Unit Overview	
Content Area: Earth and Space Science	
Unit Title: Earth Surface Processes and Space Systems: Stars and the Solar System	**Unit:** 1
Target Course/Grade Level: 5	**Timeline:**

Unit Summary:

How do individual communities use science ideas to protect Earth's resources and environment?
In this unit of study, students describe and graph data to provide evidence about the distribution of water on Earth. The crosscutting concepts of scale, proportion, quantity and systems, and systems models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in using mathematics and computational thinking and in obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-ESS2-2 and 5-ESS3-1

How do individual communities use science ideas to protect Earth's resources and environment?
In this unit of study, students are able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact. The crosscutting concept of systems and system models is called out as an organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in developing and using models, obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-ESS2-1 and 5-ESS3-1.

What patterns do we notice when observing the sky?
In this unit of study, students develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns, cause and effect, and scale, proportion, and quantity are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in analyzing and interpreting data and engaging in argument from evidence. Students are also expected to use these practices to demonstrate an understanding of the core ideas.
This unit is based on 5-PS2-1, 5-ESS1-1, and 5-ESS1-2.

Learning Targets	
NJSLS-Science	
5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
5-ESS1-1	Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

ESS2.A: Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

PS2.B: Types of Interactions

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)

ESS1.A: The Universe and its Stars

- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)

ESS1.B: Earth and the Solar System

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)

Science and Engineering Practices

Using Mathematics and Computational Thinking:

- Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)

Obtaining, Evaluating, and Communicating Information:
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)

Developing and Using Models:
- Develop a model using an example to describe a scientific principle. (5-ESS2-1)

Engaging in Argument from Evidence:
- Support an argument with evidence, data, or a model. (5-PS2-1), (5-ESS1-1)

Analyzing and Interpreting Data:
- Represent data in graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)

NJSLS Connections

Primary Interdisciplinary Connections:

English Language Arts/Literacy:
- Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1) RI.5.1
- Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS1-1) RI.5.7
- Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1) RI.5.8
- Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1) RI.5.9
- Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1) W5.8
- Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1) W.5.9
- Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1), (5-ESS1-1) W.5.1
- Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2) SL.5.5

Mathematics:
- Reason abstractly and quantitatively. (5-ESS2-2), (5-ESS3-1) MP.2
- Model with mathematics. (5-ESS2-2), (5-ESS3-1) MP.4
- Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1) 5.NBT.A.2
- Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1) 5.G.A.2

Unit Essential Questions	Unit Understandings
	• Standard units are used to measure and describe physical

1. Where is water found on the Earth? What percentage of the Earth's water is freshwater? 2. How do individual communities use science ideas to protect Earth's resources and environment? 3. In what ways do the geosphere, biosphere, hydrosphere, and/or atmosphere interact? 4. How do individual communities use science ideas to protect Earth's resources and environment? 5. What effect does Earth's gravitational force have on objects? 6. What effect does the relative distance from Earth have on the apparent brightness of the sun and other stars? 7. What patterns do we notice when observing the sky?	quantities such as weight and volume. ● Nearly all of Earth's available water is in the ocean. ● Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. ● A system can be described in terms of its components and their interactions. ● Science findings are limited to questions that can be answered with empirical evidence. ● Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. ● Individuals and communities are doing things to help protect Earth's resources and environments. ● A system can be described in terms of its components and their interactions. ● Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). ● The Earth's major systems interact in multiple ways to affect Earth's surface materials and processes. ● The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. ● Winds and clouds in the atmosphere interact with landforms to determine patterns of weather. ● A system can be described in terms of its components and their interactions. ● Science findings are limited to questions that can be answered with empirical evidence. ● Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. ● Individuals and communities are doing things to help protect Earth's resources and environments. ● Cause-and-effect relationships are routinely identified and used to explain change. ● The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. ● Natural objects exist from the very small to the immensely large. ● The sun is a star that appears larger and brighter than other stars because it is closer. ● Stars range greatly in their distance from Earth. ● Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena. ● The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its north and south poles, cause observable patterns. These include: ● Day and night ● Daily changes in the length and direction of shadows

	• Different positions of the sun, moon, and stars at different times of the day, month, and year.

