Science Curriculum Map 2019

updated 9/1/2019

	Pacing Guide	
Unit	Topics	Time Frame
1	Introduction and Origins of Astronomy	1-2 Weeks
2	The Moon and its Phases	2 Weeks
3	Telescopes and Light	2 Weeks
4	The Sun and Solar System	2-3 Weeks
5	Stars: Stellar Birth, Evolution, and Death	3-4 Weeks
6	Galaxies	2 Weeks
7	Cosmology and Gravity/Relativity	2 Weeks
8	Exoplanets and Astrobiology	2 Weeks

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Unit Summary 1: Introduction to and Origins of Astronomy

In this unit students will be introduced to Astronomy and why it is studied. We will focus on where Earth is located in the Universe and how the sky around us moves. As we look at how the Earth moves and the sky moves around us we will look at the constellations, the seasons, and Earth's climate. Students will also study how humanity realized that we live on a planet moving through space. Students will study the astronomical models of Aristotle, Copernicus, Tycho, Kepler, and Galileo and how they changed our understanding of nature.

Essential Questions:

Where is Earth in the Universe?
How does human history fit into the history of the Universe?
Why Study Astronomy?
How does the sky appear to change and move in daily and annual cycles?
What causes seasons?
How did classical philosophers describe Earth's place in the Universe?
How did Copernicus revise those ancient ideas?
How did Kepler discover the laws of planetary motion?
How did Galileo's observations support the Copernican model?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
Introduction to Astronomy Unit Test
Astronomer Timeline Project

Labs (25%)
Scaling the Solar System Lab
Insolation and Seasons Lab
Ancient Astronomy Lab
Galileo's Bench: Seasons and the Ecliptic

Practice (Homework/Classwork = 10%)
Current Events Weekly

Quizzes (15%)
Quiz on correct timeline of major astronomers or match the astronomer to their discoveries.

Resources

Astonomy Photo of the Day

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2: Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
	RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	MP.4: Model with mathematics	9.3.ST-ET.2 Display and communicate STEM information.
	WHST.11-12.9: Draw evidence from informational texts to support analysis, reflection, and research.	HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	
		HSN-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.	
		HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	
		HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.	
		HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	

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	HSA-CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Sample Measurable Objectives for Lesson Planning
Describe our solar system and the objects within our solar system
Describe the milky way galaxy
Explain how and when the universe began
Explain why Astronomy is studied
Describe the celestial objects that can be observed in the night sky
Explain why Earth experiences distinct seasons
Describe ancient views of the solar system
Describe the astronomical contributions of Copernicus, Kepler and Galileo

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Unit Summary 2: The Moon

In this unit students will study the brightest object in our sky, the Moon. Students will study the way in which the moon moves throughout the sky changing its appearance in a monthly cycle. Students will also study how the motion of the moon producing different types of eclipses and how eclipses are predicted.

Essential Questions:

Why does the moon go through phases?
What causes a lunar eclipse?
What causes a solar eclipse?
How can eclipses by predicted?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
The Moon Unit Test

Labs (25%)
Phases of the Moon Lab
Galileo's Bench: Moon Observation

Practice (Homework/Classwork = 10%)
Current Events Weekly
Quizzes (15%)
Quiz on Moon Phases

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Chasing the Moon

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2: Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
		HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	9.3.ST-ET.2 Display and communicate STEM information.
		HSN-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.	
		HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	

Sample Measurable Objectives for Lesson Planning
Name the phases of the moon and identify them based on a model.
Identify which phase of the moon occurs in various locations in its orbit around Earth.
Describe why only one side of the moon is visible from Earth.
Describe what causes lunar and solar eclipses
Differentiate between a total and partial solar eclipse
Explain why lunar eclipses are much more common than solar eclipses

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Unit Summary 3: Light and the Telescope

In this unit students will explore the nature of light and the electromagnetic spectrum. Students will learn how modern astronomers used telescopes and the concepts of light to view distant stars and galaxies that cannot be visited by astronomers. We will also study the construction of telescopes and how lenses and mirrors form the images created by telescopes. Students will also learn about telescopes that capture invisible forms of light like radio waves and x-rays.

Essential Questions:

What is light?
How do telescopes work?
Why are some telescopes located in space?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
Light and the Telescope Unit Test

Labs (25%)
Building a Telescope Lab
Galileo's Bench: Lens Parameters
Galileo's Bench: Magnification and Power

Practice (Homework/Classwork = 10%)
Current Events Weekly
Quizzes (15%)
Electromagnetic Spectrum Quiz
Telescope Quiz

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	Mathematics - MP.2: Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
HS-PS4-5: Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	WHST.9-12.2:Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS4-5)	MP.4: Model with mathematics.	9.3.ST-ET.2 Display and communicate STEM information.
		HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context	
		HSA-SSE.B.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	
		HSA.CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	

Sample Measurable Objectives for Lesson Planning
Describe light as a particle and a wave
Describe the electromagnetic spectrum
Define different types of telescopes
Describe how different types of telescopes are used
Investigate the construction of telescopes

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Unit Summary 4: The Sun and Our Solar System

In this unit students will study the closest star in our sky, the Sun. The Sun moves throughout the sky making it appear as if it is moving and it moves up and down in the sky as the seasons change. It also undergoes changes in its surface that can only be observed in a telescope. These changes lead to a phenomenon called "Space weather" which can have profound effects on the earth and the artificial satellites that orbit it. Students will also study the 8 planets and other celestial objects in our solar system.

