Lesson Plan for Create Your Own Cosmos

Description: Observers will use body-based measurements to create a stellar "Observatory" and record observations. Observations will be refined and deepened through stories, group activities, modeling, and research.

Objectives:

Each student will create a simple stellar observatory and accurately record at least one asterism.

Each student will create at least one drawing or story based on his or her asterism. Some students may work in teams to create stories that integrate multiple asterisms.

Using stellar models such as a planetarium or desktop planetarium software, students will learn which constellation or constellations incorporate their asterisms.

Materials:

1. Build your own Star Map sheets (See below)
2. Writing board
3. Pencils
4. Small rocks or sticks for marking cardinal directions
5. Clock (accurately set)
6. Optional: plumb line, red-filtered flashlight

Prior knowledge that students need to know:

1. Local latitude and longitude
2. How to use a printed or online terrestrial map. (One useful online tool is here: http://touchmap.com/latlong.html)
3. How to find North or South (See Helpful Hints at end of article)
4. How to measure time; Be sure to write down what time zone or time system is used. (i.e. 10:00 am Central Daylight Saving Time, -6 GMT, etc.). For more information, click on http://www.timeanddate.com .
5. Basic geometry of a circle

Activity: Create your own stellar observatory and star map

This should be done at night but parts may be done ahead of time during daylight hours.

I. Mark the Cardinal Directions

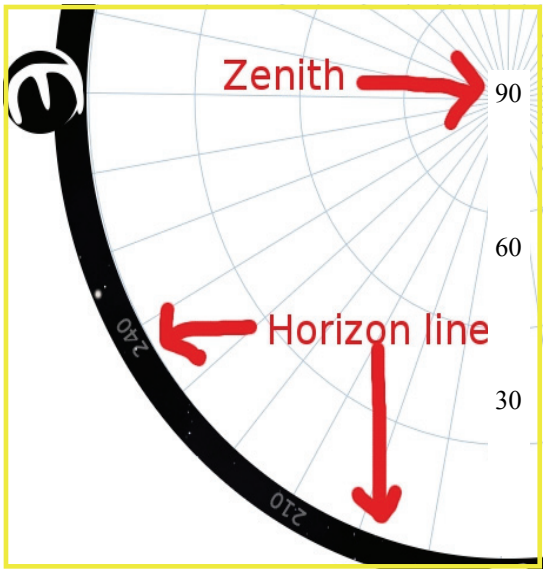
Locate North either with a properly adjusted compass (during the day) or by finding Polaris.

Place a marker such as a rock or stick on the ground to mark North.

While facing North, extend your arms straight out to the sides. Your right arm is East and your left arm is West.

Place markers on the ground for East and West.

Turn around 180 degrees so that your left arm points to the East and your right arm points West. Directly in front of you is South. Mark South.



II. Practice measurements

There are 360 degrees in a circle. The width of your fist at arm's length covers about 10 degrees on the sky.

Start with your fist stretched forward to North. Measure the number of "Fists" from North to East. You should have about 9 fists or 90 degrees but it could vary 1-2 either way. It should take about 36 fists to go in a complete circle along the horizon.

Measure how many fists from the North horizon to the Zenith (part of the sky directly over your head). This should be also about 9 fists for 90 degrees.

If in the Northern Hemisphere, use your fists to measure the angle from the horizon to Polaris. This number should equal your latitude!

III. Record an asterism on your star map.

A. Record Location data

Record your location in latitude and longitude

Record local time and time zone

Record date. Be sure to write out name of month as some countries use day before month. (i.e. April 3 in the U.S. is written 4/3, but is written 3 /4 in Europe.)

B. Find and record an asterism

Locate a group of bright stars from which you can make up an imaginary dot to dot picture. You will record each star individually on your star map using the following steps.

Find the azimuth.

Turn your body to squarely face the star. Measure what degree the star is along the horizon. For this, imagine a straight line down from your star to the horizon. Use your fists to measure how far away that would be from the nearest cardinal point. (For instance, if your star was three fists South of due West, your horizon number would be 240 degrees.)

Turn the star map so that your azimuth degree on the horizon is at, and touching, your mid-section.

Find the altitude.

Your body should be facing the star and the horizontal angle line should be pointed at your belly. Your star will be somewhere between the horizon and the Zenith. Use your fists to measure how far from the horizon (its altitude) toward the Zenith your star is located.

Mark your star on the map.

C. Repeat the steps in B for each star in your asterism.

D. Connect the dots. What does this connect the dot picture look like to you?

E. If you are working with other students, trade completed star maps and try to find each other's asterisms. This is a great way to test your accuracy.

Extension activities

Hopefully, your students have enjoyed creating their asterisms. These asterisms can be used as a topic to teach many different subjects. Here are a few ideas:

Language and Communication Arts

Create a myth about the asterism. What is it called? How did it get to be in the sky? Does the story have some lesson or record an important event in history?

Create an artwork to illustrate the asterism.

Work in a group to combine multiple asterisms into a single story.

Astronomy

In a planetarium, set the sky for the latitude and time given on the recording sheet. Student demonstrates how to locate his/her asterism including finding cardinal directions, altitude and azimuth.

Students trade asterism sheets and attempt to find someone else's asterism.

Using Desktop Planetarium software such as Stellarium (http://stellarium.org), students should attempt to discover which real constellation(s) incorporate their asterism. Discover when the asterism is visible: daily, yearly, from what part of the earth. Students find the real names, distances and classifications of stars in their asterism.

