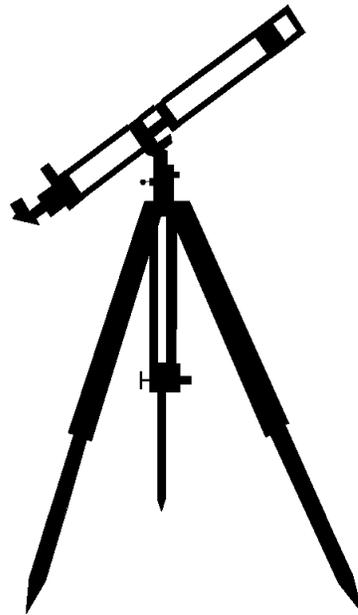




Universe Cycle
The Search for Our Beginnings

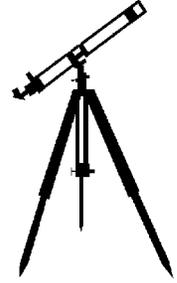


SIXTH GRADE
UNIVERSE



1 WEEK
LESSON PLANS AND
ACTIVITIES

UNIVERSE CYCLE
OVERVIEW OF SIXTH GRADE



UNIVERSE

WEEK 1.

PRE: *Exploring how the Universe may have evolved.*

LAB: *Comparing the night sky with zodiac signs.*

POST: *Comparing the different components of the Universe.*

SOLAR SYSTEM

WEEK 2.

PRE: *Exploring the structure of our Sun.*

LAB: *Calculating the weight of objects on different planets.*

POST: *Exploring astronomical themes in songs.*

EARTH

WEEK 3.

PRE: *Comparing the motion of the Sun, Earth, and Moon.*

LAB: *Discovering how the tilt of the axis causes the seasons.*

POST: *Analyzing literature with descriptions about Earth.*

GEOGRAPHY

WEEK 4.

PRE: *Discovering uses for maps.*

LAB: *Exploring military strategies using a map.*

POST: *Creating a three dimensional landscape.*

UNIVERSE CYCLE - UNIVERSE (6)

PRE LAB

Students make a “cartoon” about the beginning of the Universe

OBJECTIVES:

1. Exploring how the Universe may have evolved.
2. Developing a time frame of Universe formation.

VOCABULARY:

evolution
Universe

MATERIALS:

worksheet
video



A spiral galaxy

BACKGROUND:

The Universe is always taught with an aura of mystery. Teachers are sometimes unsure about how to explain the formation of the Universe. Part of the reason for this problem is that there is no scientific answer for this question. The data on the formation of the Universe and its evolution are inconclusive, indirect, and hard to decipher. We suggest that you tell students scientists do not yet understand all that is going on in the Universe. Part of this is because the physical rules of the Universe are somewhat different than our everyday experience here on Earth. For example, a light beam appears to travel in a straight line when we observe it on Earth. On the scale of the Universe, however, light commonly travels in curved paths, when it is warped by the gravity of stars and galaxies.

Current cosmological theory (cosmology is the branch of astronomy that studies the evolution and origin of the Universe and the objects within it) suggests that the Universe began with the Big Bang, an explosion and expansion which created matter and energy as we know them. We cannot observe what came before the Big Bang, although sophisticated computer and mathematical modeling is beginning to give some insight into this question.

Here is a rough timetable of events after the Big Bang. Note that the timing and details of these events change as more research is done.

A TIME TABLE OF EVENTS AFTER THE BIG BANG

1. The Big Bang Occurred

All interactions, gravity, strong nuclear, weak nuclear, and electromagnetism are unified. The radius of the Universe is less than 10^{-50} centimeters - A very small area.

2. 10^{-43} seconds later

Gravity separated from the other forces. Inflation, the tremendous expansion of the early Universe. The observable Universe expands to approximately the size of a grapefruit.

3. 10^{-35} seconds after the Big Bang

The strong nuclear force separates from electromagnetism and weak nuclear force. Inflation ends. The Universe consists of a hot electron-quark soup. (a quark is the main type of subatomic particle which makes up protons).

4. 1 second after the Big Bang

Electromagnetism and the weak nuclear force separate. Quarks combine to form protons, and protons and electrons combine to form neutrons. Helium and other light elements form through these through nucleosynthesis .

5. 1 million years after the Big Bang

The universe becomes transparent as it continues to expand. Matter releases radiation. Several spacecraft have detected these emissions, which are called the cosmic microwave background radiation.

6. 1 billion years after the Big Bang

Protogalaxies begin to form.

