

## Unit Plan

1. This unit plan is designed for a third-grade science class.
2. The theme of this unit is “Solar System Explorers”. The unit takes what students already have learned about landforms and resources on our planet and expands it to why Earth supports life and the characteristics of other objects in the solar system. It will address the difference between stars, planets, moons and other objects in the solar system as well as characteristics such as size and distance as well as scale of the solar system.
3. Overview of learning objectives.  
Students will be able to:
  - Create models of the solar system including orbits and positions
  - Identify the planets in solar system
  - Identify the planets’ positions in order and in relation to the Sun
  - Create models of the Sun, Earth, Moon system
  - The location of the Earth in the solar system influences the systems on Earth
4. Adaptations planned for diverse learners: Within each lesson are suggested vocabulary words to be displayed in the classroom in order to facilitate learning of students who speak English as a second language, or ELLs.
5. Student Assessment Strategies: Many lessons begin or end with entry and exit tickets, on sticky notes, to use as informal assessments of the daily learning and student outcomes. In addition, the students will be recording their evidence from investigations in science notebooks, while also writing their conclusions. Questioning will also be used by the teacher to assess student learning in the moment and to drive instruction. A final summative performance task will be included following the ending lesson, to close out the unit and assess learning.
6. Standards addressed in this unit: **Texas Essential Knowledge and Skills**

**Science***Scientific Investigation and Reasoning*

3.2 The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to:

- (A) plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world.
- (B) collect data by observing and measuring using the metric system and recognize differences between observed and measured data.
- (C) construct maps, graphic organizers, simple tables, charts, and bar graphs using tools and current technology to organize, examine, and evaluate measured data.
- (D) analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations.
- (E) demonstrate that repeated investigations may increase the reliability of results.
- (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.

3.3 The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to:

- (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student.
- (B) draw inferences and evaluate accuracy of product claims found in advertisements and labels such as for toys and food.
- (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

3.4 The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

- (A) collect, record, and analyze information using tools, including microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, magnets, notebooks, sound recorders, timing devices, including clocks and stopwatches.
- (B) use safety equipment as appropriate, including safety goggles and gloves.

#### *Force, Motion, and Energy*

- (C) observe forces such as magnetism and gravity acting on objects.

#### *Earth and Space*

3.8 The student knows that there are recognizable patterns in the natural world and among objects in the sky. The student is expected to:

- (B) describe and illustrate the Sun as a star composed of gases that provides light and heat energy for the water cycle.
- (C) construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions.
- (D) identify the planets in Earth's solar system and their position in relation to the Sun.

#### **Math**

3.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

3.4B round to the nearest 10 or 100 or use compatible numbers to estimate solutions to addition and subtraction problems

3.4E represent multiplication facts by using a variety of approaches such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line, and skip counting

3.8A summarize a data set with multiple categories using a frequency table, dot plot, pictograph, or bar graph with scaled intervals

#### **Social Studies**

3.5B use a scale to determine the distance between places on maps and globes

3.5D create and interpret maps of places and regions that contain map elements, including a title, compass rose, legend, scale, and grid system

## Lesson 1- Blast Off!

### Time Allotted: 55 minutes

- 1. Pre Assessment:** Ask, *Why do people explore space?*  
Have students discuss with shoulder partners, then share out whole-group. (They're curious, to discover new things, to know if there is life outside of Earth, to know if humans can live somewhere else.)  
Ask, *What do you know about space exploration/What have humans discovered/What are some discoveries or firsts that you already know about?* (Humans have landed on the moon, people may live on Mars one day, etc.)  
  
