
Introduction to
Lunar Greenhouse
NASA
HUNCH
ACADEMY

Introduction to NASA HUNCH video.

Mission Statement: Empowering Elementary School Students in STEM through NASA HUNCH Academy

At NASA HUNCH Academy, our mission is to ignite a passion for STEM (Science, Technology, Engineering, and Mathematics) among elementary school students by providing an immersive and innovative educational experience inspired by NASA HUNCH. We strive to cultivate curiosity, critical thinking, and creativity, laying the foundation for future leaders in space exploration and technology.

Vision Statement: Fostering a Generation of Young Explorers and Innovators

Our vision at NASA HUNCH Academy is to create a dynamic learning environment where elementary school students can thrive in STEM fields. We envision a future where every child is equipped with the knowledge, skills, and inspiration needed to contribute to space exploration and technological advancements. Through hands-on experiences, collaboration, and mentorship, we aim to nurture a community of young explorers and innovators who will boldly shape the future of science and technology.

NASA and Moon landing videos

Introduction to NASA HUNCH Plant growth NANO LAB video

Requirements

- Make a scaled model that will fit in a 2 x 2' space on a table to demonstrate how bamboo and other food items could be grown in a 20' diameter, lunar inflatable module that allows for people to tend and harvest the materials from the greenhouse. It should include:
  - Grow beds
  - Lighting
  - Plumbing—in and out
  - Mixtures of air from other modules
  - Walkways and work areas
- Choose a bamboo species that could be valuable for growing on the moon - CO2 removal and structural value.
  - Demonstrate that you can grow bamboo in lunar soil or its hydroponics and habitat conditions.

Determine the types of bamboo that would be the most beneficial and Grow them in simulated lunar soil to demonstrate that they can be grown Using artificial lighting and a growth

Dave Lehlbeing (Guest)

Objective

Read over the NASA HUNCH powerpoint, visit the websites and watch the videos for information.
https://www.hunchdesign.com/uploads/2/2/0/9/22093000/lunar_bamboo_greenhouse--10-20.pdf
Develop, design and build a prototype Nanolab for growing plants including Bamboo. NASA's long term goal is to find out how plants would live out their life cycle in microgravity so that in the future the data gathered could influence how plants could be grown as a fresh source of food for long duration space missions. We need to develop structures that allow plants to grow and mature from different stages of the plants life cycle . A plant growth Nanolab called a Hydrofuge has previously been sent to the Space Station. Now our challenge is for students to grow seeds in a 4 x 4 x 8-inch area to determine what is necessary for plant growth in such a small self-contained microgravity environment. The Hydrofuge needs to be lightweight. It cost $1.2 million per pound to send material into space. First start out by drawing a basic NANOLAB that you want to create on paper. Make a 3D drawing of your plant NANO LAB. Later we will take your blueprint and make it on tinkercad. Once you have your basic design we will do research to choose which plants we want to use for this project. We will do several investigation station for research. Then we will make modifications to our NANOLAB design to properly house our plants. Have fun and be creative.

Plant investigations Group Discussion questions

Do you think the plants will grow in space? Why or Why not?

What plants would you want to grow in space and why?

Will you have to add nutrients to the water to help the plants grow in space?

What different mediums do you think will plants grow in?

What will the plant need to survive?

Which material do you think will do the best in space? Why?

Plant Vocabulary

Plant-a living thing that grow from the soil, turn light from the Sun into food, has a stem, leaves, and roots

Stem-The stem is the main structure above ground which provides support for leaves and buds

Leaves-The leaves are attached to the stem and are the primary food-making part of the plant.

Roots-are the part of the plant that develops underground, helps anchor the plant firmly in the soil, and It absorbs water and minerals from the soil

Tubes- are like a pipeline for water and minerals from the soil are called xylem.

Vascular-Vascular plants are higher plants that use tubes to move food and water

Carbon Dioxide-is a gas from the atmosphere and is used by plants, along with sunlight, for photosynthesis

Water-is the liquid that makes life on Earth possible

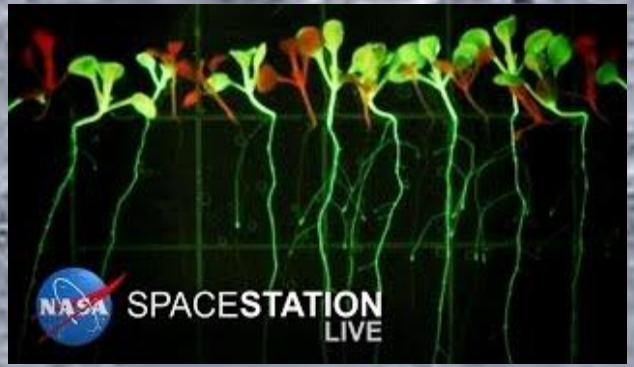
Soil-provides structural support for plants used in agriculture, is also their source of water and nutrients

Photosynthesis- process by which plants use sunlight, water, & carbon dioxide to create oxygen & energy in the form of sugar.

Germinate- Is the phase of plant growth when the seed begins to sprout.

Pollinate-

Helpful Videos and websites about plants in space



https://www.nasa.gov/exploration-research-and-technology/growing-plants-in-space/

Helpful Videos and websites about plants

https://studyjams.scholastic.com/studyjams/jams/science/index.html

Kindergarten NGSS Science standards covered in this lesson.

K-LS1-1.Use observations to describe patterns of what plants and animals (including humans) need to survive.

K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

K-ESS3-1.Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

LS1.C: Organization for Matter and Energy Flow in Organisms All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) ESS2.E: Biogeology Plants and animals can change their environment. (K-ESS2-2)

ESS3.A: Natural Resources Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)ESS3.C: Human Impacts on Earth Systems Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3)ETS1.B: Developing Possible Solutions Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

1st Grade NGSS Science standards covered in this lesson

1-LS1-1.Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*

1-LS3-1.Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

LS1.A: Structure and Function. All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

LS1.B: Growth and Development of Organisms. Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2)

2nd grade NGSS Science standards covered in this lesson.

2-LS2-1.Plan and conduct an investigation to determine if plants need sunlight and water to grow.

2-LS2-2.Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

2-LS4-1.Make observations of plants and animals to compare the diversity of life in different habitats.

LS2.A: Interdependent Relationships in Ecosystems. Plants depend on water and light to grow. (2-LS2-1). Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

LS4.D: Biodiversity and Humans There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

3rd Grade NGSS Science standards covered in this lesson.

3-LS4-4.Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

3-LS4-3.Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

LS4.C: Adaptation. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

LS4.D: Biodiversity and Humans. Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

LS1.B: Growth and Development of Organisms. Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

4th Grade NGSS Science standards covered in this lesson

4-LS1-1.Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

LS1.A: Structure and Function. Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

ESS2.E: Biogeology. Living things affect the physical characteristics of their regions. (4-ESS2-1)

5th Grade NGSS Science standards covered in this lesson

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

LS2.A: Interdependent Relationships in Ecosystems. The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems. Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

-

Middle School 6th - 8th grade NGSS Science standards covered in this lesson

MS-LS1-6.Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS2-1.Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

LS1.C: Organization for Matter and Energy Flow in Organisms. ***Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)***
LS2.A: Interdependent Relationships in Ecosystems. Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1). In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1). Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
LS2.B: Cycle of Matter and Energy Transfer in Ecosystems. Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)
LS2.C: Ecosystem Dynamics, Functioning, and Resilience. Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)PS3.D: Energy in Chemical Processes and Everyday Life. The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6). Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)

MS-LS2-2.Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-LS1-5.Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.