7. 3 billion years after the Big Bang

Quasars and some radio galaxies (galaxies that emit extremely high amounts of electromagnetic radiation) begin to form.

8. 8 billion years after the Big Bang

Most galaxies, including the Milky Way have formed. The Sun and Solar System form.

9. 13 billion years after the Big Bang

The present.

Although no one was there to witness these events, current evidence suggests that this is the best account of the origin of the Universe. This scenario will certainly change with new discoveries. Students should be told this directly. In other words, don't take the sequence of Universe evolution as fact, it will change!

PROCEDURE:

1. View a video on the creation of the Universe. There are several products on the market including Creation of the Universe (1985) and Stephen Hawkin's Universe (1997). You can purchase these on Internet video sites or check your library to see what they may have. Illustrating the creation of the Universe is difficult, and a well done video helps. You may also ask your students if any of them has a video they would like to share.

2. You may want the students to make a cartoon of the early Universe. Present the information in the Time Table to the students. Go slowly through the different parameters and try to dramatize each of the events. If students are unfamiliar with the terms review the material from either the 4th or 5th grade Universe lessons.

UNIVERSE CYCLE - UNIVERSE (6) PRE

CARTOON OF “THE BIG BANG”



UNIVERSE CYCLE - UNIVERSE (6)

LAB

Students determine if “zodiac” is scientific.

OBJECTIVES:

1. Comparing the night sky with zodiac signs.
2. Discovering the difference between the zodiac signs and astronomy.

VOCABULARY:

astronomy
zodiac

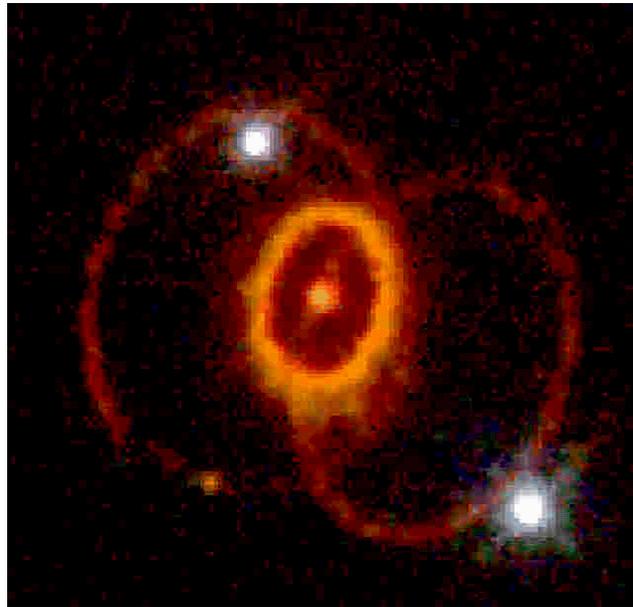
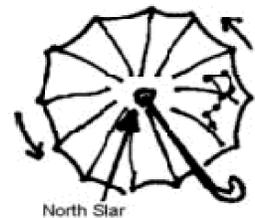
MATERIALS:

Inflatable Celestial Globes

BACKGROUND:

When students begin the study of astronomy, a clear distinction must be made between astronomy and astrology. Astronomy deals with the study of the location, motion, and nature of objects in space. Astrology is the interpretation of the influence of the heavenly bodies on human affairs. Astrology is not a science; its results are not repeatable nor consistent.

In lab, the students will try and locate different objects in the Universe by learning to read celestial globes. These are projections of the sky onto a spherical surface, which is called the celestial sphere. Within the celestial sphere, the north and south celestial poles are points in the sky that seem fixed. The remaining stars and celestial objects appear to rotate around them. In the Northern Hemisphere, the celestial pole is marked by Polaris, the "North Star". To illustrate the celestial poles, you can use an open umbrella. The pole of the umbrella represents the celestial pole; the top of it would be the North Star. As you rotate the umbrella, it shows how the Northern Hemisphere constellations seem to move in the night sky.



Supernova rings

A constellation is an apparent grouping of stars and galaxies, as viewed from Earth. They are often named for a mythical figure, animal or inanimate object. There are 88 sectors of the Universe named for constellations. Astronomers use these to locate sections of the sky. Well-known ones include Orion, Hercules, and Pegasus.

About 8 degrees north and south of the ecliptic (a band across the sky between the

highest (summer) and lowest (winter) point of the Sun's apparent path) there are 12 constellations called the zodiac. Because of the Earth's motion around the Sun, the Sun appears to pass in front of each zodiacal constellation once per year, always in the same order. For example, the Sun is at Pisces at the beginning of spring and then moves through, Aries, Taurus, and so on.

