Timeline ->	*Quarter Three (12 lessons)*
Guiding Questions	***Science:*** What can we use to demonstrate the properties of light? How do lenses and mirrors work to view items very far away? How do telescopes work? How can we describe the moon's physical characteristics? How do the interactions between the earth, moon and sun produce night and day? What are the different components in our solar system? How far away are they? How can we use the scientific method to investigate: the properties of light, moonlight and sunlight, the earth's rotation (day & night), astronomical units, properties of other bodies in our solar system? ***Language Arts:*** What can we learn about our universe by reading? How can we write to show the steps we have used in the scientific method? How can adjectives help our written science descriptions? ***Math:*** How can Venn diagrams help sort items that are the same or different? How is a bar graph drawn to show totals with provided data? What conclusions can we draw from the data portrayed by the graph? How can we use addition, subtraction and grouping (multiplication) to solve problems? How are ratios used to solve problems? **Social Studies:** How can we use information to solve a societal problem? ***Art:*** How can we draw/illustrate and label sketches for a science notebook? How can we create 3-D models to showcase our solar system?
General Learner Outcomes	***GLO#1: Self-Directed Learner:*** Students will create ……. ***GLO#2: Community Contributor:*** Students will share ***GLO#3: Complex Thinker:*** Students will use their problem solving, math and writing skills to investigate ***GLO#4: Quality Producer:*** Students will create a final product (poster/diorama/model) that illustrates the

	Students will create math products (graphs, data tables, charts) that enhance posters and diorama. ***GLO#5: Effective Communicator:*** Students will listen, discuss and record information from their different lessons through oral, written and math pieces that illustrate concepts they have learned about. Students will orally share with younger students their final products.
Assessments	Formative and summative textbook assessments. Constructed response (math, language arts, science) that is based on the unit ideas and concepts A summative product rubric will be used to assess the final science poster/diorama/model that each student produces. The rubric criteria will include assessment of the presentation of concepts learned, as well as the written and drawn presentation quality. Oral communication of final project

Standards & Benchmarks

Big Idea(s) / Major Understanding(s): *Students will understand that...*
Astronomers use large telescopes to make new discoveries possible over vast distances in space (e.g., sun flares, moon craters, Mars' rivers, distant stars).

Light travels in a straight line until it hits an object.

Light is reflected and refracted through mirrors and lenses in a telescope.

The solar system includes the sun, planets and their moons, comets, large space rocks called asteroids and small space rocks called meteoroids.

The sun is the largest object or star at the center of the solar system. The planets, comets, asteroids and meteoroids orbit or follow a pathway around the sun.
The Earth is the third planet from the sun, similar in size to the other inner planets (Mercury, Venus, and Mars).

During Earth's rotation, the side facing the sun has day and the side facing away from the sun has night.

HCPS III Benchmarks:

◊ *5.2.1* **Unifying Concepts and Themes**
Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world

◊ *5.6.3* **Waves**
Compare what happens to light when it is reflected, refracted, and absorbed

·5.8.1 **Earth in the Solar System**
Describe the relationship (size and distance) of Earth to other components in the solar system

·5.8.2 **Earth in the Solar System**
Describe examples of what astronomers have discovered using telescopes

·5.8.3 **Earth in the Solar System**
Explain that the planets orbit the sun and that the moon orbits the Earth

·5.8.4 **Earth in the Solar System**
Demonstrate that day and night are caused by the rotation of the Earth on its axis

Sample Performance Rubrics

Topic	Scientific Inquiry		
Benchmark SC.5.1.1	Identify the variables in scientific investigations and recognize the importance of controlling variables in scientific experiments		
Sample Performance Assessment (SPA)	The student: Identifies variables in a scientific investigation and describes why the variables need to be controlled.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Identify the variables in scientific investigations, explain why variables need to be controlled, and give examples of how to control variables in scientific experiments	Identify the variables in scientific investigations and recognize the importance of controlling variables in scientific experiments	Identify, with assistance, the variables in a scientific investigation or the importance of controlling the variables	Recognize, with much assistance, the variables in scientific investigations
Benchmark SC.5.1.2	Formulate and defend conclusions based on evidence		
Sample Performance Assessment (SPA)	The student: Presents findings and conclusions to classmates and answers questions using evidence from the investigation.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Formulate and defend conclusions that are supported by detailed evidence and make connections to the real world	Formulate and defend conclusions that are supported by evidence	Make conclusions that are partially supported by evidence	Make conclusions without evidence

