Space Careers

1. General

This class will familiarize the Mission Team with the opportunities and potential of careers in space. Galaxy Explorers is founded on the principle of furthering humanity’s exploration of outer space, but it takes real people dedicating their lives to make that happen. The goal of this lesson plan is to get Mission Team members thinking about the possibilities of being one of the people who helps shape the future of space exploration.

2. Learning Objectives

Subject: Space Careers

Task: You will understand the breadth of careers in fields that support space exploration, and begin to understand the preparation you should consider if you want to make your career in this area.

Presentation Guide:

Introduction
Good Morning, I am ____________ and today I will be leading a discussion on careers in space. Galaxy Explorers exists for one reason – to promote space exploration. To do this, we have lesson plans on science, engineering, and space citizenship, and these lessons teach you the tools, and give you the background to be future galaxy explorers. The only question that remains is what to do with those tools and background, should you choose to devote some part of your life to being an explorer.

In a few years, you will graduate from high school, and as you get close to that goal, you might start thinking about college. Now you might have some courses or subjects in high school that you really like, and when you get to college you will chose a field of study that will most likely be similar to the subjects you most enjoy studying in high school. Now, you might find it hard to believe but the field of study you choose in college at the age of 18 or 19 will, to a large degree, affect what you do for the rest of your life. To say it again, the major area of study you choose in college will affect the jobs you can have when you graduate, and all that is related to the courses you study in high school.

Therefore, it makes sense to think now about your future so you can prepare for it. Even now, you are making your own future. With the courses you study now, and with the grades you earn, you are shaping your own future.
Main Lecture

Galaxy Explorers is all about shaping the future, and while we generally look at the future for all humanity, today we are taking a couple of hours to shape your personal future.

Let’s think about how can we shape our future. Let’s look first at where we might want to end up – that means we are going to examine the kind of jobs that exist in the field of space exploration, and then later we can think about how to prepare ourselves to get those jobs.

Who can tell me what kind of jobs in space there are? Raise your hands and tell me. Well, the most popular and exciting job in space is to be an astronaut. Actually flying in space is one of the most exciting and important roles anyone can have in space exploration.

What is the only space vehicle the United Space uses right now to fly people into space? The space shuttle, which will resume flights after the examination of the Columbia disaster is concluded and recommendations are implemented. Now to fly in space you can either be a pilot with a lot of experience flying planes, or a mission specialist with scientific or engineering experience. But there are far more opportunities than just that. Who can me tell me some?

Someone has to come up with ideas for the rockets right? That would take scientists. And then people need to design those rockets, and then people need to build them and that takes engineers. People need to maintain the launch facilities and someone needs to launch rockets themselves. And most importantly, someone needs to decide what astronauts in space will do – will they try to fly to other planets or unexplored areas of our solar system, or will they go into earth orbit or the moon to conduct scientific experiments in weightless environments or reduced gravity environments (remember that in space you have zero gravity and on the Moon, you have reduced gravity). You see there are many, many types of careers in space.

But those are just possible careers in manned space exploration. Un-manned space exploration still needs rocket scientists and engineers to create the rockets and launch them, but they also need scientists and engineers build space probes and scientific tools that we can use to explore outer space. Can anyone name some famous unmanned space probes?

The Hubble Space Telescope
The Mars Lunar Rover
Voyager (which left the solar system and is now traveling beyond Pluto)

If you are interested in helping create future missions of this type, let’s talk about some of the specific career fields into which you could enter.

A **Spacecraft Designer** is someone who works with a team of engineers to decide how to build a satellite or interplanetary explorer that will do certain jobs. This task is just like designing a car, a television, a bulldozer or most any machine. It is very challenging though to build something that is going to go into space since it needs to be as light as possible and yet strong enough to survive the high vibration forces during launch and stressing space environment. Spacecraft designers have at least four years of college and usually have one of several kinds of engineering degrees (aerospace, electrical, mechanical).

A **Launch Control Officer** is in charge of launching spacecraft into space. They are direct other people to put the rocket on the launch pad and then install the spacecraft on the
A Mission Controller works with the launch control officer prior to launch to make sure that everything is going according to plan. When the spacecraft reaches orbit, the mission controller takes over from the launch control officer and directs all the activities that need to happen to make the mission a success. Sometimes the orbit needs to be adjusted so the engines have to fire to put the spacecraft where it is needed. When a spacecraft enters space, it needs to adjust to the vacuum conditions by getting rid of some of the gas it absorbed when it was in the atmosphere. The spacecraft needs to unfold like a butterfly coming out of a cocoon so the solar panels and antennas can work like they are supposed to. If it is a spacecraft with astronauts on it, the mission controller directs all of the activities needed to complete the mission and bring the astronauts safely back to the ground.

An Astronaut is a person who travels in space. The Russians use the word Cosmonaut to mean the same thing. Some astronauts are pilots who manage the spacecraft and make it go where it is supposed to and sees that all systems function properly to keep everyone safe and comfortable. Other astronauts are scientists or doctors. The scientists might be oceanographers who study the oceans from space or geologists who explore the moon or other large objects in space. Today, the astronauts fly on the space shuttle. Some years ago they went to the moon. Perhaps astronauts will return to the moon to do more exploring in a few years. Then they will go to Mars and on to the other planets stopping to explore asteroids along the way.