The zodiac constellations serve as reference points to astronomers when investigating the Universe. However to astrologers, the zodiac constellations, as well as the motions of the planets, were signs believed to influence the behavior and lives of people (i.e. ,finances, relationships, moods, friendships). There is no scientific basis for these interpretations.

PROCEDURE:

1. As a class, see if you can figure out the zodiac signs by using the birthdays of the students. Most of them probably know their astrological signs. Write the information on the board, as shown in the table below.

CAPRICORN - December 22 - January 19
AQUARIUS - January 20 - February 18
PISCES - February 19 - March 20
ARIES - March 21 - April 19
TAURUS - April 20 - May 20
GEMINI - May 21 - June 20
CANCER - June 21-July 22
LEO - July 23 - August 22
VIRGO - August 23 - September 22
LIBRA - September 23 - October 22
SCORPIO - October 23 - November 21
SAGITTARIUS - November 22 - December 21

2. Have the students examine the Celestial Globes and try to determine which constellations are visible during each month of the year. Have them determine if the zodiac signs really correspond to what is showing in the night sky during those months (they do, but poorly at best). Remember, to read the Celestial Globe, you first find the month, which is written on the celestial equator. Next, find the longitude at which you live, and look at the "area" of the sky around that point. This tells you what celestial objects are visible at that time. Make sure the students read the globe from the correct hemisphere.

3. Have the students cut out the sky caps and assemble them. This is part of the exercise will help the students focus on one specific month, so they see that other "zodiac signs" are in the sky at the same time.

UNIVERSE CYCLE - UNIVERSE (6)LAB

PROBLEM: Do the constellations of the zodiac and the 12 months of the year correspond to each other in the nighttime sky?

PREDICTION: _____

PROCEDURE:

Part I: Using the Celestial Globe, find out what zodiac constellations appear during each month of the year. Make sure you look at the correct hemisphere.

	CELESTIAL GLOBE	ZODIAC SIGN
JANUARY		
FEBRUARY		
MARCH		
APRIL		
MAY		
JUNE		
JULY		
AUGUST		
SEPTEMBER		
OCTOBER		
NOVEMBER		
DECEMBER		

Part II: Cut out the sky cap and assemble it. Answer the following questions.

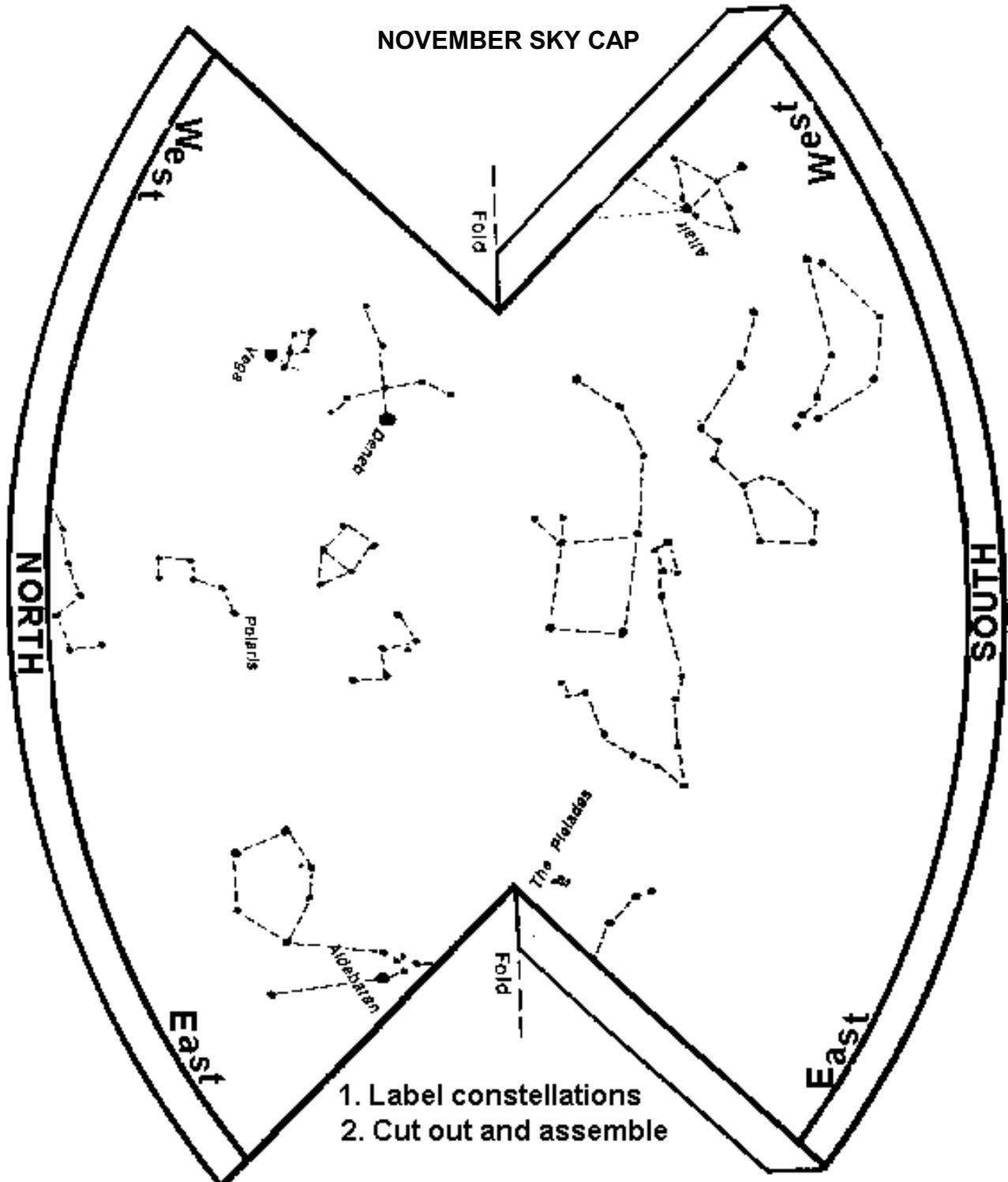
1. What zodiac constellations are visible in November?

