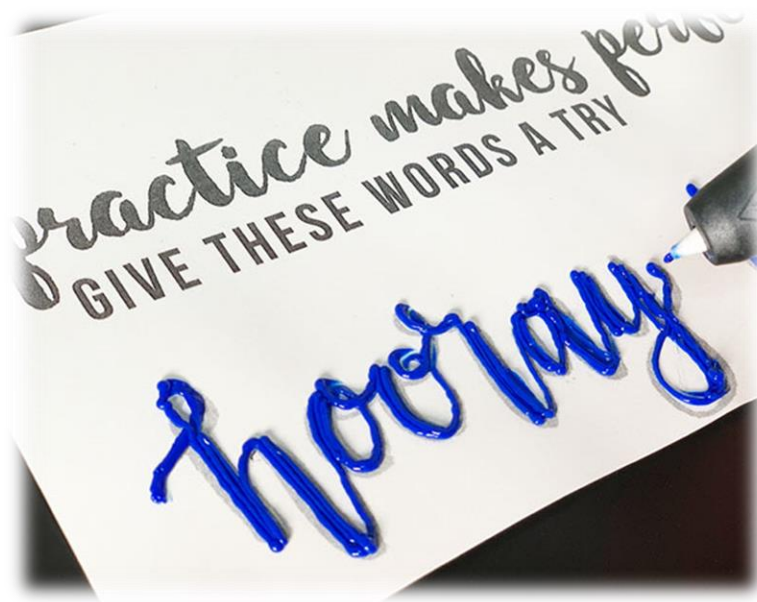


## Teacher 3D Pen Operator Guide



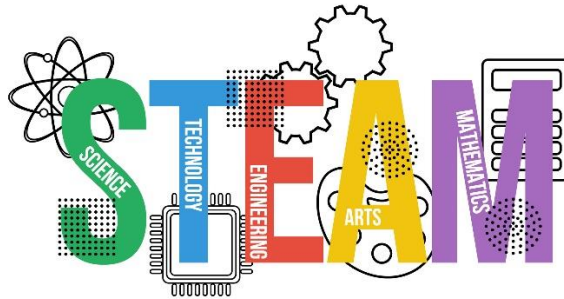
3D PRINTING,  
3D PRINTING PEN &  
STEAM Learning

# INTRODUCTION

## What is a 3D Pen?

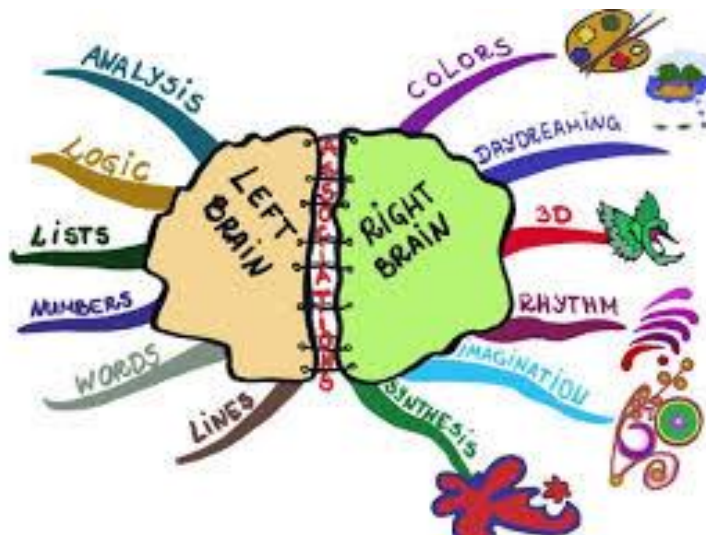


If you are familiar with 3D printers, you may have noticed that these machines are popping up in schools across the country. 3D printers involve designing objects on a computer and sending the information to a printer to fabricate. With the advent of 3D printing a new kind of drawing tool was invented which placed the power of 3D printing in one's hand. **It is called the 3D printing pen.** The Brain Buster 3D Art Pro Plus printing pen utilizes the same filament material for fabrication as used in a 3D printer. The 3D pen we offer makes it possible for you to purchase filament in bulk reducing your cost for projects in the future. A 3D pen works in a similar way to a glue gun. When the melted filament leaves the pen, it is soft and malleable, but very shortly it will cool enough to harden to create a solid structure.



