STEM CAREER ADVENTURES

Astrophysicist: Astrophotography Analysis

Adventure Description:

In this adventure, students will think like an astrophysicist and use filters to study astronomical objects.

Activity

- Teacher Note: This activity requires about 15 minutes of prep. See Handout: Teacher Prep for instructions.

Step One: Background Information on Astrophysicists, Astronomical Objects, and Color Filters (10 minutes)

- Explain to students that astrophysicists are astronomers that study the physics and chemistry of the universe. This means that they study birth, life, and death of stars, planets, galaxies, nebulae, and other objects in the universe. Astrophysicists work to understand what the objects in our universe are made of, how objects are created and eventually die.
- To learn about objects in our universe, like stars, comets, and planets, astrophysicists perform different tests, such as using computer technology to determine how far away objects are from Earth. For instance, did you know that Pluto is 4.67 billion miles away from Earth when the two are on opposite sides of the Sun? The objects orbit around the Earth at different rates, so they are sometimes on the same side of the Sun (where they are 2.66 billion miles apart), and sometimes on opposite sides of the Sun. Astrophysicists also study the rate at which planets rotate on their axis, and how long it takes them to orbit around the Sun.
- In addition to these tests, astrophysicists also study what different objects, like stars, are made of in our universe. To determine what objects are made of, astrophysicists use color filters. Provide students with Handout: Color Filters and Link: http://bit.ly/astro-photos-rozzy. Discuss how our eyes and brains interpret color, and how color filters work.
- Provide students with a blue and red gel.

Step Two: Experimenting with Color Filters (20+ minutes)

- Explain to students that they will first create their own color filter, and then use it to determine which colors they can see through each filter.
- Divide students into pairs or small groups. Provide students with the following materials (enough materials for each student to create a color filter):
  - 3 x 5 index card
  - Red, green, and blue gel (prepared according to teacher prep instructions)
  - Scissors
  - Tape
  - Handout: Experimenting with Color Filters

Please contact Allison Bischoff, Director of Teacher Support, at allison@rozzylearningcompany.com or 314-272-2560 with questions.

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- Have students complete Steps 1 and 2 on the handout. Make sure that students are cutting holes in their index cards that are smaller than 1x1 so that their gels will fit.
- After students are finished making observations, pull up the rules for the color filters at the following link: http://bit.ly/astro-photos-rozzy
- Walk through Step 3 on the handout with students. Start with the black background. Ask students to use each of their filters and write down their observations for both the black and white background.

Step Three: Using Color Filters to Observe the Crab Nebula (10 minutes)

- Explain to students that they will now use their color filters to observe real astronomical objects.
- Provide students with Handout: Observing Astronomical Objects.
- Use the Google Drive link to pull up photos of the Crab Nebula and display them on the board.
- Have students complete Step 1 on the handout. As students are working, ask them the following questions:
  - What parts of the Crab Nebula can you see using your red filter? What is this? (Hydrogen gas)
  - What parts of the Crab Nebula can you see using your blue filter? What is this? (Radiation from electrons)
  - What parts of the Crab Nebula can you see using the x-ray filter? (X-ray radiation)

Step Four: Using Color Filters to Observe Other Astronomical Objects (20+ minutes)

- Explain to students that they will now find photos of their own astronomical objects online, then use their color filters to learn what they are made of!
- Instruct students to complete Step 2 on Handout: Observing Astronomical Objects.
  - Suggest that students start their research on the websites provided on the handout.

Step Five: Taking Photos Using NASA's Micro-Observatory (15-20 minutes)

- Explain to students that they will now visit NASA's Micro-Observatory online to take photos of an astronomical object of their choice!
- Give students Handout: NASA's Micro-Observatory. Have students complete Step 1 on the handout.
  - Make sure that students navigate to the correct page, following the instructions on their handout.
  - Ensure that students have access to the email that they input into the system. NASA will send the photos to this email address.
- Tell students that after a couple of days, NASA will email them the images. Then, they will analyze the photos with their color filters!

Step Six: Analyzing the Photos from NASA's Micro-Observatory

- Teacher Note: This step should be completed when students have received their photos from NASA via email.
- Explain to students that they will now use their color filters to analyze the photos of their astronomical object.
- Have students complete Step 2 on Handout: NASA's Micro-Observatory.

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Materials List

Provided online:

- Handout: Teacher Prep
- Handout: Color Filters
- Handout: Experimenting with Color Filters
- Handout: Observing Astronomical Objects
- Handout: NASA's Micro-Observatory
- Google Drive Link: Astrophysicist Photos (http://bit.ly/astro-photos-rozzy)

Not provided (Each group needs):

- 3x5 index card
- Scissors
- 1" X 1" square of red, blue and green gels (prepared according to instructions on Handout: Teacher Prep)
- Clear (not frosty) tape

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