# Grade 06 - Unit 05- Astronomy (njdoe gr unit 6)

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **30 days - March - April - May**
Status: **Published**

## Stage 1: Desired Results

## Unit Overview/ Rationale

Gravity and nuclear forces cause our universe to expand and evolve.

## Standards & Indicators

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| Generate and analyze evidence (through simulations or long term investigations) to explain why the Sun's apparent motion acr the course of a year. (ESS1.B) *[Clarification Statement: This SLO is based on a disciplinary core idea found in the Framework. It is the following SLO.]* |
| **Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun ar** *[Clarification Statement: Examples of models can be physical, graphical, or conceptual.]* **(MS-ESS1-1)** |
| Develop and use a model that shows how gravity causes smaller objects to orbit around larger objects at increasing scales, inclu force of the sun causes the planets and other bodies to orbit around it holding together the solar system. (ESS1.A; ESS1.B) *[Clar SLO is based on disciplinary core ideas found in the Framework. It is included as a scaffold to the following SLO.]* |
| **Analyze and interpret data to determine scale properties of objects in the solar system.** *[Clarification Statement: Emphasis is from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar sys scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not ir about properties of the planets and other solar system bodies.]* **(MS-ESS1-3)** |
| **Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** *[Clarification Sta model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within t can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptua proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does n of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]* **(MS-ESS1-2)** |

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| SCI.6-8.MS-ESS1-3.ESS1.B | Earth and the Solar System |
| SCI.6-8.MS-ESS1-1.1 | Patterns |
| SCI.6-8.MS-ESS1-2 | Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. |
| SCI.6-8.MS-ESS1-2.ESS1.A | The Universe and Its Stars |

SCI.6-8.MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

## Big Ideas - Students will understand that...

At the beginning of the unit, students will develop and use mathematical, physical, graphical or conceptual models to describe the cyclical patterns of lunar phases, eclipses of the sun and moon, and seasons. Students can use mathematics to create scale models of the solar system to investigate relative distances between the planets and their orbits around the sun or to represent the distance from the sun to the Earth during different Earth seasons. Students can also use physical models to examine the phases of the moon using a light source and a moon model to view the various shapes of the moon as it orbits the earth. Students may also keep a lunar calendar for one month and analyze the results by looking for differences and patterns. Using a model of the sun, Earth, and moon, students can view the positions of these planetary objects during a solar or lunar eclipse.

To investigate seasons, students can simulate the position and tilt of the Earth as it revolves around the sun, using computer simulations, hands-on models, and videos.Students will explore, through the development and use of models, the role of the force of gravity in explaining the motions within our solar system and the Milky Way Galaxy. As part of their study of the solar system and its components, including the sun, planets and their moons, and asteroids, they will use models and examine simulations to determine how gravity holds these systems together. To visualize how gravity pulls objects down towards its center, students can experiment with dropping spheres of different masses but of the same diameter as a way to determine that gravity acts on both objects and that they drop at the same rate. If technology is available, students can measure the acceleration of the objects as they fall from various heights. Students will be able to determine that the objects speed up as they fall, therefore proving that a force is acting on them. If motion detectors are not available for student use, they could observe these using simulations.

After students have had opportunities to participate in the investigations, they should prepare multimedia visual displays the present their findings. As part of their presentation, students will use mathematical models or simulations that show the relationship between relative sizes of objects in the solar system and the size of the gravitational force that is being exerted on the object. They should be able to compare and contrast the weight of an object if it were on the surface of different-sized planets that have very different masses. Students will gather evidence that every object in the solar system is attracted to every other object in the solar system with a force that is related to the mass of the objects and the distance between the objects. They should extend this understanding of gravity to explain why objects in the solar system do not simply flow away from each other. Students should also make connections between their understanding of the force of gravity and the formation of the solar system from a cloud of dust and gas. As part of their mathematical model of the solar system, students will use variables to represent numbers and write expressions when solving a problem involving the role of gravity in the motions within galaxies and within the solar system. The variable can represent an unknown number or any number in a specified set.

Students will also analyze and interpret data from Earth-based instruments to determine the scale properties of objects within our solar system. Examples of models that students could use include physical (such as the analogy of distance along a football field or computer visualization of elliptical orbits), conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state). Students can construct scale models of the solar system that will help them visualize relative sizes of objects in the system as well as distances between objects. Students can use graphs or tables to make comparisons between the size and gravitational pull of the planets and their moons.

