



Summary of Activities

The connection to Common Core and Arizona State Standards are written in the documents themselves.

1. Meteoroids and their Impact Craters
 - a. It is a series of three experiments where students get to see firsthand how height, speed, and angle affect the depth, size, and shape of a crater.
2. Balloon Star Cycles
 - a. Students will learn about the life cycle of stars using balloons to model the process.
 - b. This activity is used to describe stellar evolution
3. Evidence for Hidden Mass
 - a. This activity explores the elusive dark matter by having students work through a rotation curve then act out the distribution of velocities. (Students investigate and describe the known universe.)
4. Lotto for Life
 - a. Students will use inquiry, problem solving, and reasoning to compare the likelihood of intelligent life existing elsewhere in the Universe and winning the lottery.
5. Gamma Ray Bursts
 - a. Students will use inquiry, problem solving, and reasoning to learn about Gamma Ray Bursts (the most powerful thing known in the universe).
6. Modeling Phases and Movements of the Moon and Planets
 - a. Students will study models of moon and planet movements to understand observations.
 - b. This fits with: describing the relationship between motion of objects in the solar system and the phenomena of day, year, eclipses, phases of the Moon and seasons (Motion of objects in the solar system)
7. Far Out Planets
 - a. Students will understand relative distance in the solar system in this hands-on activity.
8. Edible Rocks
 - a. Students will observe and describe physical characteristics of an edible sample in preparation for describing rock or meteorite samples, work cooperatively in a team setting, and use communication skills, both oral and written.
 - b. Describe the components of the solar system (the Sun, planets, moons, asteroids, comets) (*objects in the sky and universe*)
9. Star Stories to Tell
 - a. Students will explore and learn about stars and constellations.
 - b. Would be great fit if done after planetarium show
10. Phases of the Moon
 - a. Students will observe and describe characteristics, patterns, and changes in the sky.
 - b. Indicators: Observe & describe how objects move in patterns (the sun, moon, & stars)
11. Our Place in Space



- a. Students will explain the difference between a star and a planet, describe how Earth's rotation causes day and night, and name a common star pattern and the constellation in which it is found, or make up their own star pattern.
 - b. This is a series of 7 activities that range from demonstrations to hands-on stuff.
 - c. Recognize that the observed shape of the Moon changes from day to day during a one month period (*objects in the sky and universe*)
 - d. Recognize the motion of objects in the sky (the Sun, the Moon, stars) change over time in recognizable patterns (*Motion of objects in the solar system*)
12. Pluto Files
- a. Summarizes the history of Pluto (utilizing the Pluto Files from NOVA on PBS), Lowell Observatory, and Percival Lowell. It includes a short fact sheet about Pluto.
13. All About Jupiter
- a. Students will understand that Jupiter is the largest planet in the solar system—huge enough to swallow all the other planets and still have room to spare.
14. The Great Hubble
- a. Students will understand: The Hubble Space Telescope lets us see farther into space than ever before. The Hubble gives us images that are thousands of years old because light travels at a finite speed across vast distances of space. The Hubble could be used to search the universe for other Earthlike planets, but such exploration is expensive. There are arguments for and against spending money to look for other Earthlike planets that might be thousands of light-years away.
- 15.

Hands-On Activities to Take Home

1. Build a Pinhole Sunspot Viewer
 - a. Students will explain the importance of safety when observing the sun, gather data and calculate the diameter of the sun, & track sunspots and make observations.
 - b. Describe the components of the solar system (the Sun, planets, moons, asteroids, comets) (*objects in the sky and universe*)
 - c. There is a variation of this included where a telescope is used to look at sunspots.
2. Alka-Seltzer Rocket
 - a. Students have a connection with physics, the NASA program, and a fun cheap object to take home with them when they leave the Lowell Observatory Field Trip.
3. Build your Own Spectrogram
 - a. Spectroscopes need not be limited to professional scientists. Building your own spectroscope using everyday items takes just under an hour.
4. Reflective Solar Cooker
 - a. This reflective solar cooker uses the Sun's energy to cook marshmallows. The target cooking area is the space where the light concentration is greatest.

Summary of Planetarium Shows



1. Winter, Spring, Summer, and Fall Shows
 - a. Demonstrates different phases of the Moon as well as different seasonal constellations. This fully demonstrates patterns in the sky as well as the motion of objects that change in recognizable patterns (.i.e. the earth goes around the sun so depending on the time of the year; we will have different constellations in the sky at night time).
2. Universe Planetarium Show
 - a. Covers the basics of what is: a planet, star, nebula, galaxy, and universe. It is a very interesting show that won't bore.
3. Solar System Planetarium Show
 - a. There is information about all 8 main planets, dwarf planets, comets, meteors, asteroids, the sun and more!

Lesson Plan Files Found Online

1. Kinesthetic Astronomy
 - a. The Sky Time lesson reconnects students with the astronomical meaning of the day, year, and seasons. Like all Kinesthetic Astronomy lessons, it teaches basic astronomical concepts through choreographed bodily movements and positions that provide educational sensory experiences.

Concept 2: Earth's Processes and Systems

Understand the processes acting on the Earth and their interaction with the Earth systems.

PO 1. Describe how the Moon's appearance changes during a four-week lunar cycle.

PO 2. Describe how Earth's rotation results in day and night at any particular location.

PO 3. Distinguish between revolution and rotation.

PO 4. Describe the role of gravity as an attractive force between celestial objects.

2. MESA Lesson Plans
 - a. Mathematics, Engineering, Science Achievement (MESA) is a university-based outreach program operating in 8 states. In Arizona, MESA strives to provide an opportunity for ethnic minority, low income, and first generation college-bound students to explore college majors and career interests with a group of peers interested in attending college. The University of Arizona supports MESA schools in Southern Arizona and works in affiliation with Arizona State University's Fulton Schools of Engineering to support MESA in central Arizona. The southern and central regions form Arizona MESA. However, the packet I found and am including has a lot of hands-on activities with lesson plans that would be very useful to teachers.
 - b. Covers a lot of state standards already lined out in the packet.
3. Journey Through the Universe
 - a. This could be a whole unit spanning 2 weeks of class time for a teacher. There are numerous full lesson plans covering solar system objects as well as hands-on activities. The state standards for these packets have not been matched but could be done by the teacher if they decide to use the whole packet. Overall there are 10 pdf packets.



4. Stars and Galaxies

- a. This is a fun activity I found online that applies concepts of scale to grasp the distances between stars and galaxies. Students elaborate on the question, Do galaxies collide?