

# Unit 1: Earth's Place in the Universe

Content Area: **Science**  
Course(s):  
Time Period: **Marking Period 1**  
Length: **10-12 weeks**  
Status: **Published**

## Brief Summary of Unit

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Introduction: As a result of this investigation, students will develop a deeper understanding of the basic properties and defining characteristics of the sun, the planets, the moons, and the other orbiting bodies of our solar system. Students will study the forces that keep orbiting bodies in orbit, including experiences with the relationships between mass and gravity, and the roles of gravity and inertia. They will learn the properties of stars, the role of nebula, and the characteristics of galaxies and other space phenomena. The students will develop an understanding of the concept of scale, the uses of scale models, space distances via measurements, and the role of technology in space exploration. They will gain experience interpreting diagrams and data tables. The crosscutting concepts of systems, system models, patterns and cause and effect will provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models. Students are also expected to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Revision Date: July 2020

LA.RL.6.1	Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RL.6.2	Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LA.RL.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.
LA.RL.6.6	Explain how an author develops the point of view of the narrator or speaker in a text.
LA.RL.6.7	Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they “see” and “hear” when reading the text to what they perceive when they listen or watch.
LA.RL.6.8	(Not applicable to literature)
PFL.9.1.2.PB.2	Explain why an individual would choose to save money.
PFL.9.1.2.RM.1	Describe how valuable items might be damaged or lost and ways to protect them.
LA.L.6.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibly from a range of strategies.
SCI.MS-ESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
SCI.MS.ESS1.B	Earth and the Solar System
SCI.MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

SCI.MS.ESS1.A	The Universe and Its Stars
SCI.MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.
SCI.MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
SCI.MS.ETS1.B	Developing Possible Solutions
CS.6-8.8.1.8.AP.4	Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.
CS.6-8.8.1.8.AP.6	Refine a solution that meets users' needs by incorporating feedback from team members and users.
CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
CS.6-8.8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
WRK.9.2.8.CAP.2	Develop a plan that includes information about career areas of interest.
WRK.9.2.8.CAP.3	Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
WRK.9.2.8.CAP.4	Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
WRK.9.2.8.CAP.10	Evaluate how careers have evolved regionally, nationally, and globally.
TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.TL.1	Identify the basic features of a digital tool and explain the purpose of the tool (e.g., 8.2.2.ED.1).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.
TECH.9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).

## **Essential Questions**

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### **Essential Questions**

How does planning for a scientific investigation of the universe address data collection that is valid, reliable, ethical and repeatable?

Why is it important to collect data about the performance of a proposed tool, object, process or system under a range of conditions?

What is the universe, and what is Earth's place in it?

What is the universe, and what goes on in the stars?

What are the predictable patterns caused by Earth's movement in the solar system?

## **Students Will Know/ Students Will be Skilled at**

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Student will know about scientific inquiry and scientific skills.

Students will know the difference between inferences and observations.

Students will know how to create and test a hypothesis through experimental design.

Students will know the steps of the scientific method in detail.

Students will know how to distinguish between the dependent variable, the independent variable, and the controls in different experiments.

Students will be skilled at analyzing, interpreting, and creating graphs.

Students will know how to design and conduct an experiment that includes a problem, hypothesis, materials, procedure, observations, results, and a conclusion.

Students will know how to write a lab report for an experiment, clearly discussing the problem, solution, hypothesis, results, and conclusion.

Students will know the units used for measurements in the metric system.

Students will know how to compare and contrast the imperial system and the metric system.

Students will know how to convert units between the imperial and metric system.

Students will be skilled at measuring length using cm, mm, and m.

Students will be skilled at measuring volume using a graduated cylinder.

Students will be skilled at measuring mass using a triple-beam balance and an electronic balance.

Students will know how to distinguish between a star, planet, moon, solar system, galaxy, and universe.

Students will know how our solar system, Earth & moon were all created.

Students will know how and why we experience day and night on Earth.

