

Astronomy Game Plan

eCamp Physics Lab

NOTE: This presentation does not cover evolution nor creation so all families may participate.

Objective Astronomers study celestial objects (stars, planets, moon, asteroids, comets, galaxies, etc) that exist outside our planet's atmosphere. It's the one field that combines most science, engineering and technology areas in one fell swoop. Astronomy is also one of the oldest sciences on the planet. We're going to take a front-row seat in a planetarium-style astronomy presentation in addition to performing several experiments and activities in moons, stars, planets, meteorites, and more.

Main Ideas Our solar system includes rocky terrestrial planets (Mercury, Venus, Earth, and Mars), gas giants (Jupiter and Saturn), ice giants (Uranus and Neptune), and assorted chunks of ice and dust that make up various comets and asteroids.

Two planets (Ceres and Pluto) have been reclassified after astronomers found out more information about their neighbors. Ceres is now an asteroid in the Asteroid Belt between Mars and Jupiter. Beyond Neptune, the Kuiper Belt holds the chunks of ice and dust, like comets and asteroids as well as larger objects like dwarf planets Eris and Pluto. Beyond the Kuiper belt is an area called the Oort Cloud, which holds an estimated 1 trillion comets.

Our solar system belongs to the Milky Way galaxy. Galaxies are stars that are pulled and held together by gravity. Not all stars belong to galaxies. Globular clusters are massive groups of stars held together by gravity, using housing between tens of thousands to millions of stars.

About the Experiments Did you know you can take an intergalactic star tour without leaving your seat? We've put together a slide show with an audio track on the website, so you can have a front-row seat in a planetarium-style star show. We're also going to learn how to view the sun safely, discover how to capture meteorites off the front porch, build a scale model of the solar system that will blow your mind, learn why satellites crash, and so much more!

The How and Why Explanation The sun holds 99% of the mass of our solar system. The sun's equator takes about 25 days to rotate around once, but the poles take 34 days. You may have heard that the sun is a huge ball of burning gas. But the sun is not on fire, like a candle. You can't blow it out or reignite it. So, where does the energy come from?

The nuclear reactions deep in the core transforms 600 million tons per second of hydrogen into helium. This gives off huge amounts of energy which gradually works its way from the 15 million-degree Celsius temperature core to the 15,000 degree Celsius surface.

Stars like to live together in families. Galaxies are stars that are pulled and held together by gravity. Some galaxies are sparse while others are packed so dense you can't see through them. Galaxies also like to hang out with other galaxies (called galaxy clusters), but not all galaxies belong to clusters, and not all stars belong to a galaxy.

Active galaxies have very unusual behavior. There are several different types of active galaxies, including radio galaxies (edge-on view of galaxies emitting jets), quasars (3/4 view of the galaxy emitting jets), blazars (aligned so we're looking straight down into the black hole jet), and others. Our own galaxy, the Milky Way, has a super-massive black hole at its center, which is currently quiet and dormant.

Dying stars blow off shells of heated gas that glow in beautiful patterns. William Hershel (1795) coined the term 'planetary nebula' because the ones he looked at through 18th century telescopes looked like planets. They actually have nothing to do with planets – they are shells of dust feathering away.

When a star uses up its fuel, the way it dies depends on how massive it was to begin with. Smaller stars simply fizzle out into white dwarfs, while larger stars can go supernova. A recent supernova explosion was SN 1987. The light from Supernova 1987A reached the Earth on February 23, 1987 and was close enough to see with a naked eye from the Southern Hemisphere.

Questions to Ask After you've watched the video, ask your kids these questions and see how they do:

1. What's your favorite part about Jupiter?
2. Which planet is NOW your favorite (after listening to the slide show presentation)?
3. What happened to the stars in the last slide of the show?
4. How many moons around Jupiter or Saturn can you see with binoculars?
5. What's the difference between a galaxy and a black hole?
6. How many Earths fit inside the sun?