Constellation Creation

Constellations are fun to identify in the night sky, have helped humans navigate and chart the seasons for thousands of years, are the stuff of great legends and myths, but what can these patterns really tell us about stars? Students create constellation models as a team to find out.

Grades

- 5-8

Time

- Prep 15 min
- 30 min activity plus pre-activity class time discussion

Next Generation Science Standards

- ESS1.A: The Universe and its Stars. The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.
- 5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
- MS-ESS1-3– Analyze and interpret data to determine scale properties of objects in the solar system.

Materials

◊ 7 copies of Orion and Big Dipper sheet in color, cut in half

◊ 12 blue stars, 1 Betelgeuse, 1 Mizar prints in color

◊ Cardboard or poster board

◊ Glue

◊ Scissors or razor blade

◊ Popsicle sticks

◊ Extra copies of the Orion and Big Dipper sheet for your Earth observers

Utah Science Standards

- 6.1.3 Use computational thinking to analyze data and determine the scale and properties of objects in the solar system.

Do Ahead

- You want to have 7 stars for each constellation that students can hold. Cut out 6 blue stars and one Betelgeuse for Orion, glue onto board, glue Orion constellation on back, attach popsicle stick for holding.
- Cut out 6 blue stars and 1 Mizar for the Big Dipper, glue onto board, glue Big Dipper on back, attach popsicle stick for holding.
- The information on the back of Orion and Big Dipper Sheet is for your use. It can be handed out to older/ more advanced students.
- Choose a space to do the activity. Outside, in a MPR, or other large room will work. Ideally you will have 30-50 feet of space.
- Decide how you want to introduce constellations to your class. You can use stories or discussion or both.

This activity is adapted from the **National Park Service Master Astronomer Program**

Explanation

Constellations are useful for astronomers, both professional and amateur, to navigate their way around the sky. Constellations have allowed humans to chart the sky into visible patterns of stars for thousands of years. Most cultures have created fascinating constellation myths and stories.

But of course, constellations aren't 'real'. They are arbitrary and a product of the human brain. They are patterns that can only be seen from Earth. Students can learn about perspective and make some interesting observations about stars through modeling two commonly known constellations, the Big Dipper and Orion.

Directions

- Talk about constellations with your students. You may want to read a story about Orion or Ursa Major. The Big Dipper is an asterism, which means it is a small part of a larger constellation, Ursa Major, the Great Bear.
- Discuss with students why humans have created constellations. (Humans spent more time looking at the night sky before electricity, patterns helped people remember the stars, star patterns were key to navigation and tracking seasons, star patterns were important for storytelling of religion and other beliefs, constellations are very old and can be found in almost every culture, constellations are different in different parts of the world, people see different stars in different parts of the world, for example in the northern hemisphere we never see the southern cross).
- Ask students if the stars in a constellation have a relationship with each other? Ask them to brainstorm, but do not answer this question now, the activity will do it for you.
- Divide the class into two. These two groups will rotate through modeling Orion and the Big Dipper.
- Give one group of students the Orion stars and the other group the Big Dipper stars.
- Have all students in the group look at the constellations together. Explain what the numbers and letters mean under each stars name. The first notation is the stars class or size. It is perfectly fine if students haven't learned this, *they can do the activity without using this information*. The second number is the distance the star is from Earth in light years.

A **light-year** is the distance light travels in one Earth year.

One light-year is about 6 trillion miles (9 trillion km). That is a 6 with 12 zeros behind it! Our Sun is the closest star to us. It is about 93 million miles away. So, the Sun's light takes about 8.3 minutes to reach us. This means that we always see the Sun as it was about 8.3 minutes ago.

The next closest star to us is about 4.3 light-years away. So, when we see this star today, we're actually seeing it as it was 4.3 years ago. All of the other stars we can see with our eyes are farther, some even thousands of light-years away.

Directions Continued

- Tell students, they will now need to divide their group to those acting as stars in the constellation and those acting as Earth observers. Seven students will take a star. Have the star students form a line. The Earth observers now put them into place so that they are holding the stars correctly to model the constellation.
- The Orion and Big Dipper groups can do this at the same time.
- Once students are lined up and look like their constellation they should study how many light years away from Earth their star is. As a group students need to decide how many steps back from the Earth observers they should take to scale their distance from Earth. For example, should each step back represent 50 light years, or 20, or 10? They should decide based upon the room available. Encourage students to use as much room as you have.
- Once decided, each star steps back the correct steps. Now the constellation is in a 3D model, rather than the first model (2D) when students were in a single line.
- Earth observers should check to make sure stars have stepped back to the right places. Now they observe the constellation and discuss.
- Ask Earth observers if this constellation would look the same from another part of the galaxy? (No)
- Ask students, now that they can see the distances of stars in their constellations, what can they hypothesize about the stars? (Farther stars must be big and bright, that is why we can see them with the naked eye. This is the case for most constellation stars, thousands of other stars at the same distance are too dim to see well with our naked eye, so are not part of constellations)
- Have students switch groups to the other constellation. Have students switch roles of star holder and Earth observer. Repeat activity. If you choose, repeat the activity until each student has played the star role and Earth observer role.
- Conclusion– Make sure to let students know that most constellations are like Orion, they are made up of unrelated stars, far in distance from each other. The Big Dipper is unusual as the stars are relatively close together and actually are related in a group. From a stars distance we can learn something about it! If it is very far, it must also be very big and bright, this is why we can see it with our naked eye. You can also relate how Mizar and Alcor are a double star. Challenge students to find them in the night sky, can they can see the two individually. If so they have excellent vision and have passed a 13th century Persian eye test! What could affect this eye test? (Light pollution) When the sky is darker we can see the stars much better. Challenge students to look for constellations in very dark places and near outdoor lights to see how different the night view can be.