Strange New Planet

Procedures:

- **Worksheets** (students may also use a blank sheet of paper, splitting the page into 4 quadrants)
- Grade Levels: **K-8** *(adaptable for older students)*
- This activity will take: **45 minutes to 1 hour**

- **Lesson Overview:**
  - Students will plan and conduct their own real-world robotic space exploration mission.
  - Students will use 21st Century Skills to conduct solar system observations, perform self-directed problem solving, and communicate within a team.
- **Goals of this lesson:**
  - Practicing communication
  - Improving reading and vocabulary
  - Improving collaborative team-work skills
  - Making relevant observations
  - Thinking critically
  - Self-direct their own mission
  - Revealing different science jobs
- **Other adaptations:**
  - Older students can design their own planets, supplying a key for other teams. After observations are complete, each team can compare.
  - Additional observations can come from a **rover**, such as Mars' Curiosity Rover. A student can select one landing location and touch the planet with one finger. Students will communicate to other teams the reason they selected that spot.
  - For older students: introduce a budget, having students submit a written proposal and justification for desired observations.
- **For Instructors:**
  - Group together students, with four in a group (no more than 5)
  - Discuss the five roles for the activity (doesn't have to be in this order):
    - Astronomer
    - Satellite
    - Flyby Mission
    - Orbiter
    - Mission Control
- Overall tips: make sure students are observing the correct planet. Otherwise, the entire activity can get confusing. If this happens, teach them about how this sometimes happens in real life, for astronomers. You can position number signs on the planet table or visually show them where their planet is.

Adapted from NASA's Lunar and Planetary Institute (http://marsed.asu.edu/)

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Conducting the activity:

Students' Roles	Instructor's Role
Mission Control Students will take messages from their peers, interpret what they visually observed, and create an artists' rendition on their worksheet. They cannot look at the planets.	Talk about the importance of mission control (protecting astronauts, relaying information, stress communication and collaboration). All students will act as MC, unless there are groups of 5. In this case, the fifth student will have all MC responsibilities. Make sure all students do not peak at the mystery exoplanets. Tell them that as MC, they are millions of miles away and unable to see exoplanets with the naked eye. Also, tell them the big reveal is WAY more fun without cheating. They will all see the final product at the end.
Astronomers Student astronomers will take their PVC pipes and stand on the opposite side of the room. They are only allowed to look at their planet through the tube (with the blue filter). They have one minute to view, standing in place without moving. 	Distribute the PVC pipes – WITH the blue filters on the ends – to astronomers. Post-view: ask students what they think the blue filter is. Did they have a hard time distinguishing colors? How would they fix this "atmosphere is in the way" problem?
Satellites Student astronomers will take their PVC pipes and stand on the opposite side of the room. They are only allowed to look at their planet through the tube (without the blue filter). They have one minute to view, standing in place without moving.	Take off the blue filter (atmosphere). Satellites orbit the earth, so their angle slightly changes (could discuss parallax of stars). Students may pivot in place or take one step side to side. Are they still too close? How might they get a closer view?

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Flyby Missions Students, with solar panel arms positioned out like chicken wings, will walk past the table, with only the front half of the planets revealed. They will walk swiftly (not stopping) when they approach their planet.	Fold the black trash bag **off the front half** and over the back half of the planets. If a planet have a moon, <u>keep it covered</u>. Info: Flyby missions observe multiple celestial bodies in the same trip. Compared to an orbiter: Talk about fuel consumption, they don't have to slow down or change directions.
Orbiters Student orbiters, with their solar panel arms, will walk around the table, viewing all 360° of the planet. They will relate their observation to the MC student. 	Remove the black bag off the table, completely. Instruct students to walk around the table, only once. They should now be able to see any visible **moons** for the first time! *Some* spacecraft use solar panels. Have students create their power source with their arms.
(optional): ***Rover Lander*** Students can place one finger on a landing location. All students can view their mystery planet now.	If you have time, introduce the exploration factor: landing **ON** the planet! This step can be merged with the *big reveal*, if you need to consolidate steps. Q: where do students want to land? Why? Is blue a water ocean? Or poisonous methane? Is green a forest? Can a white surface be ice, or a gaseous cloudy environment? Are they landing a rover or airborne balloon? Would they prefer a rocky body or gas giant? Discuss the importance of communication between scientists and engineers: the safest location may not be an exciting area to study. Also: student could land on Moons, to observe their planet closer.

- **Example follow-up questions:**
  - What was the most challenging aspect of this team activity?
  - After this activity, do you think scientists work alone or in teams?
  - What are the advantages of having a variety of missions? Should we immediately plan a visit to somewhere we haven't observed from Earth?