## What makes the 3D Printing Pen a Powerful Learning Tool?

### It's the Left Brain Right Brain Connection!



A 3D printing pen and Brain Buster 3D STEAM Jump Start Guides are such a powerful learning tools for students. It provides the opportunity for children to do challenging thinking exercises that tap into left brain and right brain strengths, simultaneously. The left brain is the logical, problem solver and the

right brain is the creative, innovator. The Brain Buster 3D projects are geared towards helping children practice skills, utilizing these powerful left brain, right brain connections, thus expanding intellectual capacity and memory.

As teachers, imagine how thrilled you will be to observe the educational advantage your students will have as they development their visual acuity through the STEAM based, hands on learning projects. Brain Buster 3D pen projects task children to trace two dimensional drawings of detailed pieces and parts. They then peel the parts from the stencil, arranging them as they would a puzzle. The 3D pen is used melt, mold and weld the pieces in the construction of the three-dimensional object. Eventually as children become proficient in using the 3D pen, they gain the confidence to invent their own plans to construct, three dimensional objects, enhancing and accelerating their critical and creative thinking skills. Learning to use a high-tech stylus such as a 3D printing pen is not only fun and engaging but, will provide a huge advantage for students in all the STEAM subject areas now, and in the future.

### The power of DRAWING in Learning STEAM Skills



A 3D printing pen is a state of the art, high tech stylus which greatly enhances a student's drawing experience from simply using pencils, pens, and markers which are limited to two-dimensions, and expands their thinking into three-dimensional possibilities.

### Inner Workings of a 3D Pen



1. The gears rotate and pull the filament into the pen
2. The filament is moved through the chamber toward the nozzle.
3. The heating element in the nozzle heats the filament.

3D pens work when filament is loaded into the pen as hard plastic at the base of the pen. The gears rotate and move the filament through a central chamber towards the nozzle. Once the filament reaches the nozzle it enters a heating chamber and melts. The melted filament then extrudes from the nozzle when the extrude button is pushed at the top of the pen.

## PLA verses ABS Filament



3D printing pens use thermo-plastics as the material for fabricating objects. This is the same material used in 3D printers. There are two popular filament types PLA (Polylactic Acid) and ABS (Acrylonitrile Butadiene Styrene). Many popular 3D pens on the market come with ABS filament. Brain Buster 3D only offers PLA filament and there are several important reasons why:

1. PLA filament has a lower melting point than ABS filament which makes it a safer option.
2. ABS is made from the same plastic material used in making Legos. Legos are great fun, but would you want your students near melted Lego plastics? ABS work areas must be well ventilated. To compare...PLA filament is made from plant-based cornstarch and sugar cane, and has a low odor profile making PLA a much safer filament choice than ABS.
3. Is caring for the environment important to you? Then PLA is the winner in this category too, since PLA filament is made from water soluble, biodegradable materials.
4. PLA does not harden as quickly as ABS giving students more time to adjust or work with the plastic. Drawing in the air with PLA is more challenging than its ABS counterpart, but with patience and practice, this skill can be learned.
5. When ABS cools, it has a matte finish. When PLA cools, it has a glossy appearance which is very striking.
6. The tip where the filament extrudes is hot! Brain Buster 3D provides silicon thumb and finger protectors in all 3D pen kits to help students with handling the hot filament at the tip while working.