\*Information from the pre-assessment should be used to guide the learning experience for your students.
2. Show students the video, [What's Next for NASA](#). Ask, *What did you notice? What did you wonder?*  
Have students record this information in a table in their Science Notebooks, then use the Give One, Get One strategy to debrief their findings with classmates. Debrief whole-group. Record this information on a class chart.
3. If it has not come up already, tell the class that there are people who think that the study of space is important because they would like to explore the possibility of living somewhere other than Earth. Ask, *What makes the Earth such a special place to live?* (Oxygen, fresh water, soil, plants, animals).
4. Have students turn and talk about whether humans could live elsewhere in the solar system.
5. Tell the class that you have received a press release from a private investor who wants to be a pioneer in space settlement. Show and read the letter/article/post aloud. Let students know they will get to play a role in uncovering information that could possibly help this organization make settling in space a reality! Pose the driving question to the class, How can we as 3rd grade students develop a proposal for the investors at Blast Off! ® justifying the best location for a new settlement within our solar system? Show the class the performance task rubric by which their proposals will be scored and discuss the success criteria.

Press release:  
Blast Off!  
123 Orion Blvd.  
Leander, TX 78641

We here at Blast Off represent a private investor group looking to send scientists and civilians to live and work outside of our planet Earth. Advances in technology mean that the sky isn't the limit; it's only the beginning! We need your knowledge and proposals detailing where we should investigate settling within our solar system. Please include the following in your proposal:

- Where you propose to develop a settlement
- Settlement's location in the solar system and its distance in relation to the Sun
- How the Sun will impact life in your proposed location, including information about the Effects of the Sun's light and thermal energy in this location
- Other considerations or modifications necessary for human survival

Sincerely,  
Blast Off! ®

6. Make a class Know/Need to Know chart. Have students write what they know and need to know on sticky notes in order to answer the driving question and meet the success criteria (one idea per note). This chart will act as a living document for students to utilize throughout this Unit of Study. As students gain knowledge, the sticky notes may be moved from one side to the next, and allow students to generate more questions throughout the unit to add to the chart.

**Materials:** chart paper, sticky notes (2 per student), technology for students to view videos, science notebooks, project rubric (see performance task), letter example

**Vocabulary:** Earth, resources, solar system

**References:**

NASA. (2019, January 31). *NASA 2019: Keeping the promise*. [video file]. Retrieved from [https://www.youtube.com/watch?v=aOk9ClxXw\\_8&feature=youtu.be](https://www.youtube.com/watch?v=aOk9ClxXw_8&feature=youtu.be)

**Lesson 2- Solar system****Time Allotted: 55 minutes**

1. **Pre Assessment:** Ask, *How many stars are in our solar system?* Have students answer the probe, Emmy's Moon and Stars.
2. Have students turn and talk to a learning partner and explain their response, then discuss together. Show the video [How Many Stars in our Solar System?](#) Debrief by asking,
  - o How many stars are in our solar system? *One!*
  - o Why do you think this question is so tricky even for adults to answer? *Because we see so many stars at night! Our Sun is so big compared to the little stars we see, so we don't think of it in the same way.*
3. Ask, What is our solar system? *All of the planets and the Sun, the moon, other moons, asteroids, meteoroids, comets. When we refer to the solar system, we're referring to the Sun and all of the smaller objects that move around it, because "solar" means Sun!*  
*\*be sure to emphasize the sun is a star, and everything in our solar system revolves around it.*
4. Tell students we are going to investigate the sun and how it affects objects in our solar system. Explain we are going outside to examine the energy we get from the sun. Hand out the pipe cleaners and UV beads, telling students they are going to make wearable detectors of the sun's energy! Explain the beads darken as they absorb light from the sun.
5. Pass out 10 beads to each student and have them thread the beads onto a pipe cleaner, then twist the ends together so the beads stay put. (smaller or younger students may need to use less beads)
6. Outside, have students experiment to find what happens to the beads in various amounts of sun and shade. Have them put the beads in full sun, partial sun, and full shade. They may coat the beads in a thin layer of sunscreen, put them behind a pair of sunglasses, etc. to see what changes occur.
7. Allow students to experiment with putting the beads behind sunglasses, coating them in a thin layer of sunscreen, under their shirt, etc. to see how the color change is affected by protecting them from the sun's rays. Students record observations in their science notebooks.
8. Return inside and have students write about their learning and record any wonderings they may still have about energy from the sun.
9. Read the book, [The Sun is Kind of a Big Deal](#) and discuss how the sun is important to us, and how it affects our entire solar system.
10. Wrap up by having students write an exit ticket on a sticky note about what kinds of energy we get from the sun.