Essential Questions:

What can be learned about the Sun by observing its surface and atmosphere?
What are the dark sunspots?
Why does the Sun go through 11 and 22 year cycles of activity ?
What is the source of the Sun's energy?
What objects make up our solar system?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
The Sun and Our Solar System Unit Test

Labs (25%)
Sun Lab
Galileo's Bench: Planetary Observation
Galileo's Bench: Solar Rotation

Practice (Homework/Classwork = 10%)
Socratic Seminar: When is a planet not a planet?
Current Events Weekly

Quizzes (15%)
Sun Quiz
Solar System Quiz

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
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.	RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2: Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.		MP.4: Model with mathematics	9.3.ST-ET.2 Display and communicate STEM information.
		HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	
		HSN-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling	
		HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	
		HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.	
		HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	
		HSA-CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations	

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Sample Measurable Objectives for Lesson Planning
Classify objects in the solar system as star, gas giants, terrestrial or other
Represent the size of the planets and solar system in a model
Identify the layers of a Sun (star)
Evaluate the effects of the solar wind and sunspots on the earth
Identify the planets in our solar system
Describe the properties of the different planets

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Unit Summary 5: Stars

In this unit students will study the stars. Students will study the existence of stars because of hydrostatic equilibrium between the outward push of light and the inward pull of gravity. We will also study the method of classifying stars with similar properties. and the way stars change throughout their lifetime; they are born, use up their fuel and die. Students will also study categories of stars that are very different from "normal stars" such as neutron stars, white dwarves, and black holes.

Essential Questions:

How do stars form?
What is the evidence that stars are forming now?
How do stars maintain their stability?
How do stars make energy?
Why is there a main sequence of star properties?
Why is there a relationship between the masses and luminosities of main-sequence stars?
How does a star's structure change as it uses up its hydrogen fuel?
What is the evidence that stars actually evolve?
How will the Sun and other low mass stars die?
What happens if an evolving star is a member of a close binary system?
How do massive stars die?
What do we learn about stellar evolution from observations of supernova remnants?
What will be the ultimate fare of earth as the Sun evolves and dies?
How does theory predict the existence of neutron stars?
What is the evidence that neutron stars really exist?
How does theory predict the existence of black holes?
What is the evidence that black holes really exist?

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Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
Stars Unit Test
Stellar Evolution Flow Chart Project

Labs (25%)
Galileo's Bench: Stellarium and Observation
Galileo's Bench: Spectroscopy

Practice (Homework/Classwork = 10%)
Current Events

Quizzes (15%)
Stellar Evolution Quiz
Star Categories Quiz

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-ESS1-2: 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.	RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2: Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.	WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	9.3.ST-ET.2 Display and communicate STEM information.
HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the	SL.11-12.4: Present claims and findings, emphasizing salient points in a focused, coherent	HSN-Q.A.2: Define appropriate quantities for the purpose of	

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sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation.	manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	descriptive modeling.
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.		HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
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.		HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.
		HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
		HSA-CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Sample Measurable Objectives for Lesson Planning
Describe how stars are formed
Explain how stars produce energy
Classify stars based on their properties
Describe the evolution of stars
Identify the parts of a stars life cycle
Produce a flow chart of stellar evolution

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Unit Summary 6: Galaxies

In this unit students will study galaxies. Students will learn that collections of stars called galaxies are held together by gravitational attraction. Students will learn the method of classifying galaxies with similar properties. We will study how stars undergo changes over their time due to the changes in stellar populations and interactions between nearby galaxies. We will also study the existence of supermassive black holes in the centers of galaxies which affect the observable characteristics of galaxies.