## 3D Pen Features

**Slim & lightweight, ergonomically designed, to avoid fatigue**

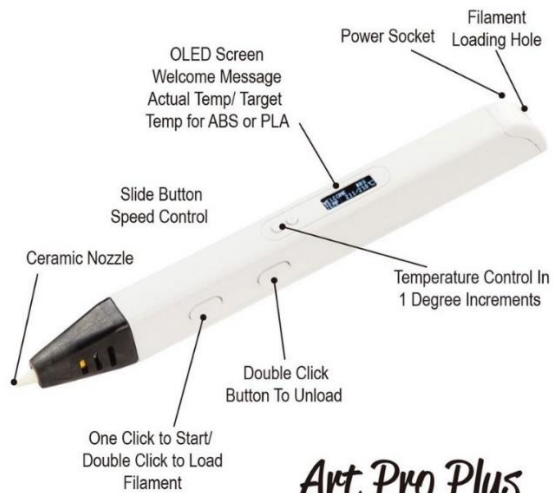
**AC/DC Adapter Included. Supports the use of a Power Bank**

**Convenient slide button for speed control for perfect filament flow**

**Load Button : One click to start. Double click to load/ Unload Button: Double click to unload**

**Anti-clogging 0.7mm ceramic tip is heat resistant and durable**

**Ventilated nozzle to keep the temperature lower**





## Operation Instructions

### Quick Start

Already familiar with 3D Pens? Then Quick Start's 3 Easy Steps is a great place to start.



Plug in the 3D pen.

It is compatible with 2 amp+ power banks.

Press the top button to start heating the pen.

The Art Pro Plus is set to heat to 190 Celsius the target temperature for PLA filament.

Insert the filament and double click to auto load or press the top button once and hold to load.

Quick Start Video Link

<https://www.brainbuster3d.com/quick-start-video>

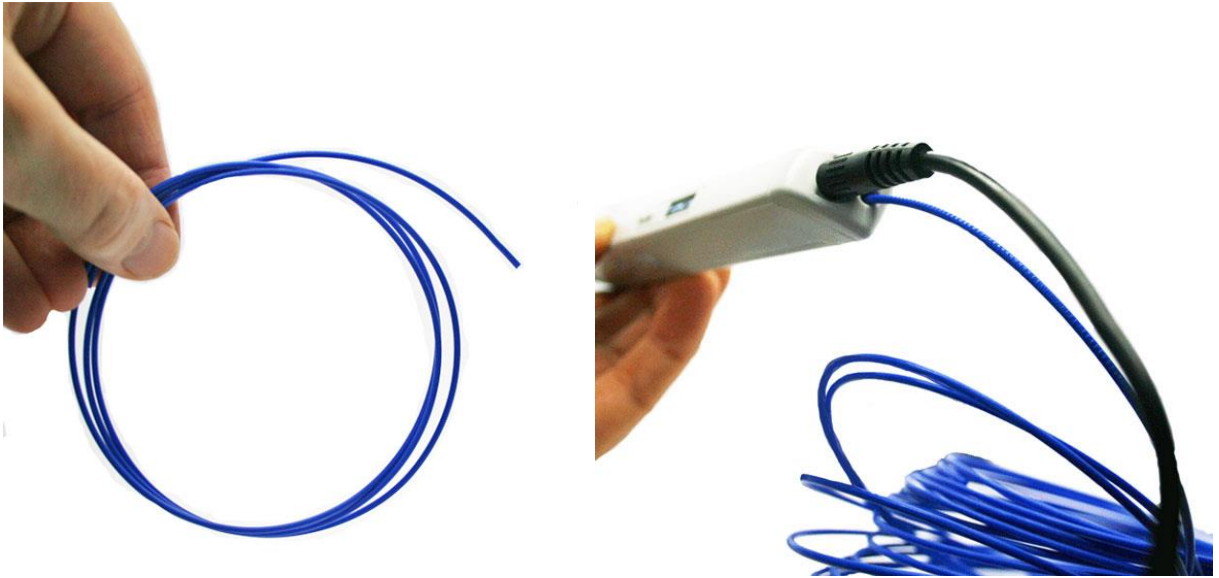
## Detailed Loading Instructions

### STEP ONE:



Select the PLA filament colors your child will use for the project. Use the power cord in the kit to plug the 3D pen into the AC/DC adapter or the Power Bank. (Note: The kit comes only with the AC/DC adapter).