Unit Learning Targets (Outcomes) – Formative Assessment

Students who understand the concepts are able to …

- Describe physical quantities, such as weight and volume, in standard units.
- Describe and graph quantities such as area and volume to address scientific questions.
- Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
- Describe a system in terms of its components and interactions.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- Describe a system in terms of its components and interactions.
- Develop a model using an example to describe a scientific principle.
- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Examples could include:
  - ✓ The influence of oceans on ecosystems, landform shape, and climate.
  - ✓ The influence of the atmosphere on landforms and ecosystems through weather and climate.
  - ✓ The influence of mountain ranges on the wind and clouds in the atmosphere.
- Describe a system in terms of its components and interactions.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- Identify cause-and-effect relationships in order to explain change.
- Support an argument with evidence, data, or a model.
- Support an argument that the gravitational force exerted by Earth on objects is directed down. ("Down" is a local description of the direction that points toward the center of the spherical Earth.)
- Support an argument with evidence, data, or a model.
- Support an argument that differences in the apparent brightness of the sun compared to that of other stars is due to their relative distances from Earth.
- Sort, classify, communicate, and analyze simple rates of change for natural phenomena using similarities and differences in patterns.
- Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.

- Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. Examples of patterns could include:
  - ✓ The position and motion of Earth with respect to the sun.
  - ✓ Selected stars that are visible only in particular months.

Cross Cutting Concepts:

Scale, Proportion, and Quantity
- Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2)

Systems and System Models
- A system can be described in terms of its components and their interactions. (5-ESS3-1)

Science Addresses Questions About the Natural and Material World
- Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)

Cause and Effect
- Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Scale, Proportion, and Quantity
- Natural objects exist from the very small to the immensely large. (5-ESS1-1)

Patterns
- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)

Integration of Technology: chromebooks, interactive whiteboard, videos

Technology Resources:

Knowing Science website
http://knowingscience.com/teacherresources

Opportunities for Differentiation:

Differentiation and support tips, which includes suggestions for ELL, struggling students, and accelerated students are available in the Above and Beyond section of the Knowing Science teacher manual.

Teacher Notes:

Career Ready Practices: *In this unit the following career ready practices are addressed*
CRP1: Act as a reasonable and contributing citizen and employee
CRP2: Apply appropriate academic and technical skills
CRP3: Attend to personal health and financial well-being
CRP4: Communicate clearly and effectively and with reason
CRP5: Consider the environmental, social and economic impacts of decisions
CRP6: Demonstrate creativity and innovation
CRP7: Employ valid and reliable research strategies

CRP8: Utilize critical thinking to make sense of problems and persevere in solving them
CRP9: Model integrity, ethical leadership and effective management
CRP10: Plan education and career paths aligned to personal goals
CRP11: Use technology to enhance productivity
CRP12: Work productively in teams while using cultural global competence

Prior Learning-

By the end of Grade 1, students understand that:

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.
- Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

By the end of Grade 2, students understand that:

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.
- Wind and water can change the shape of the land.

By the end of Grade 3, students understand that:

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.
- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)
- Objects in contact exert forces on each other.
- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

By the end of Grade 4, students understand that:

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.
- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.
- Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

Evidence of Learning

Summative Assessment

What is a System

1. Written responses from activity sheets may be used as informal assessments to determine students' understanding of science content concepts and nonfiction comprehension skills.
2. Rubric

3. Earth and Space Science Unit Test

Earth's Systems

1. Engaging in discussion with others around a particular concept leads students to a greater understanding of concept. This leads to the ability to construct explanations, and lays the foundation for scientific "argument from evidence." Clear communication of procedures, observations, and the sharing of data are essential in any community of learners, but especially the scientific community.
2. Rubric
3. Earth and Space Science Unit Test

The Hydrosphere

1. Engaging in discussion with others around a particular concept leads students to a greater understanding of concept. This leads to the ability to construct explanations, and lays the foundation for scientific "argument from evidence." Clear communication of procedures, observations, and the sharing of data are essential in any community of learners, but especially the scientific community.
2. Rubric
3. Earth and Space Science Unit Test

