FUTURE U.

Celestial Discoveries

GRADE RANGE 6–8

Objective

After learning about the characteristics of celestial bodies, students will collaborate to create their own.

Overview

After learning about the qualities of other celestial bodies, the class will work together to create a list of celestial traits. Using these traits as a starting point and a Make-Your-Own Celestial Body handout as their guide, student groups will design their own new celestial body, create a GIF of its orbit, and write a short blog post detailing the discovery. Each student will then take on the role of a particular Boeing career and will consider how their position could be involved/impacted with the discovery of this new celestial body.

STEM Topics

Earth Science, Technology, Engineering

Timing

45–60 minutes

Materials Needed

- Device with the ability to project
- Celestial Discovery video
- Create Your Own Celestial Body handout (two pages), 35 copies
- Career Overviews handout, 35 copies
- Playdough or modeling clay (several colors), enough for the class to share
- Roll of clear string and scissors, one
- Wooden clay sculpting tools, 15
- Smart phone with free GIF app such as GIF X, GIF Maker, or Giphy Cam, at least one

Preparation

- Check with the classroom teacher about projection capabilities. In some cases, it may be easiest for you to send the video link to the teacher in advance. In other cases, you may be able to easily connect your laptop.

- Connect with the teacher ahead of time to copy all handouts, as well as to determine if students should be allowed to use their own phones to create their GIFs or whether you should use your device to help with this step.
- Take a moment to read through the lesson directions, but don't worry about following all directions precisely. If student engagement leads you briefly in another direction, that's fine. Just make sure students are able to begin Step 2 of the Make-Your-Own Celestial Body handout when there are at least 35 minutes left in class.

Next Generation Science Standards: Three Dimensions

Science and Engineering Practices

Developing and Using Models

- 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

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars:

- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.

Crosscutting Concepts

Scientific Knowledge Assumes an Order and Consistency in Natural Systems:

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation

Standards for Technological Literacy

Standard 17: Information and Communication Technologies

H. Information and communication systems allow information to be transferred from human to human, human to machine, and machine to human.

J. The design of a message is influenced by such factors as the intended audience, medium, purpose, and nature of the message.

K. The use of symbols, measurements and drawings promote clear communication by providing a common language to express ideas.

Procedure

1. **Warm-Up Activity:** Explain that today, students are going to create a new celestial body that has been discovered in our Milky Way Galaxy! But first, they're going to watch a video about a real celestial discovery. Distribute the Make-Your-Own Celestial Body handout and review Step 1. Explain that as students watch the video, they should record as many celestial traits as possible: In other words, how is this outer space discovery described and characterized?
   Then show this video.
2. As students are watching the video, write the following categories on the board or on a piece of chart paper: Types of Celestial Bodies, Composition, Orbit, Sun, Earth-Like Qualities.
3. When the video is complete, ask students to 1) Share what they wrote down and 2) Tell you which category it should be placed under. If it seems that a new category should be created, don't hesitate to create one.
4. Once students have finished sharing, brainstorm together what other words you could put in each of the categories. Possible categories include but are not limited to:

Types of Celestial Bodies • Planet • Dwarf planet • Moon • Comet • Star	**Orbit** • How long does it take to orbit its sun? • Does it orbit in a habitable zone?	**Composition** • Solid (minerals and metals) • Gas (hydrogen and helium)
Does the celestial body have any Earth-like qualities? • Small in size • Rocky surface • Habitable	**Sun** • It this celestial body close to its sun? • What are the characteristics of its sun?	**Other:** _____

5. Direct students' attention back Create Your Own Celestial Body handout and read the directions that accompany Steps 2–5. (Note: You do not need to read all of the information included with each step…Just the 2–3 sentence step description!) Explain that each group will have about 35 minutes to brainstorm information about their planet, create a quick model and orbital GIF, and then write a brief blog post about the discovery. Be sure to also explain where students can find the modeling materials (clay or playdough, wooden clay sculpting tools, and string).

   Tip: Also use this time to share whether students will create their GIF using their own device or classroom tablet. If they will be using their own phone, explain which GIF software you recommend. If they will be using a classroom device, the app can be downloaded ahead of time. Suggested apps include GIPHY Cam, GIPHY Capture, and PicsArt Animator.

