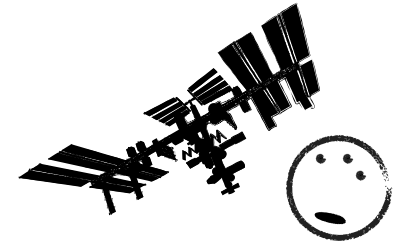


Piloted and Unpiloted Space Exploration

THE CHALLENGE

On 20 July 1969, Neil Armstrong became the first human being to set foot on another astronomical body: the moon. It was the highlight of an extended U.S. program beginning with the unpiloted Ranger 7 reaching the lunar surface in 1964 and culminating with the piloted Apollo 17, which left the moon in 1972. The scientific results from the combination of unpiloted and piloted missions were immensely important. They included high-resolution imaging of the lunar surface and lunar samples.

In this activity, Cub Scouts will explore the characteristics of piloted and unpiloted space exploration. They will consider the strengths and weaknesses of each type of activity and for what missions they may be best suited.



PILOTED AND UNPILOTED SPACE EXPLORATION

PLAN

- Prepare mystery planet(s) by attaching several small items (rocks, cotton, marbles, etc.) to a 30 cm ball using Velcro. One of the items (a small plastic animal) should be hidden under a small square piece of fabric.
- Identify an area of the room as Mission Control, where Cubs will be stationed. Position the mystery planet(s) at the other end of the room or hallway. Be sure to orient the planet(s) so

the small, hidden animal is on the far side of the planet, the side that cannot be seen from Mission Control. Cubs will explore the planet(s) in stages.

- Inform Cubs that you are about to go on a simulated mission to an unknown planet to identify the pros and cons of piloted/unpiloted space travel.

DO

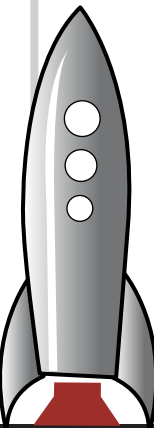
- The Pack discusses piloted and unpiloted space exploration. What do these terms mean? Under what circumstances might a space mission want to send a piloted or unpiloted spacecraft?
- Cubs are divided into groups of three or four. Each group will pick a mystery planet.
- Stage 1: Scouters point out the mystery planet and ask Cubs how early explorers examined distant objects without the help of technology. (They used their eyes to make observations.) Cubs draw or write down what they can see of the mystery planet and try to determine some facts about the object based on their observations.
- Stage 2: Cubs discuss what kinds of tools were invented to make it easier to observe distant objects. Each group will then use a mini-telescope to observe the planet and record what they see. Have they learned anything more about the mystery planet?
- Stage 3: What other methods could be used to explore the mystery planet? How about sending a probe? Cubs will send a probe into orbit around the mystery planet and see if this helps learn more about it.

Each group chooses a member to become an unpiloted probe who will be equipped with one walkie-talkie and will be launched toward the mystery planet. The Cub should stop a few metres away from the planet. The probe is only in orbit around the planet, so the Cub can

look closely at planet, but cannot touch it. Because this probe is unpiloted, it is simply a robot that responds to Mission Control. Mission Control can ask the Cub/probe questions, but the Cub can only respond with "yes", "no" or "I don't know" answers.

The remaining team members will now work together at Mission Control to come up with questions for the planetary probe. The group should then pick one member to be the Senior Engineer. This is the only individual able to communicate directly with the probe. It is up to the rest of the science team to come up with questions, which are passed onto the Senior Engineer, who in turn passes them on to the probe for answers. Senior Engineers get the other walkie-talkies. The goal is to learn as much about the mystery planet as possible. Sample questions could include: Is there water on the planet? Are there cities on the planet? Are there mountains on the planet?

- Stage 4: Each team will choose another Cub to be the astronaut on the piloted mission to the mystery planet. There are two big advances in this stage of exploration. First, the astronaut is allowed to talk with Mission Control, instead of answering just, "Yes", "No", or "I don't know." Secondly, this probe will land on the mystery planet instead of remaining in orbit. This means the astronaut can touch and grab objects on the planet. The astronaut and Mission Control will work together to explore the planet.



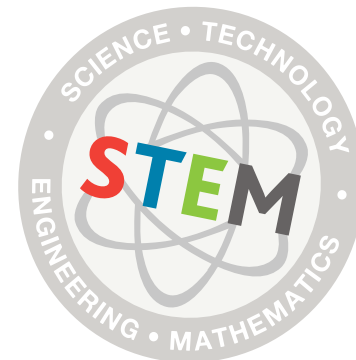
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STEM Program – Space Exploration Kit



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Piloted and Unpiloted Space Exploration



REVIEW

The Pack comes together to discuss their findings.

- What did you learn about your mystery planet?
- How useful was the unpiloted mission at conveying information to
- Mission Control compared to the piloted mission?
- What are the advantages/disadvantages of each?
- What new things did you learn from this activity?

ACTIVITY	TIME
Set up time	10 minutes
Presenting the problem and the material	5 minutes
Mystery planet exploration	45 minutes
Review	10 minutes

MATERIALS NEEDED:

- Mini telescopes
- Pencils
- 1 Ball (30 cm diameter) per team
- Velcro
- Rocks
- Cotton balls
- Marbles
- 1 small plastic animal per team
- 1 small square of fabric per team
- 1 set of walkie-talkies per team
- Notebook for recording observations

IMPORTANT NOTE

This is an indoor activity, but it requires a fairly large space, such as an art studio or a stage. If these areas aren't available, you could use a hallway or two adjoining rooms.



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