**Materials:** [The Sun is Kind of a Big Deal](#) by Nick Saluki, sticky notes (2 per student), UV beads (10 per student plus enough extra for investigation outdoors), pipe cleaners (1 per student), bottle of sunscreen, 5 pair of sunglasses

**Vocabulary:** moon, stars, solar system, galaxy, ultra-violet (UV), thermal energy, light energy

**References:**

Keely, P., Eberle, F., & Tuggle, J. (2007). *Uncovering student ideas in science, 2: 25 more formative assessment probes*. NSTA Press.

VideoFromSpace. (2012, December 10). *How many stars in our solar system?* [video file]. Retrieved from <https://www.youtube.com/watch?v=HY6M2Q69OCQ&feature=youtu.be>

**Lesson 3- How Does NASA Explore the Solar System?****Time Allotted: 3-4 class periods, 55 minutes each**

## Day 1

1. Ask, How does NASA learn about other planets when they are so far away? Students turn and talk with a partner. (rovers, satellites, telescopes).
2. Tell students they are going to analyze some NASA data today to understand how NASA scientists use data from rovers to understand Mars.
3. Give students the [map](#) of Opportunity's travels and ask them to discuss what they notice at their table. Next, have students use the scale to figure out how far Opportunity traveled overall (by multiplying or using repeated addition, depending on the time of year and skill level of the students).
4. Once they have figured out how far Opportunity traveled, they will then use the [map](#) of the landing sites to choose locations and find the distance between them. They could choose Apollo sites, lunar landing sites, or any of the sites shown on the map. Using the same 5km scale, the students will then map out how far the rover could explore.
5. Hand out the rover [infographic](#) and ask students to choose one of the other rovers. They will use that rover's total distance traveled to calculate how long it would take to resupply the nearest base. (Use the nearest NASA base, ie for Austin, Texas, it would need to travel 165 miles/270 kilometers to get to Houston). Peers assess each other on the rubric below.

4	<ul style="list-style-type: none"> <li>• Uses multiple strategies to accurately calculate the answer</li> <li>• Correct answer is given, with a label for units</li> <li>• Explains all steps using correct math vocabulary, for multiple strategies</li> <li>• Justifies why the answer is reasonable</li> </ul>
3* (Mastery)	<ul style="list-style-type: none"> <li>• Uses an efficient strategy to accurately calculate the answer</li> <li>• Correct answer is given</li> <li>• Explanation of all steps used to solve, with correct math vocabulary</li> <li>• Justifies why the answer is reasonable</li> </ul>
2	<ul style="list-style-type: none"> <li>• Uses a strategy but is inefficient or incorrect</li> <li>• Incorrect but reasonable answer</li> <li>• Partial explanation is given</li> <li>• Unable to justify answer or justification is not reasonable</li> </ul>