A Space Medicine Physician works to understand how to keep astronauts healthy in space. They often fly on missions with the astronauts noting their heart rate, blood pressure and other vital information. They decide what the astronauts should eat and how they should exercise.

An Astronomer explores the planets, asteroids, comets and stars, but never leaves the earth! Tools like the telescopes are used to gather information. Galileo explored the heavens nearly 500 years ago using a telescope. Since then many large telescopes have been built that see far out into space. The Hubble Space Telescope now sends very clear pictures back from space that are not blurred by the atmosphere. Very large radio antennas gather radio signal from space. Spacecraft orbiting or landing on other planets send back pictures, information about magnetic fields and minerals. The astronomer’s job is to make sense out of all this information to understand how our universe was formed. This information is also useful to help us understand how we can survive when we move to the moon and other planets to live.

A Satellite Communications Engineer designs and builds the radios needed on a spacecraft so they can be controlled from the ground and send back information. They also design the ground stations that have those huge antennas needed to gather the signals from space. On interplanetary missions, the design for the communication equipment is especially
challenging since very long distances are involved. Here, the engineer tries to keep the weight and power as low as possible and still complete the needed communication.

A **Space Artist** draws pictures to help people understand things in space. Some draw pictures of spacecraft in space while others draw pictures of galaxies and other natural objects. The space artists are very creative and often work with engineers and scientist to draw pictures of things people have never seen. These things may be something like a space colony on another planet. They also draw pictures of how the universe looked billions of years ago just after the Big Bang.

A **Space Historian** writes about things that have happened in space. They also write about things that happen on the ground that are related to space. Today we can read about the space pioneers like Goddard and Tsiolkovski and how their theories and experiments laid the foundation for us to go into space. We can read about how men went to the moon on the Apollo program. We can read about the tragedies like the Columbia as well. We can read all of this and much more with thanks to the talented writing of the space historians.

A **Space Educator** is a person who teaches others about space.

A **Space News Reporter** provides information about space events to the newspapers, magazines, radio and television. These people are able to explain the many complex things related to space and space exploration in simple terms that most people can understand. Sometimes they write articles to be published and sometimes they talk on the radio or television about space and related activities.

A **Space Policy Expert** develops policies and procedures for a government or businesses to foster positive working relationships between agencies and industry that result in a strong industrial base and better space services for the government.

A **Space Vehicle Cost Expert** estimates how much a space vehicle will cost when it is built. Working from design information, the cost expert considers things like the size, weight, power and complexity of a spacecraft to estimate the cost. The costs of other similar spacecraft that have already been built provide the basis for the estimate. This is a very important job since the government or corporation building the spacecraft needs to know how much money will be needed ahead of time.

A **Space Architect** works with a team of people to decide how satellites, space communications and related infrastructure should look 20 years or so into the future. This process develops a concept that guides decision makers in deciding how to spend money now so that the projected capabilities can be realized.

A **Space Photographer** takes photographs of astronauts, spacecraft being built, launches, recoveries and other space related activities like banquets.

A **Planetary Geologist** is really an astronomer who specializes in understanding what the planets and other objects in our solar system are made out of. Sometimes they do this by examining samples that are brought back to earth, but usually they rely on the information gathered from the instruments that look at these objects from the earth or from spacecraft. The information these people gather is critical for the survival of the colonies we will establish as we journey out from earth.
There are some common threads to all these areas – most really, really, really require some background in science – Galaxy Explorers should help you with that. Many careers in the space industry require a heavy background in math and science. It is a great advantage to have had one year of calculus already when starting college. Some careers in the space business; however, do not require a heavy emphasis on math such as space artist, news reporter, historian, photographer, policy expert, and some educators. The emphasis for these jobs is on other skills – writing, researching, law, creating public policy, etc. For aspiring astronomers in college the emphasis should be on physics, with some computer programming and astronomy thrown in. Some chemistry or even biology can’t hurt either, especially with this new field of astrobiology gaining significance.

So we can see that anyone who really wants to work in the space business can do so. The important thing to remember is that you do the type of work that you really enjoy doing. Now let’s take the first step in your new career – the job interview.

Activity:
This activity is conducting job interviews for applicants. Have mission team members spend 10 minutes jotting down their hypothetical resume for when they graduate from college. It should take the following form:

Name
Career Objective
College attended
    Major area of study
    Minor area of study
Any job experience
    (internships, part time jobs)

Mission Team members will break off into pairs with two or three Mission Team members being a job interviewers and the other being a job applicant. Use the information above as a guide to the duties of each job. The interview team should begin by writing down a few qualities they want to see in an applicant (i.e. an engineering job should have an engineering degree; a writing job should have experience in writing plus a knowledge of space, etc.). Team members will pick one of the jobs mentioned above as the career in which they want to work. They will take turns interviewing each other for the job. The applicant will need to sell himself or herself to the interviewer. The interviewer team will need to ask relevant questions such as

1. What do you think you will do in this job?
2. Why do you want this job?
3. What high school courses did you like and how did they lead to your college area of study?
4. Why did you pick this area of study, how do you like what you are studying, and how does it relate to this job?
5. What kind of internships and part time jobs did the applicant use to build experience?