

Teacher Resources: Stratasys F170 3D Printer

Last updated: September 2025

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STEMbound Contact Information

If anything seems missing or damaged, please contact us as soon as possible. Thank you!

Contact	Contact Information
STEMbound Team	Email: STEMbound@sourcewell-mn.gov

Website Quick Links		
STEMbound Home Page	Equipment Check-out Library Equipment Request	Consultant-led Learning Consultant-led Request
STEM Network	Partnership in Planning Request	Professional Learning

You can access the above links and more at: <https://mn.sourcewell.org/education/STEMbound>

Equipment Snapshot

Purpose

The Stratasys F170 is a professional-grade industrial 3D printer designed for rapid prototyping and functional parts using FDM (Fused Deposition Modeling) technology. It offers high precision, repeatability, and reliability across multiple material types. With the delivery you receive PLA filament. We recommend this equipment for students in grades 5-12.

Operation

Design or download .STL file

- Design part in TinkerCAD or preferred CAD software.
- Export/download .STL version of the model.
- Open the .STL file on laptop.

Open GrabCAD Print and ensure you are logged in.

- Import the .STL file
- Go to File > “open models” select your .stl file.
- Alternatively, drag the .stl file directly from your file explorer into the GrabCAD Print workspace.
- You can also click the file icon with the “+” on it within GrabCAD to add.

Configure print settings:

- Select the appropriate Stratasys FDM template (e.g., F170) for your printer.
- Adjust the layer height, infill density, print speed, and material type.
- Orient the model: Use the auto orientation tool to position the model for optimal printing.

Slice the model: Click the Slice button to generate the toolpaths for your printer.

- Export as a .cmb file:
- Go to File > Export CMB (or Ctrl+Shift+E).
- Choose a location to save your .cmb file.
- Save on thumbdrive and insert into front of printer.
- Use the printer’s screen to load and print file.

After print is complete

- Remove build tray from printer.
- Grabbing the corners of the plate twist (hard) back and forth and repeat grabbing different corners. You will hear a lot of cracking.
- You should then be able to remove the parts by hand.
- Breakaway away

Maintenance

- Remove extra debris from the oven periodically.
- Replace build plate as needed.

Safety Considerations

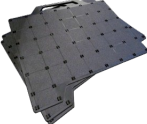
- Students should use the printer under direct adult supervision only.
- Avoid touching heated surfaces (nozzle/build plate)
- Gloves should be worn while removing parts, but this can also be done by hand (teacher only)

Possible Projects

- Design and print custom phone holders, keychains or ornaments
- Create math manipulatives (e.g., fraction tiles, geometric solids)
- 3D-printed map models for social studies

Contents Checklist

Please ensure all items and totes are present before and after use.

Item	Picture	Quantity
F170 Printer and power cord		1
PLA filament/model material		4
Build plates		6
Ethernet cable		1
Scraper		1
Gloves and cloth		1
Snipping tool		1
6 calipers and 6 measuring tapes		

Laptop & power cord		1
USB cable		1

Usage instructions

Operation & Setup Instructions

- Plug in the printer and flip two switches to power it on. The order is important. First, switch the one on the back of the machine and then switch the one on the side.
- Plug in the laptop and connect the ethernet cable between the laptop and printer.
- Students create models in a CAD software. We recommend TinkerCAD.
- Check that filament (also known as model material) is loaded by using the touchscreen on the front of the printer. If not, use the touchscreen interface to walk you through the loading process. (Material > Load, select material type, and the printer will load automatically load it)
- Check the build plate is clean and flat to the touch. Remove build plate by pushing down on the lever in the oven and pulling the plate toward you and up. Plates can be used more than once and may have residue on it with no issues. It IS an issue if there are chunks and elevated debris and you should replace it with a new plate.
- Make sure covers/doors are closed and you hear it latch.
- Export files from TinkerCAD (or preferred software) and load/open the model to print using GrabCAD on the laptop provided. You can do this in many ways. Either login to your TinkerCAD account on the laptop provided then export and load. Another way is to export .STL and place on thumbdrive and move thumbdrive to laptop and open from there. Open the GrabCAD print software on the laptop.
- Load or open .STL file in GrabCAD and adjust as needed.
 - Many adjustments can be made, but generally are not needed.
 - If you see a red '!' or error message in GrabCAD when the opening your file simply click on it and click "fix . . ."
- Once files are adjusted, click slice.
 - If an error occurs, click fix errors and it will fix itself.
- After slicing is complete, File > export .CMD and place on thumbdrive or other.
- Place thumbdrive into front of the printer
- Use the touch pad on the printer to begin printing. The oven will auto adjust, heat, and begin printing shortly after.

After print is complete

- Remove build tray from printer.
- Grabbing the corners of the plate twist (hard) back and forth and repeat grabbing different corners. You will hear a lot of cracking.
- You should then be able to remove the parts by hand.

Maintenance

- Remove extra debris from the oven periodically.
- Replace the build plate as needed.