Students will be skilled at comparing and contrasting rotation and revolution.

Students will be skilled at drawing a Sun-Earth diagram to show why seasons occur.

Students will know how to explain Earth's rotation and revolution impact Earth's cycles.

Students will know how to demonstrate and explain how the moon rotates and revolves around the Earth.

Students will be skilled at illustrating the 8 phases of the moon & explain why they occur.

Students will know how to demonstrate & explain why a solar eclipse occurs and why a lunar eclipse occurs.

Students will be skilled at drawing a Sun-Moon-Earth diagram to explain eclipses.

Students will know how to explain why tides occur & how they are affected by the moon.

Students will know how to describe key characteristics that make the 8 planets in our solar system unique.

## **Learning Plan**

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Lemon of a Lesson: students make observations and demonstrate the importance of detailed observations and demonstrate why incomplete observations cause problems. Students complete lab activity in class, along with lab handout including analysis and discussion questions. Share answers with class.

Observation vs. Inference: students view a series of pictures and make observations only. Share/discuss. Then students will make inferences based on their initial observations. Share/discuss and repeat with 3 different pictures. Students will then view fossil evidence on the smart board and make as many observations as possible. Homework: to create a short story based on the fossil evidence and observations from class

Paper Planes Practice Lab: Students will perform a practice lab to help teach them the basics parts of lab procedure. Students will build a paper airplane, test the flight, modify the airplane and then test again. While going through these steps students will be asked questions about the fairness of the lab and certain things that should be done to make the lab a success. Students will fill in a lab worksheet during class and then attempt to define lab related words based on what they experienced during the lab. *Class Discussion: How can we make a lab "fair"? What steps should we always follow when setting up a lab? Why should we conduct many trials of the same lab? How do variables and constants affect a lab?*

Hypothesis Writing: Does anyone know what a hypothesis is? Give examples and demonstrate on the board. Students will take notes on how to write a good hypothesis. Students will practice as a class with examples on the smart board and go over answers together. Partner work: practice worksheet with hypothesis examples. Students will share answers. Homework: Writing a good hypothesis worksheet

Mixing Solutions Lab: Students will perform a lab to put into practice the skills and terms learned in the previous practice lab, class discussion, and practice with hypothesis writing. Students will conduct a lab to test the effect of calcium chloride on water temperature. Students will follow all lab procedures, write a hypothesis and collect and analyze data. Students will complete a lab handout while performing a lab, as well as complete analysis questions when they are done. *Class Discussion: Use the analysis questions to start class discussion about the lab and to introduce the idea of possible sources of error.*

Tennis Ball Assessment: Students are given the scenario of figuring out which brand of tennis ball bounces the highest. Students will then write up a lab in their binders that includes a problem, hypothesis, materials, and procedure. Teacher will walk around and informally assess students. When complete, students will share/check their labs with their table to see if they did everything correctly.

Variables: Demonstration- re-do tennis ball experiment from yesterday and have students pick out variables. (things that are different amongst the test groups) Examples on smartboard, students discuss answers and take

notes on how to identify dependent and independent variables. Partner Work - Practice worksheets identifying variables. Student share answers with class. Homework: Identifying variables in a hypothesis and in an experiment.

Putting it all together: students will practice each skill separately again as a review and share with class. Students will then practice writing a hypothesis, picking out the variables and the controls. Share with class. Add procedure & data collection to experiment layout. Homework: writing a hypothesis, identifying controls and variables.

Conclusion: What is a conclusion? What goes in one? Why is the conclusion important? Discuss answers and take notes on what must be included in a lab report conclusion. Students will make a bulleted list on key points for writing a good conclusion. Skill Practice – students will be given experiment scenarios and they will have to add an appropriate conclusion to the scenarios. Go over conclusions in class & have students make corrections. Repeat, but this time have partners correct each others conclusions as teacher walks around to facilitate. Homework: practice conclusion writing

### **SGO Pre-Assessment: Graphing**

Graphing: Review pre-assessment, students will make corrections and keep in their binder as a reference. Discuss graphing requirements and take notes. Hand out graphing rubric, for all graphs, and have students review and keep in binder to use every time they make a graph. Group work – students will work with table to construct a practice graph and go over with class when finished. Homework: graphing practice.