## Day 2

1. Tell students today they will be NASA engineers and scientists planning a mission for a rover.
2. Watch the interview with Apollo astronauts describing what it was like to ride in the original lunar rover and the difficulties faced.
3. Tell students NASA is asking for their help in redesigning the lunar rover for astronauts to use when we return to the moon. The requirements include being able to safely navigate the lunar surface, weighing no more than 100 lbs on the moon, and holding two astronauts safely. In order for NASA to endorse their design, each of these criteria must be met.
4. Students will then write questions they need to answer on sticky notes, then pair-share with table buddies before ideas are shared to the class and an aggregated list of questions is created by the class. (Some questions from the teacher might include ‘what knowledge do we already have that will help us redesign the rover’, ‘how does the surface of the moon affect rover operation’, ‘why does it need to land in a specific area’, and ‘how will we know our designs are going to be successful on the moon?’)
4. In order to understand weight limitations for the rover design, students will read the ‘weight on the moon’ section of the article *Weight on the Moon Today* and create a ratio table of weights.
5. Students will then continue creating a ratio table by hundreds, up to 1,000 pounds on Earth to discover the maximum weight on Earth for the rover they built for it to weigh in under the 100 pound limit on the moon. Using this ratio table will help to solidify the concept of gravity being much less on the moon than on Earth and the impact it has on exploring the lunar surface.
6. Students work in groups of up to four to design their lunar rover prototype.
  - First students will work to develop individual plans, then share ideas with their team before combining the ideas into one design.
  - They will then write notes about their rover and how it will meet the requirements laid out by NASA.
  - Create a prototype of their rover using MakerSpace and present their design to their peers as part of the final session. They will present their prototype as well as the labeled scientific drawing of their plan and explain how it fits the requirements.

## Day 3 (optional)

6. As an extension, students can use the moon maps to determine the prime landing location for the rover and defend their answer in writing, then create an announcement, tweet, or broadcast to persuade NASA where the best site would be.

**Materials:** MakerSpace supplies (clean trash, beads, pipe cleaners, etc), cool touch hot glue guns (used by teacher only), printed copies of rubric (1 per student)

**Vocabulary:** weight, mass, gravity, prototype, rover, moon, ratio table, Opportunity, graph, table, infographic, distance

**References:**

Cain, F. (2008, October 9). Weight on the moon. [blog post]. Retrieved from

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#### **Lesson 4- Astronomers, Unite!**

##### **Time Allotted: 55 minutes**

1. Ask, Can you name the planets? What do you know about the planets? Fold a large sheet of butcher paper in 8ths. Record planet names in each section. Have students record information they think they know about each of the planets on sticky notes to place within the corresponding section.

*Information from the pre-assessment should be used to guide the learning experience for your students.*

2. Tell students that they will work in partner pairs or groups of three to become experts about a planet to share with their classmates. Divide students in the class so that all will be able to contribute to the research of one planet per student group and all planets are accounted for. Students will utilize the [Planets Hyperdoc](#) to conduct their research and will compile information in Google Slides. Emphasize the importance of good citizenship online and how to record findings without plagiarism. You may choose to utilize

cooperative learning structures to assign research roles. Tell students that they will need to find the following information:

- What does it look like? (Physical appearance) - Include a picture
  - What is its distance from the Sun?
  - What is its position in the solar system?
  - Size
  - How long is a day? A year?
  - 3 interesting facts
2. Ask, What makes a good presenter? *Facing audience rather than reading word-for-word from slides, using a clear, loud voice, etc.*
  2. Have students do a virtual gallery walk of other's slides, then allow students time to present information they learned to their classmates. Students needing support can use text-to-speech features or partner with another student to share out.

\*Note for teachers- presenting may need to take place on a 2<sup>nd</sup> day, depending on length of time period allotted for lesson.

**Materials:** large butcher paper (folded into 8 sections), technology for students

**Vocabulary:** Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, physical characteristics, atmosphere, temperature, precipitation, habitable zone

**References:**

Astronimate. (2018, July 4). *Five minute solar system- episode 05: Jupiter*. Retrieved from <https://www.youtube.com/watch?v=aszRdGO446E>

Google. (n.d.). *Sky*. Retrieved from <https://www.google.com/sky/>

NASA/JPL Edu. (2015, April 29). *Mars in a minute: is Mars really red?* [video file]. Retrieved from <https://www.jpl.nasa.gov/edu/learn/video/mars-in-a-minute-is-mars-really-red/>

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Planets for Kids. (n.d.). *Uranus*. Retrieved from <https://www.planetsforkids.org/planet-uranus.html>

Planets for Kids. (n.d.). *Neptune*. Retrieved from <https://www.planetsforkids.org/planet-neptune.html>