Kids as Curators

1. Ask students to write an explanatory paragraph on why models are useful in science. The paragraph should have an introductory statement, specific reasons for the usefulness of models, and a concluding statement.
2. Rubric

Human Impact on Earth's Systems

1. Engaging in discussion with others around a particular concept leads students to a greater understanding of concept. This leads to the ability to construct explanations, and lays the foundation for scientific "argument from evidence." Clear communication of procedures, observations, and the sharing of data are essential in any community of learners, but especially the scientific community.
2. Content reading comprehension may be used as informal assessment.
3. Rubric
4. Earth and Space Science Unit Test

Which Way is Down

1. Have students write a paragraph that compares their initial understanding of gravity at the beginning of this lesson and their understanding of gravity now. Students must include evidence from experiments or history to illustrate their current understanding of gravity, and a concluding sentence.
2. Have students drop objects from a range of heights. Students design an experiment that tests whether dropping objects of different masses from different heights will produce results that differ from those achieved in previous lesson.
3. Rubric
4. Earth and Space Science Unit Test

Our Sun, the Star!

1. Engaging in discussion with others around a particular concept leads students to a greater understanding of concept. This leads to the ability to construct explanations, and lays the foundation for scientific "argument from evidence." Clear communication of procedures,

observations, and the sharing of data are essential in any community of learners, but especially the scientific community.
2. Content reading comprehension may be used as informal assessment.
3. Rubric
4. Earth and Space Science Unit Test

Predictable Patterns

1. Engaging in discussion with others around a particular concept leads students to a greater understanding of concept. This leads to the ability to construct explanations, and lays the foundation for scientific "argument from evidence." Clear communication of procedures, observations, and the sharing of data are essential in any community of learners, but especially the scientific community.
2. Content reading comprehension may be used as informal assessment.
3. Rubric
4. Earth and Space Science Unit Test

How Far Away Are the Sun and Other Stars?

1. Have students consider the following statement: 'The sun appears hotter and brighter than other stars because it is so close to the Earth." Do they agree with this statement? Have them answer the question in their science notebooks, using evidence and examples to support their answers.
2. Challenge students to make a different model that explores the relative distance of the Earth from the same ten stars mentioned in this lesson.
3. Rubric
4. Earth and Space Science Unit Test

Equipment needed: Whiteboard, laptops, headphones, and hands-on materials for lessons

Teacher Instructional Resources (Hyperlinks):

Global Water Distribution: In this lesson sequence, students predict and model the availability of water on Earth and discuss methods that can be used to purify and conserve this critical resource. They also assess how much water they and their families typically use, and think about ways to reduce their water usage. Finally, students explore different techniques being employed for water management around the world, including the use of dams to create reservoirs.

Simulating an Oil Spill to Understand Environmental Impact: This 8 minute instructional video provides a model for teachers to follow of a week long investigation of oil spills and the environmental impact they have on shorelines and creatures. Students take on the task of cleaning up a simulated oil spill. Educator uses the 5E curriculum model to engage students with fiction and non-fiction texts before exploring methods that simulate an oil spill and its cleanup. Video demonstrates the key portions of the activity and models appropriate teacher questioning and interactions with the students.

NOAA What-a-Cycle: Through role-playing as a particle of water, students gain an understanding of the complexity of the movement of water through earth's systems. Stations are set-up for nine different water reservoirs associated with the water cycle. On each turn, students roll the dice at each station and either stay in place or move to a different location. Students track their unique journey through the water cycle to later share and discuss the strengths and limitations of the game as a model for the movement of water through Earth's systems.

Shower Curtain Watershed: What is a watershed? How do our actions affect the health of a watershed? Students explore these questions by analyzing pictures and identifying watershed features.

Students then make a watershed model using a plastic shower curtain, a spray bottle of water and themselves or classroom objects The objectives of the lesson are to: a) Identify nonliving and living features found in a watershed. b) Understand how human activities can affect watersheds.

Gravity and Falling Objects: PBS Learning Media lesson where students investigate the force of gravity and how all objects, regardless of mass, fall to the ground at the same rate.

NASA's Solar System Exploration website contains several resources that educators and students can use to make sense of the night sky.