## Essential Questions - What provocative questions will foster inquiry and transfer of learning

*What pattern in the Earth–sun–moon system can be used to explain lunar phases, eclipses of the sun and moon, and seasons?*

*What is the role of gravity in the motions within galaxies and the solar system?*

*What are the scale properties of objects in the solar system?*

## Content - Students will know…

- Patterns in the apparent motion of the sun, moon, and stars in the sky can be observed, described, predicted, and explained with models.
- The Earth and solar system model of the solar system can explain eclipses of the sun and the moon.
- Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun.

- The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.
- Patterns can be used to identify cause-and-effect relationships that exist in the apparent motion of the sun, moon, and stars in the sky.
- Gravity plays a role in the motions within galaxies and the solar system.
- Gravity is the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them.
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids, that are held in orbit around the sun by its gravitational pull on them.
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.
- Models can be used to represent the role of gravity in the motions and interactions within galaxies and the solar system.
- Objects in the solar system have scale properties.
- Data from Earth-based instruments, space-based telescopes, and spacecraft can be used to determine similarities and differences among solar system objects.
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.
- Time, space, and energy phenomena in the solar system can be observed at various scales, using models to study systems that are too large.

## Skills - Students will be able to…

1. Students will develop and use a physical, graphical, or conceptual model to describe patterns in the apparent motion of the sun, moon, and stars in the sky.
2. Students develop and use models to explain the relationship between the tilt of Earth's axis and seasons.
3. Analyze and interpret data to determine similarities and differences among objects in the solar system.

## Stage 2: Assessment Evidence

### Assessment

End of Unit Assessments (multiple choice and constructed responses)

Mini-lab Performance-based Assessments (rubrics)

Essential Questions Responses

Page Keeley Science Probes (formative assessments)

Chapter 20 assessments including tests and quizzes

Chapter 21 assessments including tests and quizzes

Chapter 22 assessments including tests and quizzes

MiniLabs

Inquiry Labs

Essential Question Responses

Lab activity worksheets

Performance Assessment: Scale Model of Solar System

## Stage 3: Learning Plan

### Learning Activities

***Modifications for all students:***

- Structure lessons around questions that are authentic, relate to students' interests, social/family background

and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

**Accommodations for students with IEPs and learning difficulties**:

-visual sentence frames using academic vocabulary for discussion

-graphic organizers and sentence starters

-graphic organizers for comparing and contrasting of rays in the electromagnetic spectrum and how the stars are layered

-Provided interactive guided reading notes with visuals for students to take closed notes as teacher presents information

-Model using slinky to show the frequency vs wavelengths for the rays in the electromagnetic spectrum

-Use visuals to show important vocabulary for students to make connections

-Draw pictures for vocabulary words for visual learners

-Have students share their text to text, text to world, and text to self connections

-One on one teacher support for comprehension and fluency

- Modeling and scaffolding to highlight specific vocabulary and key concepts

-close reading chapters/chunks

-rereading key sections for fluency and comprehension

-colored overylays and reading windows to reduce visual distractions

-Sentence starters for writing assignments

-Vocabulary word banks and strategies (Say it, Define it, Act it)

-Think alouds and Think-Pair-Share

-Modified tests/quizzes

-Use of technology to allow students to be read the text, allow for highlighter use, and stop students to think about key ideas/concepts

-End of Unit project of research project/poster display of student choice of stars. Graphic organizers for note taking with guiding questions and room for sketching ideas

-Foldable to show students wavelengths/frequency of the electromagnetic spcectrum, describe the frequency/wavelength of each ray, and tell uses for each ray.

**For ELL students:**

-visuals for vocabulary

-word wall

-additional word work such as illustrating vocabulary and playing vocabulary games

-partner reading

-choral reading

-Think-aloud while modeling writing

-analyze sample summaries before writing

-color-coded sticky notes for close reading to identify which sticky notes pertain to vocabulary

-questions about text, etc.

-When students make an error in speaking, answer or restate what they said using the correct form without drawing

attention to the mistake.

## Resources

***Glencoe Earth and Space iScience, McGraw Hill, 2012***

***Chapter 19***

***Chapter 20***

***Chapter 21***

***Chapter 22***

**ConnectEd.Mcgraw-hill.com resources**

**NJDOE Model Curriculum**

**Quizlet.com**

**Padlet.com**

**ebackpack.com**

**Page Keeley Science Probes**

**Brain POP shorts**

**Various literature selections connected to science topics**

## Unit Reflections & Teacher Notes