Nov. Unit 2 A: Formation of our Solar System

Content Area: **Science**
Course(s):
Time Period: **November**
Length: **3 Weeks**
Status: **Published**

Unit Overview

In this concept, you will learn how the sun and planets took shape. According to the Nebular Theory, the Sun, the planets, and all many other celestial bodies in our Solar System originated from a large mass of gas and dust that coalesced 4.6 billion years ago.

Enduring Understandings

Lesson Objectives

By the end of this lesson, students should be able to:

- Describe the formation of our solar system.
- Describe the orbits of the planets in our solar system.
- Explain the relationship between a planet's distance from the sun, the length of a year, and duration of its orbit.
- Explain why the inner and outer planets have different sizes and compositions.

Essential Questions

- **Overarching Question**
    - What is the universe, and what is Earth's place in it?
- **Focus Question**
    - What are the predictable patterns caused by Earth's movement in the solar system?
- **Lesson Questions**
    - How did the solar system form?
    - Why do the inner and outer planets in our solar system have different sizes and compositions?
    - How does the gravitational pull between the sun and a planet affect the planet's orbit?
- **Can You Explain?**

- How does the way in which the solar system formed explain the orbits, sizes, and compositions of the planets?

Instructional Strategies & Learning Activities

The Five Es

- The Five E Instructional Model

  Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- Engage (45–90 minutes)

  Students learn about nebula, which provide most of the material from which the solar system formed. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (90 minutes)

  Students investigate questions about the formation of our solar system through videos and reading passages. Students complete an Exploration to compare and contrast the planets of our solar system.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of the connection between the formation of the solar system and the orbits, sizes, and compositions of the planets.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of the formation of our solar system as they use math to visualize the solar system and investigate tools and topics of astronomical research about the solar system.

- Evaluate (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Projects: Space mission technology presentation and the planet presentation.

Integration of Career Exploration, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
TECH.9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
TECH.9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.TL.4	Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3).
TECH.9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
TECH.9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
	Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
	An individual’s strengths, lifestyle goals, choices, and interests affect employment and income.
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
	Multiple solutions often exist to solve a problem.
	Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

Technolgy and Design Integration

Technology is fully integrated with the Discovery Techbook

TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.10	Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Differentiation

Struggling Students

1. Help students create a storyboard that shows the main steps in the formation of the solar system. Students can use an illustration and short caption for each step.

ELL

1. Encourage students to keep a list of key vocabulary and terms with which they are not familiar. Students can include a short definition and the term in their native language.
2. Allow students to complete the Spanish version of the Exploration How Big Is Big? Then, pair English-language learners with a native English speaker to complete the student worksheet in English.

Accelerated Students

1. Have students read the passage Our Future in Space, which ties in directly to the Connection to Students' Lives section.
2. Have students create their own imaginary solar systems. Students should consider the number, size, and compositions of the planets, as well as their orbital shapes and sizes.
3. Have students calculate the size differences of different objects in the Exploration How Big Is Big? that were not specifically stated.

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

IEP and 504 Accommodations will be utilized.

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

See assessments located in the unit link above.

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

See D.E. assessments located in the unit link above. Teacher-made summative assessment will be used as well.

Instructional Materials

See materials located in Unit above.

Standards

SCI.MS.ESS1.A	The Universe and Its Stars
SCI.MS.ESS1.B	Earth and the Solar System
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	Earth’s Place 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.

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Developing and Using Models

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.

Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).