

Unit 2: Space Systems

Driving Question: Why is Earth so unique?

Anchor Phenomenon: The movie "Contact" Opening Scene










Duration: 35-40 days



Unit Overview: In this unit, students will explore the origins and mechanics of the universe and how they affect life on Earth. Topics include the Big Bang, nuclear fusion, and stellar nucleosynthesis, which explain how the universe and elements were formed. Students will then study orbital motions and how they produce predictable patterns, including tides and seasons. Through models, data analysis, and simulations, students will understand the relationships between celestial motions and Earth systems.

Performance Expectations [PE]:

- HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the Sun and the role of nuclear fusion in the Sun's core to release energy that eventually reaches Earth in the form of radiation.
- HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
- HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.
- HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
- HS-ESS1-7: Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically.

	Identifying the Driving Question	Unit 2: Space Systems						
		Fueling Fusion	Big Bang Theory	Cooking Up the Cosmos	Orbital Motions	Cyclic Changes		
Anchor Phenomenon Activity	Why is Earth so unique?	How do stars provide energy in the Universe?	What evidence supports the Big Bang Theory?	Where do elements originate?	What governs the way celestial objects move?	How do the motions of the Universe affect Earth?	Anchor Phenomenon Activity	State Investigation
Contact Video Clip 	Driving question board. 	How the Universe Works 	Expanding Red Ballon 	TedEd Video 	Sun and Moon Size Comparison 	Bay of Fundy Tidal Changes 	Contact Video Clip 	Unearthing Mars 
Short-form Video	Driving Question Board Activity	Short-form Video	Demo Activity	Short-form Video	Think/Pair/Share Activity	Short-form Video	Short-form Video	A Historical Perspective

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Anchor Phenomenon Activity

Why is Earth so unique?

Scope and Sequence of Activities

Opening scene for the movie "Contact".



Short-form Video

Life on Earth Artifact Walk



Station Rotation Activity

Student Lead Question Creation



Driving Question Board Activity

Identifying the Driving Question



Driving Question Board Activity

Resources and Links

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Fueling Fusion

How do stars provide energy in the Universe?

Key Concepts

1. Process of Nuclear Fusion
2. Stellar Evolutions of Stars
3. The Sun and the Sunspot Cycle

Performance Expectations

HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the Sun and the role of nuclear fusion in the Sun's core to release energy that eventually reaches Earth in the form of radiation.

Scope and Sequence of Activities

Phenomenon / Exploration

Show clip from "How the Universe Works" on "How does fusion power the Sun?".

Keynotes & Investigations

Investigation: Sunspot Cycle
Keynote: The Sun and Sunspot Cycle
Investigation: Stellar Evolution
Keynote: Fusion and Stellar Evolution

Practice

Question Clusters
and Supplementals

Evaluate

15 Question
Assessment

Resources and Links

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Big Bang Theory

What evidence supports the Big Bang Theory?

Key Concepts

1. Motions of the Galaxies Evidence
2. Background radiation Evidence
3. Composition of Matter Evidence

Performance Expectations

HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

Scope and Sequence of Activities

Phenomenon / Exploration

Expanding red balloon demonstration with dots to represent galaxies.

Keynotes & Investigations

Investigation: Special Lines
Keynote: The Universe

Practice

Question clusters for homework

Evaluate

10 Question Assessment

Resources and Links

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Cooking Up the Cosmos

Where do elements originate?

Key Concepts

1. Stellar Nucleosynthesis as a Function of Mass
2. ESSRT: Generalized Nucleosynthesis in a Massive Star
3. Extrapolating and Predicting data

Performance Expectations

HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.

Scope and Sequence of Activities

Phenomenon / Exploration

TedEd Video Short
"Where does gold come from?"

Keynotes & Investigations

Investigation: Stellar Nucleosynthesis
Keynote: Stellar Nucleosynthesis

Practice

Question clusters
for homework

Evaluate

10 Question
Assessment

Resources and Links

Investigation: Stellar Nucleosynthesis Construction

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Orbital Motions

What governs the way celestial objects move?

Key Concepts

1. Newtonian Laws
2. Kepler's Laws
3. Parts of an Ellipse

Performance Expectations

HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Scope and Sequence of Activities

Phenomenon / Exploration

Think - Pair - Share Activity
Sun and Moon Size Comparison

Keynotes & Investigations

Investigation: Constructing Ellipses
Keynote: Laws of Orbital Motions

Practice

Question clusters
for homework

Evaluate

15 Question
Assessment

Resources and Links

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Cyclic Changes

How do the motions of the Universe affect Earth?

Key Concepts

1. Phases of the Moon and Tides
2. Solar and Lunar Eclipses
3. Seasonal Changes

Performance Expectations

HS-ESS1-7: Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically.

Scope and Sequence of Activities

Phenomenon / Exploration

Short-term video of the tidal changes
at the Bay of Fundy

Keynotes & Investigations

Investigation: Tidal Simulation
Keynote: Moon and Tides
Investigation: Eclipse Simulation
Keynote: Eclipses
Investigation: Seasonal Temperatures
Keynote: Seasons

Practice

Question clusters
for homework

Evaluate

20 Question
Assessment

Resources and Links

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Synthesizing the Driving Question

Why is Earth so unique?

Scope and Sequence of Activities

Revisit the
Driving Question



Driving Question
Board Activity

Answering the
Question



Socratic Seminar
Discussion

Write and defend your argument
based gained knowledge



Synthesizing the
Driving Question Argument

Resources and Links

Investigation: Unearthing Mars — A Historical Perspective

Why is Earth so unique?

Performance Expectations

HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Resources

Secure documentation provided by director.