Social Studies

There are no "right or wrong" asterisms. Each culture may see the sky differently. Students should read myths from various cultures.

Compare asterisms of others in the class. Likely some of the same asterisms were given different names by different students. Research to find other names the asterism is known in other cultures.

Interview the oldest available member of your family. Use your asterism to represent an event in that person's life and present it to the class.

Record data about the asterisms and the creators of the asterisms. (i.e. is the asterism an animal, machine, person, supernatural being? Was the creator male, female, left or right handed, etc.) Does the data show any trend? Are left handed females statistically more likely to create an asterism about supernatural beings than other groups?

Helpful Hints Finding North

Use "pointer stars" Merak and Dubhe to find Polaris, or the Southern Cross to find the Southern Pole; OR info on how to correctly adjust a compass for magnetic declination may be found here: http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp; OR set up your local "Observatory" in daylight on school grounds using solar shadow sticks to determine North.

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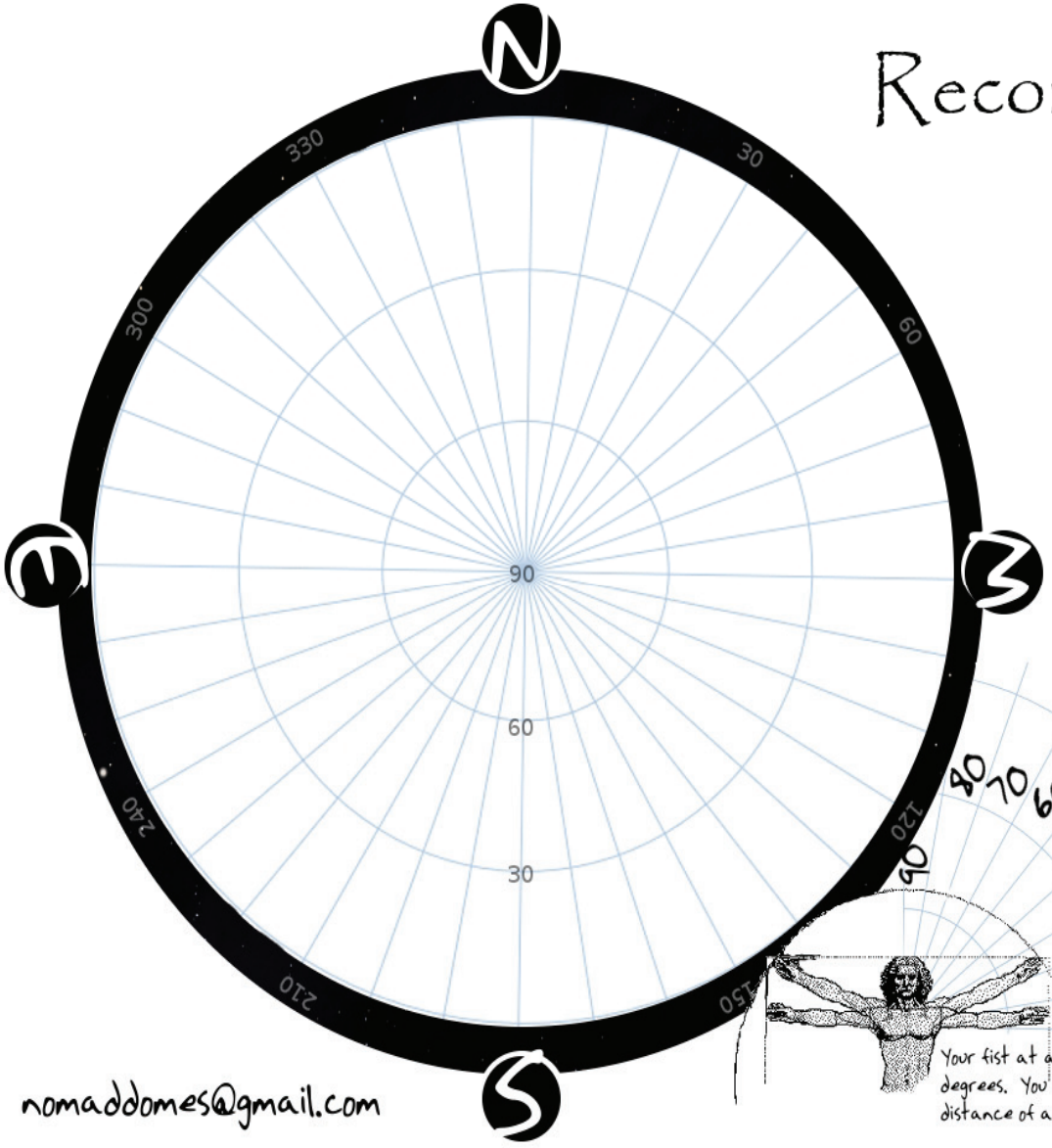
The dark black circle is the **horizon line**. NWSE are the cardinal directions. The grey numbers along the horizon line are **azimuth degrees.** Each grey line represents 10 degrees (one fist's width). **NOTE: You may at first think that East and West are backwards.** Remember you hold a *road* map between yourself and the road; you hold a *star* map between yourself and the stars. If you hold the star map over your head, you will see that E and W line up correctly.

Three faint concentric rings radiate out from a **midpoint** labelled 90, which is the **Zenith,** directly above the observer's head. The rings represent altitudes above the horizon. 45 degrees should be ½ of the way between the horizon and the

African photos courtesy Leslie Kadane, charts by the author.

Record your Star Map



Your fist at arms length covers about 10 degrees. You can use this to measure aprox distance of a star from the horizon

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