Essential Questions:

What is the evidence that we live in a galaxy?
what is the evidence that our Milky Way Galaxy is a spiral galaxy?
What are the arms of the Milky Way and other spiral galaxies?
What is in the nucleus of the Milky Way Galaxy?
How did the Milky Way Galaxy form and evolve?
What are the different types of galaxies?
How do astronomers determine distances, sizes, luminosities, and masses of galaxies?
Do other galaxies contain central supermassive black holes and dark matter as does our Galaxy?
How do collisions and interactions affect the evolution of galaxies?
How did supermassive black holes in the galactic nuclei form, evolve and affect their host galaxies?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
Galaxy Unit Test
Milky Way Project

Labs (25%)
Galaxy Classification Inquiry Lab

Practice (Homework/Classwork = 10%)
Current Events Weekly
Galaxy Zoo

Quizzes (15%)
Galaxy Classification Quiz

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NASA
Galaxy Zoo
National Geographic

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-ESS1-2: 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.	RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2: Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
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.	WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	9.3.ST-ET.2 Display and communicate STEM information.
	SL.11-12.4: Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	HSN-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.	
		HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	
		HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.	
		HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	
		HSA-CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	

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Sample Measurable Objectives for Lesson Planning
Analyze the structure and history of the universe
Identify galaxy types
Illustrate the Sun's location in the Milky Way.
Describe the history of the universe as explained by the big bang theory
Evaluate the evidence explaining the big bang theory
Explain redshift and blueshift of light
Explain the expansion of the universe.

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Unit Summary 7: Cosmology and Relativity

In this unit, students will study current theoretical models of the cosmos. They will learn the latest information on the limits and extent of the universe, the formation of the universe and the "Big Bang" theory and the ultimate fate of the universe at the end of time. In addition students will find out that gravity is not a force but a curvature of space-time in accordance with the general theory of relativity and that the speed of light is a cosmic speed limit in accord with the special theory of relativity.

Essential Questions:

Does the Universe have an edge and a center?
What is the evidence that the Universe began with a "Big Bang" and expansion from a hot dense state?
How has the Universe evolved and what will be its fate?
What does the general theory of relativity tell us about gravity?
What does the special theory of relativity tell us about the speed of light?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
Cosmology and Relativity Unit Test
Cosmic Calendar Project

Labs (25%)
Watch "Interstellar" (only the part that details how time passes in gravity wells) and discuss it.
Discuss the "Twin Paradox" Use PBS documentary on Einstein to illustrate.
Gravity and Free Fall activity in "Galilieo's Bench"

Practice (Homework/Classwork = 10%)
Activity 26 in "Learning Astronomy by Doing Astronomy" Finding the Expansion Rate of the Universe
Activity 27 in "Learning Astronomy by Doing Astronomy" A Cosmic Calendar
Think Like Einstein

Quiz (15%)
Quiz on Modern Cosomology

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PBS

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NASA
"Learning Astronomy by Doing Astronomy" Stacy Palen and Ana M Larson
Zooniverse
Galileo's Bench

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STANDARDS for Learning Targets			
NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-ESS1-2. 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.	RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2 Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
	WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	9.3.ST-ET.2 Display and communicate STEM information.
		HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.	
		HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	
		HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.	
		HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	
		HSA-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving	

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equations.

Sample Measurable Objectives for Lesson Planning
Explain how the universe formed from a super dense singularity
Describe how the cosmic backround radiation is proof of the “Big Bang”
Describe the theory of general relativity
Explain the consequences of the speed of light being a constant.
Describe how general relativity explains how Gravity works.

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Unit Summary 8: Exoplanets and Astrobiology

In this unit students will study Exoplanets and the life that may exist on them. Beginning in 1995, observable evidence indicated that there were planets orbiting stars outside the solar system. Students will study several methods we now have to discover exoplanets and how it will soon be possible to directly observe these planets. We will describe the properties of these planets and the bias of the detection methods. Students will also learn the requirements of a planet to sustain life and the properties of the "Habitable Zone". We will also study the possibility of intelligent life existing in other places in the universe.

Essential Questions:

What are the observed properties of a solar system?
What is the theory for the origin of Solar Systems that explains the observed properties?
How do planets form?
What do astronomers know about extrasolar planets that are orbiting other stars?
Is there life on these extrasolar planets?
How can we determine if there is life on these extrasolar planets?
Is there intelligent life on other planets?

Evidence of Learning:

Summative/Performance Assessments (Tests/Projects = 50%)
Unit Test on Exoplanets and Astrobiology

Labs (25%)
Exploring Exoplanets with Kepler Activity | NASA/JPL Edu Link to Kepler Activity

Practice (Homework/Classwork = 10%)
Socratic Seminar: Space Exploration
Finding Exoplanets (NASA)

Quizzes (15%)
Quizzes on Exoplanet discovery and elements of Astrobiology

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NASA
"Learning Astronomy by Doing Astronomy" Stacy Palen and Ana M Larson
Zooniverse
Galileo's Bench

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NGSS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2 Reason abstractly and quantitatively.	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
		MP.4 Model with mathematics.	9.3.ST-ET.2 Display and communicate STEM information.
		HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	
		HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.	
		HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	
		HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.	
		HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	
		HSA-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	

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Sample Measurable Objectives for Lesson Planning
Describe the properties of a solar system
Describe the origin of the solar system
Describe how planets are formed
Explain the requirements of a planet to sustain life

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