### Lesson 5- Pocket Solar System

#### Time Allotted: 55 minutes

2. **Pre Assessment:** Ask, How can we create a model that will show the planets and their distances in relation to the Sun? Ask, what information do we need to know or consider before we start? Have students discuss in partners or table groups. Debrief whole group. Create (*what the planets are, what order the planets are in distances between planets and how we will represent those distances*).
3. Tell the class that they will create a model of our solar system that will show the planets and their distance in relation to the Sun. Ask, what information do we need before we start? *Need to know what the planets are, what order the planets are in, what materials will we use, need to know the distances between planets and how we will represent those distances on something as small as a sentence strip, should we include anything else in our model?*
2. Give each student a sentence strip. Tell the students:
  - Place the sentence strip on your desk in front of you vertically (so that it is tall instead of fat).
  - In very small letters, write “Sun” on the very top edge of the strip and “Pluto” on the very bottom edge.
  - Encourage students to use small print, especially for the Sun. Instruct students NOT to use circles to depict the object - just letters.
4. Tell students to fold the strip in half (top to bottom) and open it up, showing the crease. Ask,

- Can you think of an object in the Solar System that might belong on the crease?
- Ask volunteers to share their ideas and then, reveal the answer. Uranus

Tell students to write Uranus on the crease.

6. Tell students to fill in the rest of the planets on the strip of paper, making sure to put them in order and keep their relative locations where they think they should be.
6. Lead students through making a second model with another sentence strip. Give each student a second sentence strip.
  - Tell the students, “Place the sentence strip on your desk in front of you vertically, so that it is tall instead of fat. In very small letters, write “Sun” on the very top edge of the strip and “Pluto” on the very bottom edge.” Encourage students to use small print, especially for the Sun, and instruct them NOT to use circles to depict object, just letters.
  - Tell students to fold the strip in half (top to bottom) and open it up again, showing the crease. Write Uranus in the crease.
  - Fold Pluto to Uranus. Write Neptune.
  - Fold Sun to Uranus. Write Saturn.
  - Fold Sun to Saturn. Write Jupiter.
  - Fold Sun to Jupiter. Write Asteroid Belt.
  - Fold Sun to Asteroid belt. Write Mars.
  - Fold Sun to Mars. Write Venus.
  - Write Mercury in between Sun and Venus.
  - Ask, Which planet is missing? Write Earth in between Venus and Mars.
8. Have students place their sentence strip with their predictions on top of their revised model to make comparisons. Ask, How close or far off were your predictions? What surprises you?
8. Ask the essential question, How can we evaluate the effectiveness of this model? Allow students the opportunity to inquire about the meaning of this question. Tell students that one way we can evaluate the effectiveness of a model is to consider what it does and does not allow us to see or do. Tell the class that all models have benefits and limitations. Ask,
  - What are some of the benefits of our model? *We can see all planets and their order from the Sun at once, small scale.*
  - What are some of the limitations? *Planets are not in a perfect line like this. We do not see the relative sizes of objects in this model.*
  - What would you do to address some of the limitations of this model?
10. Tell students that we could change to a more accurate model to reflect the orbits of planets and their relative distances from the Sun. Have students form small groups and challenge them to create a more accurate model on butcher paper.
11. Finish the lesson by having groups present their models and give feedback on the benefits and limitations of each.

**Materials:** sentence strips (2 per student), butcher paper

**Vocabulary:** relative, model, asteroid belt, Kuiper belt, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, scale, limitation, benefit

**References:**

NASA Jet Propulsion Lab. (n.d.). *Solar System Scroll*. Retrieved from <https://www.jpl.nasa.gov/edu/teach/activity/solar-system-scroll/>

**Lesson 6- Solar System Scale**

**Time allotted: 55 minutes**

**1. Pre-assessment**

Students complete the following analogy, If the Earth is like grape, Jupiter is like a \_\_\_\_\_. Students share responses and reason for their answer with other students. *For students who have difficulty writing, provide printed sentence stems or write the sentence stem for them.*

2. Tell students that they are taking a trip through the solar system to investigate the size of the planets and other objects in our solar system.
3. Explain to students that they will be create a model of the solar system that focuses on the size of objects in the solar system using fruit or paper.

