Unit 7: The Milky Way and Galaxies

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **1-2 weeks**
Status: **Published**

Summary

The Milky Way is our home galaxy, but there are many other galaxies with similarities and differences. Students will learn about the shapes of galaxies, how galaxies formed, and how human understanding of galaxies has changed over time. Students will also study new topics in astrophysics such as dark matter and dark energy.

Revision Date: July 2024

9.4.12.CI	Creativity and Innovation
1	Make sense of problems and persevere in solving them
P.1	Act as a responsible and contributing community members and employee.
P.3	Consider the environmental, social and economic impacts of decisions.
2	Reason abstractly and quantitatively
P.4	Demonstrate creativity and innovation.
P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
3	Construct viable arguments and critique the reasoning of others
P.6	Model integrity, ethical leadership and effective management.
4	Model with mathematics
P.7	Plan education and career paths aligned to personal goals.
9.4.12.CT	Critical Thinking and Problem-solving
P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
8	Look for and express regularity in repeated reasoning
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.
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.
HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
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.
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.
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.
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.
HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
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.
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.
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.
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.

Essential Questions/Enduring Understandings

Essential Questions:

How is our Milky Way Galaxy different from and similar to other galaxies?

What discoveries from the Hubble and James Webb Space Telescopes have helped scientists further expand our knowledge of galaxies and our universe?

How do astronomers determine the size and shape of our Milky Way Galaxy?

Enduring Understandings:

Our galaxy is one of several billions of galaxies in our universe.

Galaxies exist in clusters [neighborhoods] and are believed to mimic the same rotational motion as planets orbiting stars.

Perceptions that galaxies are small are based on night sky observations, but on the contrary, they are extremely large and very far away.

To explain the rotational motion of galaxies, it is believed a massive black hole exists at the center of every galaxy.

Objectives

Students will know how interstellar dust affects our observations of stars and the Milky Way.

Students will know what happens when galaxies collide.

Students will know how to measure the distances to nearby galaxies.

Students will know what Hubble's Law is and what consequences it has for the future of the universe.

Students will know the various shapes of galaxies and their evolutionary stages.

Students will be skilled at identifying the parts of our Milky Way galaxy.

Students will be skilled at comparing galactic properties to our Milky Way galaxy.

Students will be skilled at calculating the size of the Milky Way.

Learning Plan

ISLE Cycle - The Milky Way and its shape and size

ISLE Cycle - Dark Matter and Dark Energy

Activity - Classifying galaxies

Math Activity - Measuring Galaxies

Assessment

Formative Assessment:

Do Now &/or Start-Up Questions, Discussions

Understanding during ISLE Cycle activities

Diagram labeling of the Milky Way Galaxy

Categorizing the shapes of galaxies based on the Tuning Fork Illustration on the evolution of galaxies

Exit Ticket Submission

Alternative Assessment:

Mathematical application of Hubble's Law & the Hubble constant to measure the distances to galaxies and the expanding universe.

Poster Creation detailing various shapes of galaxies

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