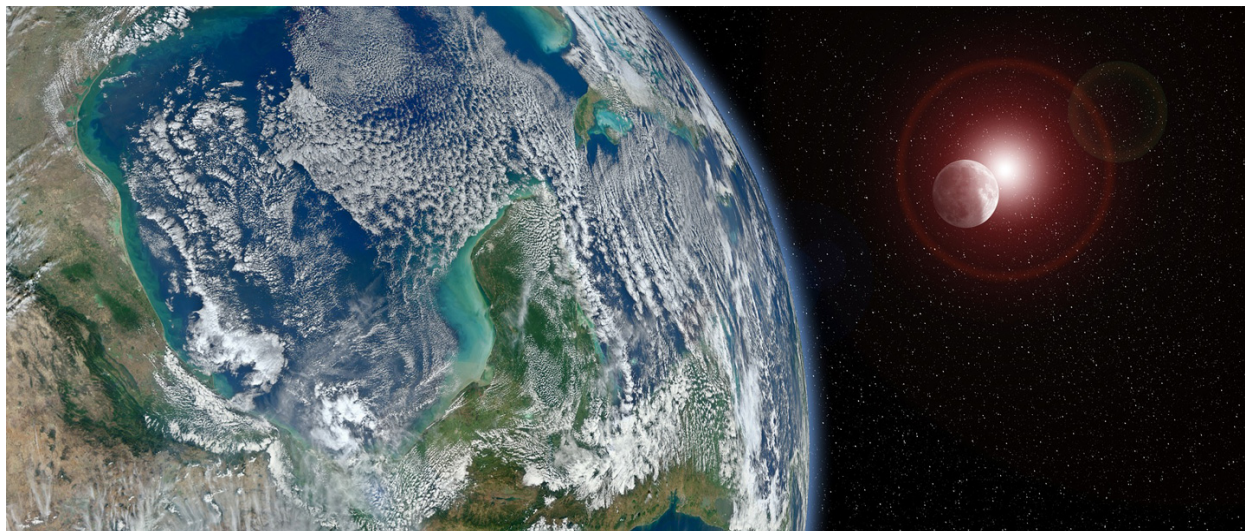


kingdom in peril



Kingdom in Peril

Middle School 21st Century Skills Standards Alignment Document



WHAT STUDENTS DO: Explore the arrangement of Sun, Earth, and Earth's moon necessary to generate eclipses.

Students will assume the role of a 17th century monarch who must learn and understand eclipse phenomena to save the kingdom from revolt. Students will explore the arrangement of the Sun, Earth, Moon system, and inclination of the Moon's orbit necessary to generate solar and lunar eclipse patterns experienced on Earth. They will explore the shadow zones and likelihood of observing these phenomena.

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

What are the predictable patterns caused by Earth's movement in the solar system?

ESS1.B: Earth and the Solar System

INSTRUCTIONAL OBJECTIVES (IO)

Students will be able to

IO1: Explain predictable eclipse patterns using a model to discover and demonstrate the evidence of phenomena at different scales such as the Moon's inclination (orbital plane) in combination with the position of the Sun, Earth, Moon system.



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.



2.0 Instructional Objectives, Learning Outcomes, Standards, & Rubrics

Visit <https://infiniscope.org/> 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*
- 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 21st Century Skills.
- You will know that you have achieved these instructional objectives if students demonstrate the related **learning outcomes (LO)**, also aligned with 21st Century Skills.
- 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 21st Century Skills. For convenience, a quick view follows:



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

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

What are the predictable patterns caused by Earth's movement in the solar system?

ESS1.B: Earth and the Solar System

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>
IO1: Explain predictable eclipse patterns using a model to discover and demonstrate the evidence of phenomena at different scales such as the Moon's inclination (orbital plane) in combination with the position of the Sun, Earth, Moon system.	LO1a: Use a model to discover and explain the arrangement of the Sun, Earth, Moon system to generate eclipses LO1b: Evaluate the credibility of arguments provided by advisory for the cause of solar and lunar eclipses based on ways of knowing. LO1c: Use a model to discover and explain the relationship between umbral diameter and likelihood of viewing an eclipse from Earth. LO1d: Use a model to investigate and explain the relationship of the Moon's inclination and the pattern of observed solar eclipses over time.	Communication Grade 8 Benchmark Flexibility and Adaptability Grade 8 Benchmark



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

The connections diagram is used to organize the Instructional Objective 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 Common Core State Standards Alignment Document for details on their specific alignments.





4.0 Evaluation/Assessment


Use the *(N) Kingdom in Peril Rubric* as a formative and summative assessment, allowing students to improve their work and learn from mistakes during class, but also providing final assessment of learning activities. The rubric evaluates the activities using the 21st Century Skills.

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 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.
- 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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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.

 Partnership for 21 st Century Skills		
Instructional Objective	21 st Century Skill	Grade 8 Benchmark
IO1: Explain predictable eclipse patterns using a model to discover and demonstrate the evidence of phenomena at different scales such as the Moon's inclination (orbital plane) in combination with the position of the Sun, Earth, Moon system.	Communication	OUTCOME: Students are familiar with the use of computational models as tools to describe and predict real-world phenomena.

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**(N) Teacher Resource. Kingdom in Peril 21st Century Skills Alignment Rubric**

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

**Partnership for 21st Century Skills**

	Expert	Proficient	Intermediate	Beginner
Communication	Effectively uses orrery model to gather data. Accurately references aspects of digital model in eclipse explanations and implements those aspects in detailed 2D drawings from the model."	Effectively uses orrery model to gather data. References aspects of digital model in eclipse explanations and implements those aspects in 2D drawings from the model."	Uses orrery model to gather data and implements aspects of the digital model in 2D drawings.	Uses orrery model to gather data.