Our Super Star: PBS Learning Media lesson that guides students to understand the basic facts about the Sun, model the mechanics of day and night, and use solar energy to make a tasty treat.

Modifications for ELL's, Special Education, 504, and Gifted and Talented Students:

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

· 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.

· Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

ACTIVITIES	**MATERIALS**
Unit 1: Earth and Space Science	
1.1 What is a System?	
Session 1: (40-50 minutes) How does a system work?	• Sticky notes, at least 2 per student • Activity Sheet 1: The "School" System

Session 2: (40-50 minutes) What is the difference between static and dynamic systems?	• Activity Sheet 2: Systems Folktale • Activity Sheet 3: Static and Dynamic Systems
Session 3: (40-50 minutes) How do Earth's systems interact?	• Activity Sheet 4: Dynamic Living Systems
1.2 Earth's Systems	
Session 1: (30-40 minutes) What are the characteristics of Earth's four main systems?	• Activity Sheet 1: Earth Systems Part 1 • Sticky notes
Session 2: (30-40 minutes) How do Earth's systems interact?	• Activity Sheet 2: Earth Systems Part 2
Session 3: (30-40 minutes) How do Earth systems interact in our local area?	• Activity Sheet 3: Local Spheres
Session 4: (40-50 minutes) How can Earth systems be further observed at a local study site?	• Activity Sheet 4: Illustrating Connections • Optional: colored pencils
Session 5: (30-40 minutes) Why is the hydrosphere the most important system on Earth?	• Activity Sheet 5: The Hydrosphere • Water Distribution Kit
1.3 The Hydrosphere	
Session 1: (40-50 minutes) What do we already know about the hydrosphere? How can we represent the distribution of water on Earth?	• Activity Sheet 1: Ocean Layers
Session 2: (40-50 minutes) Where does the hydrosphere interact with the Earth's other spheres?	• Activity Sheet 1: Ocean Layers
Sessions 3-5: (40-50 minutes per session) What can we learn about the intersections of the hydrosphere with Earth's other systems?	• Access to print or digital sources for research
Session 6: (40-50 minutes) How can we change our notes into a summary of what we have learned?	• Activity Sheet 2: Writing a Summary • Citation guide
1.4 Kids as Curators	
Session 1: (40-50 minutes) What is a museum? What is an exhibit? What are some important elements of a museum?	• From the Principal's Desk, one for each student (see online Teacher Resources)

	• Activity Sheet 1: Museum Observation Guide • Students' summaries from Lesson 1.3: The Hydrosphere
Session 2: (40-50 minutes) What are the requirements for completing a museum exhibit? How can we develop an exhibit that communicates information and engages visitors?	• Activity Sheet 2: Design Challenge and Criteria, one for each student • Activity Sheet 3: Preliminary Planning for Your Exhibit, one for each student • Computer bookmarked to http://kidcurators.com

Session 3: (40-50 minutes) What is a model? How do models communicate information? What is an interactive feature in an exhibit?	• Wave Maker model
	  ○ Sand
	  ○ Sloped tray
	• Activity Sheet 4: Sand on the Beach
	• Activity Sheet 5: Detailed Plan for Building an Interactive Display
	• Students' summaries from Lesson 1.3: The Hydrosphere

Sessions 4-6: (40-45 minutes per session) What do we need to do to complete our exhibit? Can we practice being docents?	• Activity Sheet 5: Detailed Plan for Building and Interactive Display, from previous session • Glue • Students' summaries from Lesson 1.3: The Hydrosphere
Session 7: (40-50 minutes) What steps do we need to take to set up our exhibit?	• Exhibition space
Session 8: (40-50 minutes) What have we learned?	• Evaluation of Exhibit rubric
1.5 Human Impact on Earth's Systems	
Session 1: (30-40 minutes) What are Earth's material resources?	• Activity Sheet 1: Earth's Material Resources • Activity Sheet 2: Material Resources Notes • Sticky notes
Session 2: (30-40 minutes) What are Earth's energy resources?	• Sheet 3: Earth's Energy Resources

