Desired Results: Based on their understandings of what makes the Earth habitable, students will be able to make and defend a claim about which exoplanet in another solar system is most Earth-like and a potential home for humans in the future.

Title of Unit: *Discovering New Worlds*

Enduring Understandings

The vast scale of the universe and Earth's placement within it helps explain planetary and cosmic processes.

Gravity and interactions govern orbits, planetary structure, and longer-term system dynamics.

Energy flow and mineral resources shape the Earth's structure, climate, and support of life.

Geological and cosmic events can be dated and understood through scientific reasoning.

Solar radiation drives Earth's systems, influencing climate and ecosystems.

Essential Questions

1. How do scale and structure of Earth and the cosmos influence biological evolution?
2. What roles do gravity and energy play in Earth's systems and in shaping life over time?
3. How can we interpret data (from rocks, isotopes, or models) to read Earth's and life's history?
4. In what ways does solar energy drive Earth's climate and the conditions necessary for life?

Guiding Questions

1. What are your initial ideas about what has made Earth successful in having sustained life for so long?
2. Why is the Sun so important to life on Earth?
3. How does the Sun work?
4. How has the Sun provided us with the "right" amount of energy for life to exist?
5. Does the exoplanet have a star like our Sun?
6. What is our Sun like, compared to other stars?
7. Do all stars become supernovas?
8. How do we know which stars are stable?
9. Is the exoplanet like Earth in terms of its distance from its star?
10. What are the factors that allow an exoplanet to maintain a stable temperature?

Knowledge

Students will understand:

- Formation of the universe, galaxy and solar system
- Evidence for the Big Bang Theory
- Lifecycle of Stars
- Nucleosynthesis
- Characteristics of Planet Types
- Orbital Motions of Earth and other planets
- Habitable Characteristics of Earth

Vocab:

- Scale
- Gravity
- Orbital Motion
- Modeling
- Radiometric Dating
- Half Life
- Mineral Resources

Skills

- Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review)
- Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically)
- Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations
- Evaluate the claims, evidence, and/or reasoning behind

	currently accepted explanations or solutions to determine the merits of arguments

Standards

HS-ESS 1-1 - 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-ESS 1-2 - 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-ESS 1-3 - Communicate scientific ideas about the way stars, over their life cycle, produce elements.

HS-ESS 1-4 - Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

HS-ESS 1-6 - Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

HS-ESS 2-7 - Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth.

Assessment Evidence

Students will demonstrate their knowledge throughout the unit through the following:

Formative:

- Frequent feedback provided by checking student work and allowing them opportunity to clarify and correct
- Discussions during activities, questioning by teacher

Summative:

- Unit Test: Discovering New Worlds
- Performance Task: Discovering New Worlds (Given data, make a claim regarding the most habitable planet in another solar system and support your claim with evidence)
- NYS Investigation: Unearthing Mars

Learning Plan

Learning Activities

- Model of the Solar System
- Formation of the Solar System
- Plan and Conduct an Investigation : Asteroid Lab
- Phet Simulation of Kepler's Laws
- PHet Gravitational Simulation
- A Glowing Star
- Exo-planet Eccentricity
- Star in a Box
- Chasing Lights
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Resources