evaluate**	**Constructing Explanations and Designing Solutions** Construct their own explanations of phenomena using their knowledge of accepted scientific theory and linking it to models and evidence. Use primary or secondary scientific evidence and models to support or refute an explanatory account of a phenomenon. Offer causal explanations appropriate to their level of scientific knowledge. **Obtaining, Evaluating, and Communicating Information** Engage in a critical reading of primary scientific literature (adapted for classroom use) or of media reports of science and discuss the validity and reliability of the data, hypotheses, and conclusions.	**LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. **LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or too drastic, the opportunity for the species' evolution is lost.	**Patterns** By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics). **Scale, Proportion, and Quantity** As students deepen their understanding of algebraic thinking, they should be able to apply it to examine their scientific data to predict the effect of a change in one variable on another, for example, or to appreciate the difference between linear growth and exponential growth. As their thinking advances, so too should their ability to recognize and apply more complex mathematical and statistical relationships in

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(N) Teacher Resource. Mystery of Blacktail Canyon NRC Framework Rubric

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

NRC Framework for K-12 Science Education

Learning Outcome	Expert	Proficient	Intermediate	Beginner
LO1a: Discuss and compare explanations for the observed change in rock patterns and the connections those patterns reveal between the Great Unconformity (earth science) and the Cambrian Explosion (life science).	Extremely interested in participating in an on-topic discussion with peers and clearly defines a claim, fully supported by evidence, for the changes in the rock patterns and the connections between the Great Unconformity and the Cambrian Explosion.	Interested in participating in an on-topic discussion with peers and defines a claim, supported by a piece of evidence, for the changes in the rock patterns and the connections between the Great Unconformity and the Cambrian Explosion.	Somewhat interested in an on-topic discussion with peers and defines a claim for the changes in the rock patterns and the connections between the Great Unconformity and the Cambrian Explosion.	Interested in a personal discussion with peers and defines a claim for the changes in the rock patterns and the connections between the Great Unconformity and the Cambrian Explosion.
LO1b: Investigate the changing geologic patterns of the Grand Canyon and then integrate information from virtual media to make an inference about the processes that occurred here.	Elicits evidence regarding the geologic patterns within the Grand Canyon from the virtual field trip and accurately applies the evidence to an inference of past processes.	Elicits evidence regarding the geologic patterns within the Grand Canyon from the virtual field trip and applies related and non-related evidence to an inference of past processes.	Elicits evidence regarding the geologic patterns within the Grand Canyon from the virtual field trip and makes an inference of past processes.	Explores the geologic patterns within the Grand Canyon from the virtual field trip.
LO1c: Explain the importance of collecting data from multiple sites to piece together the geologic history and evolution of life on a global scale.	Fully explains the importance of collecting data from multiple sites, using multiple lines of evidence from the virtual field trip and reading, to piece together the geologic history and evolution of life on a global scale.	Explains the importance of collecting data from multiple sites, using evidence from the virtual field trip and reading, to piece together the geologic history and evolution of life on a global scale.	Explains the importance of collecting data from multiple sites using evidence from the virtual field trip or reading.	Explains the importance of collecting data from multiple sites using information from irrelevant experiences prior to the lesson.

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