Unit 5: Survey of the Solar System

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **3 weeks**
Status: **Published**

Summary

The evolution, formation, and structure of our solar system is a model astronomers use to search and compare for other worlds. Objects in the solar system are our nearest neighbors, and humans have been studying them, charting their motions for a very long time. Studying and learning about our solar system helps guide scientists to further understand planetary formation during the evolution of the solar system and its other orbiting bodies. Planets, asteroids, meteors, the Kuiper Belt, and the Oort Cloud will also be studied.

Revision Date: July 2024

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	Look for and express regularity in repeated reasoning
ELA.RI.MF.9–10.6	Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
ELA.W.IW.9–10.2	Write informative/explanatory texts (including the narration of historical events, scientific procedures/experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
SCI.HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
SCI.HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
SCI.HS-PS2-3	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
SCI.HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
SCI.HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
SCI.HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles

	(objects) and energy associated with the relative position of particles (objects).
SCI.HS-ESS1	Earth's Place in the Universe
SCI.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.
SCI.HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
SCI.HS-ESS1-6	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.
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CT	Critical Thinking and Problem-solving

Essential Questions/Enduring Understandings

Essential Questions:

What criteria do scientists rely upon to decide how to classify objects in our solar system?

What comparisons have scientists and astronomers created among the planets in our solar system?

How does our study and understanding of earth help scientists establish our understanding and evolution of our sister planets in our solar system?

Enduring Understandings:

Our solar system is made up of two types of planets: rocky composition v. gaseous composition.

Inner planets revolve the sun in less time than earth; outer planets revolve the sun in longer time periods than earth.

Although space probes have visited every planet, and no planet has been visited by humans, Mars is the primary candidate due to its physical surface condition similarities to earth.

Objectives

Students will know the definitions of key terms: interstellar medium, accretion disk, terrestrial, jovian, interior, superior, conjunction, opposition, retrograde, Kuiper Belt, and Oort Cloud.
Students will know how studying these celestial objects can help astronomers better understand the evolution of our solar system.
Students will know what reasons scientists have for reclassifying Pluto and why there is continued debate surrounding it and other Kuiper Belt objects.

Students will know how to analyze the moons of our solar system and which candidates are suitable for colonization.

Students will know the difficulties of traveling to our solar system neighbors.
Students will be skilled at identifying the planets in our solar system.
Students will be skilled at comparing planetary properties to Earth.
Students will be skilled at differentiating meteors, asteroids, and comets.

Learning Plan

History of the discovery of planets

Evidence for the formation of the solar system and planets

Constructing a scale model of our solar system

Categorizing planets based on observational data

Project: Planet Posters

Video: The Pluto Files

Assessment

Formative Assessment:

Do Now &/or Start-Up Questions, Discussions

Understanding during ISLE Cycle activities

Comparative planetary database generation

History/theories of solar system formation

Exit Ticket Submission

Alternative Assessment:

Computer website interactive on planetary motion and planetary properties

Planet brochure/poster project

Mathematical calculations on planetary motions

Summative Assessment:

Topic & Vocabulary Quizzes

Unit Tests

Benchmark Assessment:

Final Exam

Materials

quantitative/qualitative lab equipment for activities, experiments
related astronomy maps, charts
supplementary interactive multimedia, internet websites, videos

Textbook: The Cosmic Perspective - 10th Edition

Integrated Accommodation and Modifications

https://docs.google.com/spreadsheets/d/1VPJNV9-GTZxi5VPcYkvEMPdHR8D8wTBI7zIj1BWYpek/edit?usp=drive_link