**Option 1** - Modeling the Solar System with fruit. *The cafeteria could support this lesson by providing the food materials if requested.*

- a. Tell students we will be creating a model of the solar system using the following food items: Large trash bag stuffed with newspaper (circumference 61 inches), 1 mini chocolate chip, 1 mini marshmallow, 1 grape, ½ of sunflower seed without the shell, 1 raisin, 1 cantaloupe, 1 grapefruit, 1 orange, 1 plum, 1 mini chocolate chip with tip pinched off to make it smaller than the other chip.
- b. Students work in groups of 3-4 to design a model on paper, which uses the fruit as a model of the solar system. They should also record their work in their individual science notebooks.
- c. Encourage students to use information from the PowerPoint, [solar system cards](#), books, webpages, and science notebooks as reference.
- d. Display group model plans and do a gallery-walk. During the gallery walk students discuss the benefits and limitations of each proposal. After the gallery walk, students hot dot the best design.
- e. Create the class model using fruit. *When creating the model of the solar system, make sure planets are not placed in a straight line but more representative of how they orbit the Sun.*

**Option 2: Paper Planets**

- a. Tell class that they will be creating a model of the solar system using paper. Explain to them that for this model it is important to measure accurately.
- b. Demonstrate how to create an object with diameter of 20mm.
  - i. Draw a 20mm line to represent the diameter of the planet.

- ii. Ask students, what is half of 20? 10.
- iii. Place a dot at the 10mm mark.
- iv. Turn meter stick perpendicular to first line. Match the 10mm mark with 10 mm on the meter stick. Draw a 20 mm line perpendicular to the first line.
- v. Connect the ends of the lines with an arc to form a circle.
- vi. Cut out paper model. Color and label model based on characteristics of planet.

\*\*Use this method to create each object in the solar system.

b. Each student group chooses two objects from the solar system to model: a planet that has a small diameter and a planet or star that has a large diameter from the chart below so that all objects are chosen. Groups will combine their object models to create a class model of the solar system.

Objects in the Solar System	Object Diameters (reduced by factor of one billion)
Sun	1392 mm
Mercury	5 mm
Venus	12 mm
Earth	13 mm
Mars	7 mm
Jupiter	143 mm
Saturn	121 mm
Uranus	51 mm
Neptune	49 mm
Pluto (Dwarf Planet)	2 mm

- d. Students create objects in the solar system.
  - d. As a class, post the model of the solar system on a wall. *It is strongly encouraged that when placing the model of the solar system on the wall, planets are not placed in a straight line but more representative of how they orbit the Sun.*
7. Discuss the benefits and limitations of the model. Ask,
  - What are some benefits of this model? *Able to see the relative size of the planets compared to each other and how the planets orbit the Sun.*
  - What are some limitations of the model? *Size of planets not the real size, not able to see the characteristics of the planets (gaseous/rocky), not able to see the distance between planets, paper model is two-dimensional*
  - How can this model be improved? *Use fruits that are more in scale with the size of the solar system objects. Measure more with the paper cut-out.*
  - What patterns does this model show about the solar system? *The smaller planets are closer to the Sun, the larger planets are farther away from the Sun.*
9. Students write ideas for improving their model or for creating a new model in their Notebook.

**Materials:** Large trash bag stuffed with newspaper (circumference 61 inches), mini chocolate chip, mini marshmallow, grape, sunflower seed without the shell, raisin, cantaloupe or cabbage, grapefruit, orange, plum, mini chocolate chip with tip pinched off to make it

smaller than the other chip, butcher paper, construction paper, FOSS Solar System Cards, Science Notebook

**Vocabulary:** Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, relative, model, scale, limitation, benefit

**References:**

AAAS. (2012). *Planet size comparison*. Retrieved from

<http://sciencenetlinks.com/interactives/messenger/psc/PlanetSize.html>

NASA Solar System Exploration. (n.d.). *Solar system and beyond trading cards (complete set)*.