Benchmark SC.5.2.1	Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world		
Sample Performance Assessment (SPA)	The student: Uses geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, or stories as models to represent features of objects, events, or processes in the real world.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Consistently select and use models and simulations to effectively represent and investigate features of objects, events, and processes in the real world	Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world	With assistance, use models or simulations to represent features of objects, events, or processes in the real world	Recognize examples of models or simulations that can be used to represent features of objects, events, or processes
Benchmark SC.5.6.3	Compare what happens to light when it is reflected, refracted, and absorbed		
Sample Performance Assessment (SPA)	The student: Demonstrates and compares how light can be reflected (e.g., by a mirror), refracted (e.g., by a lens), and absorbed (e.g., by an object).		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Compare and give examples of the ways light can be reflected, refracted, and absorbed	Compare what happens to light when it is reflected, refracted, and absorbed	Describe that light is reflected, refracted, and absorbed	Provide examples of the reflection, refraction, or absorption of light
Benchmark SC.5.8.1	Describe the relationship (size and distance) of Earth to other components in the solar system		
Sample Performance Assessment (SPA)	The student: Creates a model or diagram showing the sizes of and distance between components of Earth and the other components of the solar system.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Compare and contrast the relationship of Earth to the other components in the solar system	Describe the relationship (size and distance) of Earth to other components in the solar system	Identify a few differences between Earth and other components in the solar system	Provide a few examples of the relationship (size and distance) of Earth to other components in the solar system
Benchmark SC.5.8.2	Describe examples of what astronomers have discovered using telescopes		
Sample Performance Assessment (SPA)	The student: Describes the information gathered by astronomers on Mauna Kea.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Explain the significance of what astronomers have discovered using telescopes	Describe examples of what astronomers have discovered using telescopes	Recognize examples of what astronomers have discovered using telescopes	Name a discovery that astronomers have made using telescopes
Benchmark SC.5.8.3	Explain that the planets orbit the sun and that the moon orbits the Earth		
Sample Performance Assessment (SPA)	The student: Explains that the Earth and other planets orbit the sun and the moon orbits around the Earth.		

Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Demonstrate and explain how the planets orbit the sun and how the moon orbits the Earth	Explain that the planets orbit the sun and that the moon orbits the Earth	Recognize that the planets orbit the sun and that the moon orbits the Earth	Recall that planets orbit the sun or that the moon orbits the Earth
Benchmark SC.5.8.4	Demonstrate that day and night are caused by the rotation of the Earth on its axis		
Sample Performance Assessment (SPA)	The student: Demonstrates how day and night are caused by Earth's rotation on its axis.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Use a model to demonstrate and explain how the rotation of the Earth on its axis causes day and night	Demonstrate the rotation of the Earth on its axis and how it causes day and night	Provide an example that the Earth rotates on its axis and causes day and night	Recognize that the Earth rotates on its axis and causes day and night

Lessons Summary

Lesson Day #	Lesson Title	What students will be able to know, do & understand
Apple in the Dark Birthday Candles		**Pre-assessment** (formative)
JTTU	Radiation Jars	Can use baby food jars/plastic cups and thermometers Have students paint with tempura the outside of the jars, then conduct experiment.
JTTU lesson	Investigating Light Waves & Colors	
AIMS	Catch a Ray	Using mirrors to create a pathway in the classroom
AIMS	What Does a Mirror Do?	Reflection
JTTU lesson OPTIONAL	Mirrors & Lenses	Used in 8th grade - sample
400 Years of Astronomical Telescopes		This needs a specific poster BUT I gave you a comic book called "History of Telescopes"
HARCOURT TEXT – UNIT D – CHAPTER 13		
	FIRST LIGHT (30 min)	DVD – "First Light" introduction to our own environment in regards to astronomy Richard will obtain donated copies for all teachers Writing – pro/con paper with supported perspective
Harcourt Text Lesson 1	Earth, Moon, and Beyond	Lesson Quick Study (RS 82-83) – Note***Q 3 – night, day and twilight (not exactly 3 months of dark) Vocabulary Power RS81 OPTIONAL: TRANSPARENCY IS 35 Use Time/Space

		Relationship
Lesson 1	Experiment	Lab Manual LM131-133 "Moving Through Space"
AIMS		Rubber-band booklet on Famous Astronomers
AIMS	How Far to the Sun	Teacher's Guide pp.3-4 Student's worksheets pp. 5-7
Harcourt Text Lesson 2	Earth & Moon Comparisons	Lesson Quick Study RS 84-85 Lesson 2 – How Do Earth and the Moon Compare? TRANSPARENCY RS 36 Compare & Contrast (Venn diagram – have students bring in "cool whip" lid for this purpose)
HarcourtText Lesson 2	Experiment (optional)	LM 134-136 "Making Craters"
Lesson 3	Solar System	Solar System charts - "Pluto" issue with dwarf planets Achieve 3000 articles: How Many Planets?, Pluto's Day in the Sun, Next Stop Pluto… RS 86-87 Lesson 3 – What Makes Up Our Solar System?
Harcourt Text Lesson 3	Solar System Experiment	"Make a Telescope" LM 137-139…..($5 telescope kits) Then do an experiment with just lenses and mirrors so they start to build an understanding about how light is bent, refracted and used to see things that are far away
AIMS	Lining up the Planets	Rubber-band Solar System Game
AIMS	Can You Planet? Planetary Facts	Rubber-band Planetary Fact booklets Graphing Venn together Venn individual (assessment)
AIMS	Weight in Space	OPTIONAL – create some make believe characters that have provided weights and students can choose to use their own weight or a character's weight
AIMS	Planetary Trivia	OPTIONAL
AIMS	Galactic Games	OPTIONAL
AIMS	Phone Home	OPTIONAL
	Assessment	Could use the Chapter 13 test ALSO consider using the Performance Assessment (which includes rubric etc.)
Post assessment		
Discovery ED	John Pack	Various readings – about day/night, seasons, revolution
AIMS	Space Capsule	What things from Earth would you send to exemplify our planet? Students individually take home the ideas & come back w/at least 3 ideas of what should be in the capsule. Brainstorm as a class a list of items in small groups and share the list. Survey class for the results. Use Connected Learning questions as a post-assessment.