6. Have students count off by six, and direct students with the same numbers to work together. (For example, all “ones” will be a group; all “twos” will be a group, etc.) Students should find their group members and then immediately get started.
7. After about 20 minutes have passed, regain the class’s attention. Explain that as they write their posts, there is one more important feature that they must include: a quotation from a reputable source! Distribute a Career Overview handout to each student and review the directions. Answer any questions they have before you direct the students to continue working.
8. **Wrap Up:** When there are about five minutes left in the period, encourage volunteers to share their blog post with the class!

Create Your Own Celestial Body

STEP 1: As you watch the celestial discovery video, record characteristics of celestial bodies below. In other words: What descriptive words or measurements could be used to describe a celestial body?

STEP 2: The discovery of Proxima B is old news. You're about to create breaking news with your discovery of a brand-new celestial body! Answer the questions below to brainstorm ideas for your new celestial body. Then put all of your brainstorming together in Step #3.

Question 1: What type of celestial object will you be creating? (Circle one option below)

- Planet: Planets move in a fixed orbit around a star, have a round shape, and have cleared the neighborhood around its orbit (which means there are no objects in its way as it orbits its sun).
- Dwarf planet: Dwarf planets move in a fixed orbit around a star, have a round shape, but have *not* cleared the neighborhood around its orbit (which means there are objects in its way as it orbits its sun).
- Moon: Moons are a natural satellite, which means they are within a planet's gravitational pull and therefore revolve around it.
- Comet: Comets are a small piece of rock and ice that, when they get closer to a star, start to release gases.
- Star: Stars are huge balls of gas that create their own light and have a large gravitational pull.

Question 2: Stars give celestial bodies heat and light. Low mass stars only give off a little heat, but can last up to hundreds of billions of years. Solar type stars, like the Earth's Sun, give off more heat but don't live for as long. High mass stars give off the most heat but live the shortest: only about a million years.

Will your celestial body exist near a star? (circle one) Yes No If so, what kind? _____

Question 3: What, if anything, does your celestial body orbit and how long does a full orbit take?

Question 4: What is the surface of your planet like?

Question 5: Does the atmosphere have enough oxygen to sustain life?

Question 6: Does your celestial body have any other important characteristics? (Be creative!)

Create Your Own Celestial Body

STEP 3: Create a small model of your celestial body. Think about how you can represent its composition (e.g. what it is like on the inside) as well as its surface features.

Tip: It may be helpful to start with a small ball for the core and then add layers from there. You can then cut into your model to show the different layers!

STEP 4: Use your model to create a GIF that demonstrates your celestial body's orbit. If your celestial body orbits another body, draw or model this as well so it can be included!

STEP 5: With your group, use your work from the previous steps to write a short blog post that announces and explains your discovery. Pretend that it will appear as a guest post on a science blog along with your GIF, so write for an audience who loves science!

Post Headline: _____

Career Overview

Directions:

1. Read through the career summaries below and select one that interests you. Then pretend to be a person with this career, and imagine what you might say about the celestial discovery. For example: How would this discovery impact your career? What might you be most excited about?

   _____

   _____

   _____

2. Share your quotation with your group.
3. Together, choose at least one quotation to incorporate into your group's blog post.

Autonomous Engineer: You help create autonomous technologies, which are systems (such as satellites) that are able to make decisions on their own without human intervention. The technologies you develop help scientists study celestial bodies from afar. The extreme nature of space makes it a perfect environment for autonomous technologies!

Aerospace Engineer: You design, create, modify and test aircrafts and satellites. You may also review aerospace proposals and designs to see if they are feasible and if they meet engineering and environmental criteria.

Astrophysicist: You study a combination of physics, mathematics and chemistry in order to understand the life and death of planets, galaxies, stars and other celestial bodies. You normally do your observations from afar using telescopes.

Robotics Technologist: You work with engineers to develop robotic systems aboard spacecrafts. Robots are often able to explore space in a cost effective and safer way, and you help make this possible.

Media Relations Specialist: You work closely with engineers ands scientists to share news and stories about advancements and discoveries. You hope to engage the public through overseeing news stories, as well as information spread to the public over the internet and other media sources.

Programmer Analysist: You help design, code and create computer applications and software that are used in outer space. The computer programs you work on could be used for satellites, unmanned space rovers and even human exploration.

Policy Expert: Space policy, which are the guidelines that govern space exploration, is controlled by different treaties and agreements. No single country owns or governs outer space! Policy experts will work to create agreements among the government, private businesses and other countries on all issues regarding space.

Human Factors Engineer: You work on developing exploration technology. As you develop this technology, your primary goal is to make sure the technology works for the humans who have to use it. Your job is always to put the astronaut first.