Mission Investigation!
Shared Learning with Your Public

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BIOGRAPHIES
I hold a B.S. in Astronomy and a M.A. in Science Education. I spent eight years in industry before beginning my career as a teacher in 1998. I have been at the Howard B. Owens Science Center planetarium for 25 years, 18 as full-time staff.

ABSTRACT
In the Fall of 2017 I took on an ambitious series of programs for my public presentations, held once a month. I entitled the series: “Mission Investigation!” and chose to study Mars in October, Jupiter in November, and Pluto in December, highlighting the scientific missions that bring us information about these solar system favorites. This was ambitious because I am in no way an expert on any of these topics, and didn’t want to “fail” my public. Then I remembered, I don’t HAVE to be the expert! I designed these programs to be a shared experience, allowing the public to participate in activities and learn alongside me the wonders of these planets! In this session I’ll share my procedure and successes.

INTRODUCTION
In order to develop interactive public programs on Mars, Jupiter, and Pluto, I relied heavily on NASA resources in the form of images and data. I specifically used information available on the websites solarsystem.nasa.gov and spaceplace.nasa.gov. For each public program, I set up a variety of activities developed from NASA activities for the public to explore for a half hour prior to the actual planetarium presentation. The planetarium presentation was usually between one and one and half hours long, allowing for questioning and a tour of the night sky. In each program, I provided the audience with materials that enabled them to share in the learning experience, and at times, become the experts themselves! My public programs typically bring in families with children as young as three years of age, so I carefully planned activities that I felt would include everyone.

1. MARS
   1.1 Pre-Program Activities
   To engage my younger audience, I provided Mars coloring sheets. For a slightly more challenging coloring opportunity, I provided a sheet with an outline of a person, and information about the planet so that the artist could design what they would need to wear on the planet (Figure 1). I printed fun facts about Mars and the various rover missions and posted them all around the room, and created a scavenger hunt of questions that could be answered from the printed facts. My volunteers collected the completed scavenger hunt papers so we could award prizes at the conclusion of the evening.

Figure 1 – Draw Me! – Pre-Program Activity Sheet
I.2 Planetarium Lesson/Activities

The planetarium lesson began with an observation of Mars in the night sky, and progressed forward in annual motion to observe the retrograde motion. We then brought up a visual to explain retrograde motion. Next, we integrated the arts by playing a musical selection, the Mars movement from Holst’s Planet Suite, showing images of Mars while the music played. There were no labels to the pictures, no explanations, no talking; this was merely intended to provide an overall wonder for the planet through music and visuals. After this segment, we shared knowledge of Mars by bringing up images and having the audience hold up a picture showing whether the image came from an orbiter or a rover. We had “experts” in the audience share the Top 6 Discoveries of Mars by reading the materials that came directly from the NASA website. We concluded the evening by returning to the current night sky, exploring planets and constellations visible.

II. JUPITER

II.1 Pre-Program Activities

As with the Mars program, coloring sheets were made available, this time relating to Jupiter. Sample artwork was displayed, showing how Juno images from Jupiter inspired artists (Figure 2). We had several stations set up around the room, including an activity called “Dunking the Planets” where you used different fruits to represent the planets to determine which ones sink/float (a density lesson). We had a scale where you could weigh yourself and determine your weight on other planets. “Mystery balloons” had different materials inside for the participants to guess, representing the objective of the Juno mission to determine the “insides” of Jupiter. Glitter jars were set up to simulate storms on Jupiter. A thermometer was placed inside a two liter bottle which had a pump to increase pressure to demonstrate the relationship between temperature and pressure.

II.2 Planetarium Lesson/Activities

For this program, I took on the role of the Roman goddess Juno for the entire presentation. I began using the planetarium orrery to demonstrate “how I got to my husband Jupiter” by considering how the constant motion of the planets affects the planned trajectory of a spacecraft. I mentioned the many moons surrounding Jupiter, and went around the room asking to see which moons each person represented, making sure to tell Ganymede, Callisto, Europa, and Io that I was keeping a close eye on them! Then I provided “a glimpse of why my husband is so wonderful” by presenting images of Jupiter set to music. I pointed out the close conjunctions of the planets in the morning sky that happened to be close to the date of the presentation (October 17, 2017). I forwarded to January 8, 2018 to show the close conjunction of Jupiter with Mars. We brought the lights up to look at images and also to ask volunteers to share improvisation stories on “How I came to be” and “What’s inside my Body.” We related this to the mission of Juno, and asked the six different audience members who had been given the appropriate cards to read information about the spacecraft. After discussing the mission, we turned to the night sky and I guided them through the planets and constellations that would be visible, as well as highlighting the Leonid meteor shower.
III. PLUTO

III.1 Pre-Program Activities

As with the programs highlighting Mars and Jupiter, coloring sheets on Pluto were made available. One activity sheet asked for the participant to draw what they thought the surface of Pluto should look like, at a distance of 40 times further away from the Sun than the Earth. We had a fundraiser for the planetarium, asking people to make a donation in order to vote for Pluto’s status after reading information about Pluto and the definition of planet and dwarf planet (Figure 3). Activities included creating a flip book comparator to represent the discovery of Pluto and making a model of the Pluto/Charon system to demonstrate the location of the center of gravity is between the two planets.

![Pluto Status Ballot](https://ga02202829.schoolwires.net/cms/lib/GA02202829/Centricity/Domain/521/PLUTO_part2.pdf)

My vote is that Pluto should be classified as a (Circle one):

- Planet
- Dwarf planet
- Kuiper Belt Object

Name:__________________________________________________________
Mailing address:__________________________________________________

Figure 3 – Pluto Status Ballot

III.2 Planetarium Lesson/Activities

We began the program by observing images from the New Horizons flyby of Pluto, briefly discussing characteristics of the planet to show how surprising the discoveries were to scientists. We then toured the night sky to locate deep sky objects, and then observed images of these objects at different wavelengths in order to understand the importance of creating scientific images which observe at these varying wavelengths. We considered the future of the New Horizons mission as it heads out to explore the Kuiper Belt Object 2014MU69. We returned to the early morning sky to identify planets, pointing out the location of Pluto in the sky. While this portion of the program had fewer shared learning activities as compared to the Mars and Jupiter programs, I always make sure that the audience remains involved through question and answer techniques.

CONCLUSION

You don’t have to be an expert to facilitate a love and wonder for science in your audience. I demonstrated here creative ways that I use easily accessible information from NASA websites to allow the audience members to share in the learning experience by becoming temporary experts or even impersonating moons! I find that if you demonstrate a love for learning, you can pass that on to all that attend your programs!

REFERENCES