	• Activity Sheet 4: Energy Resources Notes
Session 3: (30-40 minutes) How do humans dispose of their waste?	• Activity Sheet 5: The Problem with Trash
Session 4: (50-60 minutes) What is our lunchtime waste? (optional)	• Activity Sheet 6: Lunchtime at the Landfill Part 1 • Activity Sheet 7: Lunchtime at the Landfill Part 2 • Disposable gloves • Bucket, 5 gal. • Scale • Drop cloth • 6 large plastic trash bags
Session 5: (30-40 minutes) How do humans pollute Earth's systems?	• Activity Sheet 8: Pollution
Session 6: (50-60 minutes) How do water treatment facilities work?	• Activity Sheet 9: Water Treatment for Beginners • Filtering Kit • Safety glasses, one pair for each student • Disposable gloves, for anyone handling the alum • 1 stirring rod • 500 ml glass beaker • Measuring spoons • Measuring cups • "Swamp water" • Knife or sharp scissors (for teacher use only)
Session 7: (30-40 minutes) How can we protect our material and energy resources?	• Activity 10: Protecting our Resources • Activity 11: 4 Rs Thinking • Activity 12: Plastics Hunt (optional homework) • Optional: samples of as many types of plastics as possible
Session 8: (50-60 minutes) How can an oil spill be cleaned up?	• Activity Sheet 13: Oil Spill • Oil Spill Kit • Measuring spoons • Water
Session 9+: (30-40 minutes) How can we promote human responsibility for resource protection?	• Activity 14: Resources Protection Project
2.1 Which Way is Down?	

Session 1: (40-45 minutes) What do you already know about gravity? What happens when you drop an object?	• Which Way is Down? Kit • Activity Sheet 1: Bungee Jumpers
Session 2: (40-45 minutes) Does the size of an object make a difference in how quickly it falls? How does forward motion affect falling objects?	• Gravity Kit • Digital scale • Safety glasses • Camcorder or cell phone video cameras (optional)
Session 3: (40-45 minutes) How have our ideas changed about gravity? How do ideas develop and change in science?	• Digital scale • Several sheets of copy paper
Session 4: (40-45 minutes) How have our ideas changed about gravity? How do ideas develop and change in science?	• Which Way is Down Kit?
2.2 Our Sun, the Star!	
Session 1: (30-40 minutes) How does our sun compare to other stars?	• Activity Sheet 1: Starring the Sun! • Sticky notes
Session 2: (30-40 minutes) Why do stars appear so different in the night sky?	• Activity Sheet 2: Sagittarius Star Cloud • Activity Sheet 3: Relative Star Sizes and Colors • Distance vs. Size Kit • Meter sticks, 1 for each group
2.3 Predictable Pattern	
Session 1: (30-40 minutes) What predictable patterns result from Earth's rotation and revolution?	• Activity Sheet 1: Earth Travels • Activity Sheet 2: Sunrise, Sunset
Session 2: (40-50 minutes) How do shadow patterns give clues about Earth's rotation and revolution?	• Activity Sheet 3: Shadows and Time • Sundial Kit • Meter Stick • Compass • Glue • Marker • Small, similar-sized stones(optional) • Scissors • Printouts of sundial base and gnomon templates
Session 3: (30-40 minutes) How do moon phases indicate the passage of time?	• Activity Sheet 4: The Moon

	• Activity Sheet 5: Lunar Calendar • Activity Sheet 6: Moon Phases Project (optional) • Moon Phases Kit
Session 4: (40-45 minutes) How do star patterns change with seasons?	• Activity Sheet 7: Constellations • Activity Sheet 8: Make an Astrolabe • Scissors
2.4 How Far Away Are the Sun and Other Stars?	
Session 1: (40-45 minutes) What are the properties of a typical star like the sun? How can the sun be safely observed?	• Activity Sheet 1: Our Sun is a Star
Session 2: (40-45 minutes) Why is the sun seen during the day, but other stars are only visible at night? What is a light year and why is that measure used as a unit of distance for stars?	• Visible/Invisible Stars Kit • Copy Paper • Activity Sheet 2: What is a Light Year?
Session 3: (40-45 minutes) How can we use data to develop a model of the relative distances of ten stars from the Earth?	• Activity Sheet 3: Building a Model • Rulers • Meter Sticks • Stars Distance Kit • Glue