Astronomy Unit 1 - Where are We?

Content Area: **Science**
Course(s): **Astronomy**
Time Period: **Full Year**
Length: **18 days**
Status: **Published**

NJSLS - Science

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

Science and Engineering Practices

Using Mathematical and Computational Thinking

Use mathematical or computational representations of phenomena to describe explanations. (HS-ESS1-4)

Disciplinary Core Ideas

ESS1.B: Earth and the Solar System

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. (HS-ESS1-4)

Crosscutting Concepts

Scale, Proportion, and Quantity

Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4)

Rationale and Transfer Goals

Students will learn where they are in the universe, how to place themselves in the middle of it all (as it appears

to us), and how to find objects in the sky. Students will gain a cosmic perspective--a broad understanding of the nature, scope and evolution of the Universe, and where the Earth and Solar System fit in, the notion that physical laws and processes are universal, the notion that the world is knowable, and that we are coming to know it through observations, experiments and theory (the nature of progress in science), plus exposure to the types, roles and degrees of uncertainty in science.

Enduring Understandings

Objects in the universe can be located in what is called the celestial sphere, as described by drawing an imaginary sphere with the observer at the center.

Our place in the universe can be thought of as our galactic address. All celestial objects have a galactic address.

Essential Questions

Where are we located in the universe?

Are we in the center of the universe?

Content - What will students know?

- Definitions related to the celestial sphere.

Skills - What will students be able to do?

- Describe and explain celestial coordinates as a tool for mapping the sky (poles, equator, azimuth, altitude, ecliptic, local sky, zenith, meridian, right ascension, declination, tropics, circles).

- Explain the daily path of the seasonal constellations.

Activities - How will we teach the content and skills?

- Making a “sextant” to measure.
- Using a compass.
- “Your Galactic Address” activity.
- Sky Sphere model making.

Evidence/Assessments - How will we know what students have learned?

- **Assessments can be reviewed for each course in this folder.**
- Formative assessments
- Having students find measurements of objects in and around the building from standardized positions.
- Analysis questions after making and using models.
- Quizzes
- Tests
- Astronomy Benchmark #1

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
• protractor use • solar system (middle school)		review objects in our solar system (sun, planets, asteroids, comets)

Key Resources

TOPS Learning Systems

http://gk12glacier.bu.edu/wordpress/haery/lesson-plans/astronomy-measuring-with-right-ascension-declination/

21st Century Life and Careers

9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.

Career Readiness, Life Literacies, & Key Skills

9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).
9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
9.4.12.IML.7	Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).
9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

Interdisciplinary Connections/Companion Standards

Science Standard	Math Connection	ELA Connection	Science Skills Used	Math Skills Used	Real-World Application
Analyze and interpret data to determine similarities and differences in findings. (Human genetic traits)	Represent and represent numerical data using bar graphs.	Close Reading of the "Real" Genes to identify patterns in the text and apply specific text-based evidence.	SEP.4 Analyzing and Interpreting Data, SEP.5 Using Mathematics and Computational Thinking	7.SP.3, 6.2	CR: Active Site
Developing and using models to describe the ways in which genetic information is passed from parents to offspring and how genetic variation among organisms in a species is maintained. (Punnett Square)	Describe patterns in the number of offspring with each trait.	Science Words: Identify and define Punnett square, model, genotype, phenotype, allele, and assemble a Punnett square.	MS-LS3-1, 2	6.2 SL.5	MP: Active Site
Planning and conducting investigations individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much and accuracy of data needed to produce reliable measurement and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.	Make sense of problems and persevere in solving them.	Evaluate Effective Presentation and Analysis: Create a range of conclusions and make predictions with known validity.	SEP.3	MP.1	PE: Active Site