Tennis Ball Lab: students will work in partners to complete lab. Each student will squeeze a tennis ball to test grip strength over time. Students will record each others' data and complete lab handout with questions. Students will create a double line graph with both students' data. Review lab and graphing.

Bean Lab: Students will work in partners to create, set-up, and perform a lab experiment in class. Students will collect and analyze data and then write a complete lab report. Students will test the effects of a substance of their choice on bean growth. This lab spans 3 days, including preparation, set-up, data collection and some class time to begin writing the report.

Introduction to Metric System: students complete a brainteaser to introduce metric system and get an “ah-ha” moment about the ease of the metric system over U.S. system. Students will then complete the back of the worksheet on their own first & then brainstorm with their table for more answers. Class discussion on different units of measurement for U.S. versus Metric systems.

View powerpoint, discuss, & take notes on the Metric System to go along with activity. End of powerpoint: practice activity to assess knowledge via smartboard.

Worksheet (homework) – practice with metric units and measurements, \*\*peer check with table, answers eventually on board for student support\*\*

Measurement Skills: Teacher will demonstrate the use of a Ruler, a graduated cylinder, a triple beam balance and an electric balance. Students will first practice each skill via worksheets and then complete a lab activity to practice hands-on skills with each tool.

Length Lab: Teacher will demonstrate how to accurately measure to the nearest decimal using a ruler & meter stick. Students will follow along on their own ruler & participate in questioning. Students will then complete a basic worksheet on using a ruler and measuring to the nearest decimal.

Then students will complete lab activity. Students will measure the length of different objects around the room & record their observations. Students will be assessed on their accuracy and may work with/help their table

partners. **\*\*more advanced students instruct lower level\*\***

Volume Lab: Teacher will demonstrate how to accurately measure volume using a graduated cylinder. Students will follow along on the graduated cylinder per table & participate in questioning. Students will be advised to look closely and make observations about the water in the graduated cylinder, which should lead to a discussion about the meniscus. Students will then complete a worksheet to ensure basic understanding of measurement using a graduated cylinder.

Then students will complete lab activity. Students will practice measuring out different amounts of liquid as well as finding the volume of different objects using a graduated cylinder. Students will be assessed on their accuracy & will participate in class discussion on the lab. **\*\*use of graduated cylinders, and scales will be used by all students\*\***

Mass Lab: Teacher will demonstrate how to accurately measure mass using a triple beam balance and an electronic balance. Students will follow along on the balances at their tables & participate in questioning. Students who catch on quickly will be asked to guide & teach the other students at their table. Students will complete a worksheet to ensure basic understanding before moving on to the lab activity.

Students will practice measuring mass using a triple beam balance and an electric balance. Students will be asked to find the mass of different solid objects as well as liquid, using both types of balances. Students will be assessed on their accuracy & will participate in class discussion on the lab **\*\*lesson extension for enrichment: extra mystery to solve using the balances, all students will complete basic lab\*\***

Prior Knowledge Check: Without any discussion or background information students will fill out a chart trying to define some key terms in this unit. (solar system, galaxy, star, moon, planet, universe) They will work with their table and then share their answers with the class in a class discussion. Corrections will be made and the correct definitions will be discussed and filled in.

Demonstration – Students will first brainstorm with their table to come up with the explanation for day and night. Share answers with class.

Demonstration #1 - using a lamp and a ball as the Earth, ball will be spun and moved to show day and night

Demonstration #2 - using a lamp for the sun, students make a circle around the lamp and spin according to the time of day, assuming they are the Earth (midnight, noon, dawn, dusk)

Notes/Discussion - Take notes on Earth's rotation and the cause of day and night

Demonstration – Students will first brainstorm with their table to come up with the explanation for seasons. Share answers with class.