## STEP TWO:



Before you load the PLA filament, make sure it is cut straight across so it will catch into the gear drive properly. Feed the filament into the hole at the rear of the pen until it stops. The pen must be heated to the target temperature of 190 degrees Celsius before it will engage the gears to pull the filament into the heating chamber. This should take approximately one minute.

## STEP THREE:

OLED displays actual/target temperature

Easy temperature adjustment 1 Degree Increments



Once the 3D pen reaches the target temperature of 190 degrees Celsius, double click the top button to load the filament automatically. If the top button is single clicked, hold the button while it loads. At this point the filament should be pulling into the pen. If it is not pulling, carefully push the filament forward until it catches in the gear. IF IT DOES NOT CATCH IN THE GEAR, pull out the filament and cut the end straight and try loading again. To stop auto-loading, click the load button one time.

When the filament reaches the tip of the nozzle it will extrude whatever residual filament was in the chamber first. Because of the pressure inside the heating chamber, a little bit of filament extrudes all the time. Have a paper towel handy and use the silicon thumb and finger protectors when removing extra filament from the tip since it is hot to the touch. Place the tip near the spot on the stencil or pad to begin working. Press the load button to extrude the filament while working. To stop extruding simply stop pressing the button.

#### **STEP FOUR:**



Once the filament starts to extrude from the tip of the pen, the speed of the flow of the heated filament can be increased or decreased with the stepless control slider on the side of the pen.

Moving the slider up towards the tip will make the filament flow slower. Down will make the filament flow faster.

#### **UNLOADING to CHANGE FILAMENT COLORS**



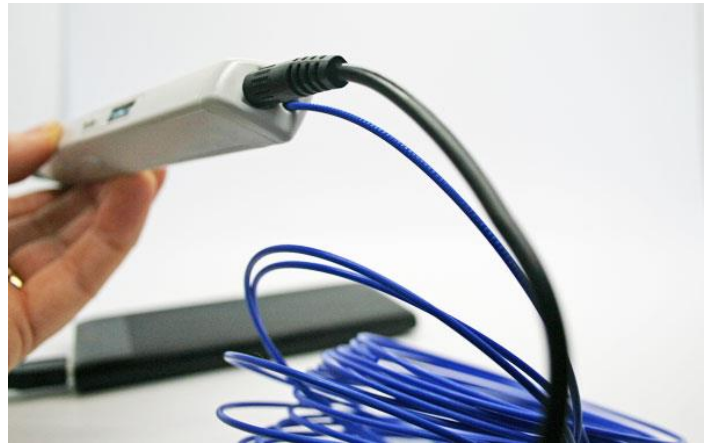
To unload the filament double click the second button which is the unload button. You will notice that the motor will start to move the filament back out of the heating chamber and pen. It should automatically unload.

Once the filament releases, there will be a change in the sound of the motor. Once this happens press the unload button one more time so it will stop unloading. When the filament is expelled from the gear chamber, the filament can be gently pulled out of the pen.

Be sure to cut the filament straight after you remove it for your next use. The pen will start to automatically cool down. If you take less than two minutes to reload your new PLA color, it should not drop below the target temperature and will be ready to load right away.

<https://www.brainbuster3d.com/reload-video>

## SHUT DOWN PROCEDURES



When finished with the pen, the best practice is to unload the filament completely from the chamber at shut down. To unload the filament double click the second button which is the unload button. The motor should move the filament back out of the heating chamber automatically until you press the button again which will stop the unloading process.

When unloading filament, you will know it is finished when you hear a change in the sound of the motor. At this point withdraw the filament from the pen and press the unload button one more time to stop the unloading process.

The pen will start to cool down automatically after unloading and will shut down after two minutes of idle use. After the tip cools down, it can be unplugged from the power source and stored for next time.

<https://www.brainbuster3d.com/unload-shutdown-guide>