Safety Considerations

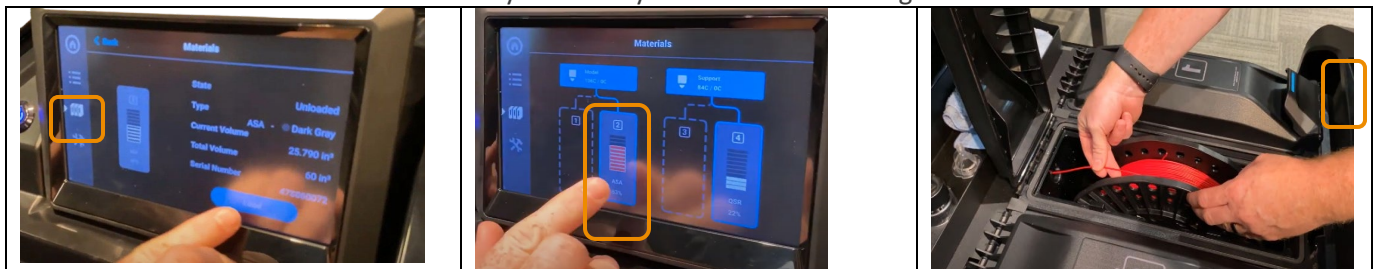
- Students should use the printer under direct adult supervision only.
- Avoid touching heated surfaces (nozzle/build plate)
- Gloves should be worn while removing parts, but this can also be done by hand (teacher only)
- In an emergency shut off the power switch at the rear of the unit.

Possible Projects

- Design and print custom phone holders or mechanical parts
- Create math manipulatives (e.g., fraction tiles, geometric solids)
- Prototype environmental design solutions
- Build working gears and mechanical systems
- 3D-printed map models for social studies

Loading and unloading material**Setup Instructions:**

- Find location for printer and lock the wheels.
- Plug printer in and power on.
- Load and unload filament spools as needed.
 - Material > touch model icon then select desired action load or unload.
 - Open drawer second drawer.
 - Open the black lid by pulling up on the lever closest to you.
 - When loading or unloading you will hear the machine working.
 - After the machine unloads material lift up on the spool.
 - Please new spool in (they only go in one way) and insert the end of the material into the opening. Machine will automatically load and you will hear it working.



Best Practices

- Always preview support structures in GrabCAD before printing (picture)
- Use standard resolution for classroom projects unless high detail is required

Troubleshooting Guide

Problem	Solution
Print not adhering to build plate	Replace build plate with a new one
Build plate uneven message	Replace build plate with a new one
The final printed part is faulty.	Auto calibrate the printer using touchscreen ○ Maintenance > Calibration > Auto Calibrate. This will take about 5 minutes and requires the printer to print a part and you to inspect after complete. Follow this video. (154) Stratasys F Series Calibration - YouTube 
Error occurs during slicing	Click on it and select fix errors and it will fix itself.

Extension Options

Cross-curricular uses

Grades 5-8

ELA

- Print symbolic representations from literature, perhaps representing figurative language.
 - Benchmark: Cite textual evidence to support their analysis
- Create a 3D-printed plot map or timeline with physical markers representing rising action, climax, and resolution for a novel
 - Benchmark: Analyze how a particular sentence, chapter, scene, or stanza fits into the overall structure

Math

- Design and print scale models of buildings or area representations.
 - Benchmark: Solve problems involving scale drawings.
- Design and print tessellation tiles or explore surface area/volume by printing scaled models of real-world objects
 - Benchmark: Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects

Science

- Build gear systems or plant/animal anatomy models
 - Benchmark: Develop and use models to describe how parts of a cell or organism interact to support life functions
- Print parts to construct a model of the rock cycle or plate tectonics in motion using gears or sliding tracks
 - Benchmark: Develop a model to describe the cycling of Earth's materials

Social

- Print architectural monument replicas
 - Benchmark: Describe physical and cultural characteristics
- Print and build a layered topographic map or physical map model of a world region being studied
 - Benchmark: Use geographic tools to analyze physical characteristics of places

Other

- **Art** – Design and print 3D relief art or abstract forms
 - Benchmark: Demonstrate intentional use of art media
- **Art** - Use digital design software to create wearable art like jewelry or emblems that reflect cultural art movements
 - Benchmark: Use tools, materials, and techniques to explore a variety of visual arts

Grades 9-12**ELA**

- Print interactive story poem artifacts – icons symbolizing themes
 - Benchmark: Determine themes or central ideas and analyze their development
- Design 3D propaganda pieces or visual rhetoric artifacts (e.g., badges, logos) that relate to persuasive or political texts
 - Benchmark: Analyze how an author uses rhetoric to advance a point of view

Math

- Print complex 3D calculus solids (e.g., rotated functions), explore volumes
 - Benchmark: Apply calculus in modeling
- Print parabola-focused launcher prototypes to study projectile motion, then collect and model the data
 - Benchmark: Graph functions expressed symbolically and show key features of the graph

Science

- Create precision parts for physics experiments (e.g., lever arms)
 - Benchmark: Use representation to analyze conservation of energy
- Build a working model of a DNA double helix or a molecular structure to explore form and function
 - Benchmark: Construct a model to illustrate the function of cell structures in multicellular organisms

Social

- 3D-print replicas of historical artifacts or political symbols
 - Benchmark: Relate physical environment to historical change
- Recreate historical artifacts (e.g., coins, printing press blocks, seals) for primary source analysis or museum-style exhibitions
 - Benchmark: Evaluate historical sources for point of view, context, and reliability

Other

- