01 A Cosmic Perspective

Content Area: **Science**
Course(s): **CP Astronomy**
Time Period: **Marking Period 1**
Length: **3-4 weeks**
Status: **Published**

Course Pacing Guide

Since the dawn of man, humans have been on a quest to understand who we are. At its most basic level, this quest is inextricably linked to a desire to discover how the universe is put together, how it works, and what our place is in it. In this course, we will explore the science that guides the phenomena we observe in the natural world as we stand on our Planet Earth and gaze into the furthest expanses of the universe. As we journey through the cosmos, we will also explore the social, historical, and philosophical impacts of scientific exploration.

Unit	MP/Trimester	Weeks
A Cosmic Perspective	1	4
The Daytime and Nightime Sky	1	4
The Space Program	1-2	2
The Solar System	2	3
The Stars	2	3
The Universe	2	2

Unit Overview

In this unit, we look at the "big picture" of the entire universe: its history and the objects we find it. We begin by learning what science is, and we eventually study how scientific knowledge has changed over time through the lens of the Copernican Revolution. Students start to get a feel for the scale and history of the universe through projects that attempt to make the astronomical sizes and time scales in the universe more manageable.

Enduring Understandings

- Science and technology drive society, and sometimes society is limited by the resistance of popular thought.

- As new evidence is discovered that contradicts current understanding, we must modify or replace completely our theories.
- Scale models are useful because they help us to have a more intuitive mental picture of extremely large or extremely small sizes and distances.
- The meaning of words as used in the scientific community is often different than the meaning intended in everyday conversation.

Students will know:

- The scientific meanings of the words: fact, law, hypothesis, theory, belief.
- The constellations of the zodiac are the 13 constellations that the Sun passes through throughout the course of the year. The dates of horoscope charts do not actually match the sun's position because those charts were created 2000 years ago when the Earth's axis was tiltled toward a different part of the sky.
- There are over 100 billion stars in each galaxy and over 100 billion galaxies in the universe.
- The contributions the following scientists made to our understanding of the universe: Aristotle, Ptolemy, Copernicus, Tycho Brahe, Kepler, Galileo, Newton, Einstein, Hubble.

Students will be able to:

- Construct a scaled timeline of the universe.
- Create and construct a scale model of objects in the universe.
- Explain the relationship between society/culture and the progress of science.

Essential Questions

- What is science?
- How does scientific knowledge change and build over time?
- How did early astronomers come up with theories about the universe?
- How do scientific laws and principles observed on Earth compare to the rest of the unvierse?
- What is our place in the universe?

New Jersey Student Learning Standards (No CCS)

9-12.HS-ESS1-1.3.1	students understand the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. They recognize patterns observable at one scale may not be observable or exist at other scales, and some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly. Students use orders of magnitude to understand how a model at one scale relates to a model at another scale. They use algebraic thinking to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).
9-12.HS-ESS1-4.5.1	Use mathematical or computational representations of phenomena to describe explanations.
9-12.HS-ESS1-2.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of

	sources (including students' own investigations, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-ESS1-4.ESS1.B.1	Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system.

Amistad Integration

Holocaust/Genocide Education

Interdisciplinary Connections

MA.N-Q.A	Reason quantitatively and use units to solve problems.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Technology Standards

List specific standards that are relevant
No general statements

TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.

21st Century Themes/Careers

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP11	Use technology to enhance productivity.

Financial Literacy Integration

Instructional Strategies & Learning Activities

1. First Day Assignment: Preconceptions and Questions
2. The Process of Science: Guided Notes
3. Astrology Activity: Sky Chart
4. Grand Tour of the Universe: Article and Questions
5. Structure of the Universe: Cosmic Address and Photographic Overview
6. Scale Model Project
7. Size and Distance: Guided Notes
8. Cosmic Calendar
9. History of Astronomy
10. Cosmos: When Knowledge Conquered Fear
11. Study Guide
12. Jeopardy Review
13. Unit Test

Differentiated Instruction

Examples may include:

- Inquiry/Problem-Based Learning
- Variety of learning preferences (visual, auditory, kinesthetic)
- Meaningful Student Voice & Choice
- Self-Directed Learning
- Debate
- LMS use
- The Hot Seat/Role-Play
- Mastery Learning (feedback toward goal)
- Simulation-Based Learning
- Grouping
- Socratic Seminar
- Rubrics
- Concept Attainment
- Assessment Design & Backwards Planning

Formative Assessments

- Various Do-Now Activities
- Observation
- Question and answer

- Informal check-ins

Summative Assessment

Scale Model Project

Unit test

Benchmark Assessments

Alternate Assessments

Resources & Technology

- Astronomy Picture of the Day (NASA website)
- Heavens-Above Interactive Sky Chart
- Materials for Scale Model Project and Cosmic Calendar
- TV episode "The Cosmos: When Knowledge Conquered Fear"

BOE Approved Texts

none

Closure

Such as:

- Gallery Walk - On chart paper, small groups of students write and draw what they learned. After the completed works are attached to the classroom walls, others students affix post-its to the posters to extend on the ideas, add questions.
- Low-Stakes Quizzes - Give a short quiz using technologies like Kahoot or a Google form.
- Have students write down three quiz questions (to ask at the beginning of the next class).

- Question Stems - Have students write questions about the lesson on cards, using question stems framed around Bloom's Taxonomy. Have students exchange cards and answer the question they have acquired.
- Kids answer the following prompts: "What takeaways from the lesson will be important to know three years from now? Why?
- Ask a question. Give students ten seconds to confer with peers before you call on a random student to answer. Repeat.
- Have kids orally describe a concept, procedure, or skill in terms so simple that a younger student would understand it.
- Kids write notes to peers describing what they learned from them during class discussions.

ELL

Such as:

- Alternate Responses
- Advance Notes
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- E-Dictionaires
- Google Translate

Special Education

List is not inclusive but may include examples such as:

- Shorten assignments to focus on mastery of key concepts.
- Specify and list exactly what the student will need to learn to pass.
- Evaluate the classroom structure against the student's needs (flexible structure, firm limits, etc.).
- Keep the classroom quiet during intense learning times.
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Provide a vocabulary list with definitions.
- Permit extra time as indicated in IEP.
- Allow tests to be taken in a room with few distractions (e.g., the library).
- Have test materials read to the student, and allow oral responses.

- Divide tests into small sections of similar questions or problems.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.

504

Examples of accommodations in 504 plans include but are not limited to:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

At Risk

Examples may include:

- Use of mnemonics
- Have student restate information
- Concrete examples
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- No penalty for spelling errors or sloppy handwriting
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Preview test procedures
- Cue/model expected behavior

Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking