



## Build a Habitat

**Objective:** Students will be learning about the different modules that are part of a Mars habitat and building their own design using a 3D printing pen or Play-Doh.

**Materials Needed:**

- Activity – Mars Living Quarters Model Build:
  - 3D Printing Pen
  - Power Source (must be plugged in at all times)
  - Filament
  - Scissors (useful to have a few on-hand to trim filament)
  - Play-Doh

Activity – Mars Living Quarters Model Build

Students will build a model of the Living Quarters of their Mars Habitat using 3D Printing Pens. They can select any color filament they want, or a combination of several. Students may need a time limit for this station, as they can work for a while.

Students in middle and high school are typically the most successful in using the 3D Printing Pens; however, the pens can be used with younger students with adult assistance. Play-Doh can be used by younger students, or for any student who would prefer.

### ***Setup Instructions:***

- Activity – Mars Living Quarters Model Build:
  - Set out all the pens. They must be plugged in, so you may need power strips and extension cords. Set out the filament.
  - It could be useful for students to have an example, so feel free to make a 3D model and set that out for them to see. Making an example is also useful for familiarizing yourself with the pens and will better prepare you to assist students if issues arise.

### ***Additional Notes:***

- Activity – Mars Living Quarters Model Build
  - The pens can be tricky for students, especially at first. It is important that you use the pens to prepare for questions and issues that may arise.
  - The biggest struggle for students is loading the filament. If there is an issue, here are things to check:
    - Make sure the speed slider is at max speed (furthest from the tip). This is on the side of the pen.
    - Make sure the red light has turned green. If it has not, press the down button until it has.
    - Make sure the student is holding the down arrow and gently pushing the filament into the hole.
    - Make sure the filament is going in as straight and level as possible
    - Make sure the end of the filament is even. Trim it if it has been previously used and is uneven.
    - If a student struggles with removing filament, check all the issues above. Make sure a student does not pull too hard or break off the filament because it can get jammed and it is impossible to unjam it.
    - For building, it is easiest if students build walls in 2D and then attach the walls together.
    - It is also best if they do shorter, smaller strokes to make the structure stronger.
    - To build directly in 3D, students should slow down the speed by pushing the slider closer to the tip. This makes it easier for the material to dry as it is released, but they will still need to use their hand or another object to support the filament as it dries.

## PHASE FOUR: LIVING ON MARS

### 3D-Printed Model Design:

You will be creating a model of the living quarters of the Mars Community using a 3D Printing Pen. Using the pen, create the outside structure of the habitat.

How to use the pens:

1. DO NOT TOUCH THE TIP OF THE PEN. IT IS HOT!
2. They must be plugged in at all times.
3. Press the down button near the tip of the pen. When the light changes to GREEN, it is ready to use.
4. To insert a color, place one end of the filament into the hole at the top of the pen. Hold the DOWN arrow as you gently guide and push the filament into the pen. It will take a minute or so for it to make its way out of the drawing tip of the pen.
5. When drawing, hold down the DOWN arrow. To change the speed at which the filament comes out, move the slider on the side of the pen up or down.
6. When you are building, give the filament a few seconds to dry before touching it.
7. When you are done with a color, hold the UP arrow and **GENTLY** pull the filament out of the pen.

### Tips for building with 3D pens:

- Try building 2D walls on the table, then attaching the walls together to create the 3D structure.
- To build directly in 3D, slow down the speed of the pen. Draw directly up.
- If filament won't load properly, remove it. After you have fully removed the filament, cut off the end with scissors so it has a straight, clean edge and try again.

### Play-Doh Model Design:

- *You will be creating a model of a Mars Habitat using Play-Doh. Some things you can put in your design include:*
  - *A living and sleeping quarter*
  - *A lab*
  - *An exercise room*
  - *A greenhouse*