Retrieved from

<https://solarsystem.nasa.gov/resources/2482/solar-system-and-beyond-trading-cards-complete-set/>

### Lesson 7- Our Place in Space

1. **Pre-Assessment:**

Ask students to work with a partner to create a list of why the Earth is in the perfect location and why it is the only planet where humans can live. *Information from the pre-assessment should be used to guide the learning experience for your students.*

2. Explain to students that NASA launched an exploratory mission in March of 2009 to find planets beyond our solar system that may support life. Ask,
  - What characteristics do you think the scientists are looking for when exploring other planets?
3. Have students look for these features while they view the video, *Kepler - A Search for Habitable Planets*.
4. After viewing video, have students write down new wonderings that they now have based on the video. Have students share their wonderings with a partner. Tell students that the Kepler mission was extended in 2012.
3. View with students the video, *Kepler Mission Discovery, Dec. 2011*, which discusses how NASA scientists and engineers have found several planet candidates that are similar to Earth and are found in the habitable zone in their solar system. The video also shows how the mission is not one or two scientists, but a large group of scientist, engineers, and other personnel working together to support the mission.
3. Review list of characteristics scientists are looking for when exploring other planets. Make sure that the characteristics of location of the Earth (habitable zone), atmosphere, water, and temperature are present on the class list.
3. Ask students,
  - Are there any characteristics that we need to add to our list?
  - Were there any characteristics that you found interesting or surprising? Why?
  -

**Materials:** Kepler article

**Vocabulary:** Kepler Space Telescope, exoplanets, solar system, galaxy, satellite, habitable zone

**References:**

NASA. (2009). *Kepler: A search for habitable planets* [video file]. Retrieved from <http://www.youtube.com/watch?v=7MAI2khSvwQ>

NASA's Ames Research Center. (2011). *NASA's Kepler Mission discovery summary, Dec. 2011.* [video file]. Retrieved from <https://www.youtube.com/watch?v=7AnKgHwZPq8>

Kids Discover. (2014, April 11). All about the Kepler Telescope, our wounded space scout. [blog].

Retrieved from <https://www.kidsdiscover.com/quick-reads/kepler-telescope-wounded-space-scout/>

## Lesson 8- Performance Task

**Time allotted:** 2-3, 55 minute class periods (up to 2 for work, 1 for finishing and presenting)

### Performance Task Blast Off!

**Overview:**

A private investor group, Blast Off! ® is seeking proposals for a new settlement for scientists and civilians to live and work within our solar system. Blast Off! ® will consider proposals which justify a new settlement location and detail how this location could sustain human life. Students must name a location within the solar system, describe the location including its position in relation to the Sun, detail how the Sun will impact life, how gravity will impact life, and name other considerations or modifications to a settlement that would be necessary for human survival.

**Driving Question**

How can we as 3rd grade students develop a proposal for the investors at Blast Off! ® justifying the best location for a new settlement within our solar system?

**Things to Include:**

- Where you propose to develop a settlement
- Settlement's location in the solar system and its position in relation to the Sun
- How the Sun will impact life in your proposed location, including information about the Effects of the Sun's light and thermal energy in this location



<b>Light and thermal energy from the Sun</b> 3.8B	I explained the Sun's role in systems that exist in my chosen location, such as weather, day/night, and water cycle.  I explained the cause of the day/night cycle and the apparent movement of the Sun.	I explained the role of the Sun in providing light and thermal energy.  I described the effects of the Sun's light and thermal energy on my proposed location.	I described the Sun as an object in the sky and explained what it might look like from my proposed location.	I described the Sun.
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