Demonstration - using a lamp and a big beach ball as the Earth (labeled hemispheres) the ball will be moved and tilted to show seasons

Assign practice worksheet to reinforce concepts. *(most likely homework)*

Notes/Discussion - Take notes on Earth's revolution and the cause of the seasons

\*notes copied & given to students as needed\*

Discussion/Venn Diagram: Students will fill out a Venn Diagram on their own, comparing and contrasting rotation vs. revolution. Class discussion will follow and the students answers will be put on the board. A review demonstration involving the students will follow.

## Demonstration/Notes/Discussion/Diagram –

Demonstration - using a lamp as the sun, a globe as the Earth and a small ball as the moon; the moon & Earth will be moved to show the shadows from the sun and reason for the phases of the moon.

-Students will draw and label a phases of the moon diagram. Students will take notes & discuss why we see different phases. Assign practice worksheet to reinforce concepts. (*most likely homework*)

\*notes copied & given to students as needed\*\*peer check with table for all learners, answers on board for student support\*\*

OREO Lab Activity – students will be given Oreos and toothpicks and have to demonstrate the 8 phases of the moon. They will complete a guiding worksheet and analysis questions that go along with the activity.

Eclipse Demonstration – Lamp as sun, globe as Earth & ball as moon. The Earth and moon will be moved around the sun to show how/when shadows are cast on the Earth to create a solar eclipse and shadows are cast on the moon to create a lunar eclipse. Assign practice worksheet to reinforce concepts. (*most likely homework*)

Tide Demonstration – students will act as the moon and Earth, a string will represent the movement of Earth's water according to the moon's gravity

Notes/Discussion - Take notes on Solar and Lunar Eclipses and tides

\*notes copied & given to students as needed\*

Planet Research Presentation – Students will work in groups of 3 and research one of the 8 planets in our solar system. They will create a Google Slide presentation with all of the information they researched, according to their rubric. They will present their research to the class. Each individual student will write a paragraph summarizing what he or she has learned about their planet.

Stations Activity – Students will rotate through 6 stations reviewing the solar system. Station 1: Quizlet, Station 2: Heads Up #1, Station 3: Tic Tac Toe, Station 4: Matching, Station 5: Heads Up #2, Station 6: Quizizz

## **Evidence/Performance Tasks**

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Science courses are designed to promote skill attainment. Student progression and pace through which they proceed through the performance tasks is based on their affinity for and ability to reach skill attainment. The teacher will determine formative and summative skill attainment; alternative assessments will be incorporated for each student based on their strengths and challenges.

### **Formative Assessments:**

- Worksheets
- Do Nows
- Exit Tickets
- Class Discussions

Quizzes:

- scientific method
- metric conversion
- graphing
- Solar vs Lunar Eclipse
- Phases of the Moon

**Bench Marks:**

*Formal Lab Reports*

- Tennis Ball Lab
- Paper Plane Lab
- Calcium Chloride Lab
- Bean Lab

*SGO*

- *Graphing*
- *Scientifid Method*

**Alternative:**

- Observation vs Inference Short Story
- Planet Research Project
- Length Lab
- Mass Lab
- Volume Lab
- Oreo Lab

**Summative:**

*Unit Tests:*

- Scientific Method
- Metric
- Space

**Materials**

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McGraw-Hill Earth Science iScience Textbooks (ISBN#: 978-0-07-888003-2)

Guided note packets (teacher developed)

Technology (student & teacher laptops, SmartBoard, document camera)

PowerPoints

Workshets/notes

Youtube/Netflix

Virtual Activities

Safety Equipment

Lab goggles

Graduated cylinders varying in mL

Meter stick

electronic balance

triple-beam balance

ruler

food coloring

Calcium chloride

test tubes

thermometer

tennis balls

oreos

toothpicks

plastic cups

pinto beans

plastic bags

duct tape

paper towels

beakers