2. What constellations could you see?

CONCLUSION: What is a constellation? How do the signs of the zodiac correspond to the constellations?

UNIVERSE CYCLE - UNIVERSE (6)

LAB



UNIVERSE CYCLE - UNIVERSE (6)

POST LAB

Students use the Internet to update data on the Universe

OBJECTIVES:

1. Researching current information on the Universe.
2. Exploring careers in astronomy and other space sciences.

VOCABULARY:

astronomer
astronomy
planet
Solar System
space
Universe

MATERIALS:

books on astronomy
Internet



The Milky Way - the nucleus of the galaxy is blocked by dust

BACKGROUND:

The exploration of space can be a new adventure for students. Space and all its wonders can still amaze even the most disinterested child. Remember that astronomy, the study of outer space, is a field that changes rapidly. With each new space probe we learn information that may change the existing data. As a teacher, you cannot always give your students all the knowledge, but you can show them where to get more information. Learning to discover how to find information is very important in science, especially in fields like astronomy that change rapidly.

Astronomy, unlike many other fields, will change with each new mission. Students should become accustomed to looking at the dates of the publication in books. Information prior to certain missions, especially prior to 1990, should be verified.

PROCEDURE:

1. Provide several books on astronomy for your students to examine. If you have enough books you might ask the students to find the book that is the most readable, the most informative, or has the best graphics. Have them also check the publication dates, and make sure they understand the importance of up to date information.

2. You may also want to discuss the types of careers available in astronomy. Astronomers are scientists that study different parts of space. Astronauts are people who go into space. People with different professions such as pilots, doctors, geologists, or teachers, that go into space are still “astronauts.” Astrogeologists are geologists that study different planets. Mathematicians and physicists also develop models for space. Defense workers also are interested in space, especially working with satellites that can help detect enemy attacks. Space is still a new frontier.



Kitt Observatory, Arizona

3. This is a good lesson in which to update your students on any new advances that may have occurred from the previous year. Newspaper articles or magazines can help provide up-to-date information. Students can check the websites listed below to see if anything new has occurred since last year. You should also have students do a search on one of the Internet search engines.

<http://opposite.stsci.edu/pubinfo/Anim.html>

Animations of planets and galaxies. The home page for this site contains links to many, many Hubble Space Telescope pictures.

<http://www.damtp.cam.ac.uk/user/gr/public/>

Cambridge Relativity of Cambridge University. Discusses Cosmology, Black Holes, Inflation, Cosmic strings, and more. Good illustrations and graphics.

<http://windows.ivv.nasa.gov/>

Windows to the Universe from NASA - a comprehensive educational website for planetary science and astronomy.

<http://www.nationalgeographic.com/features/97/stars/>

Star Journey - a National Geographic site which includes star charts of the night time sky.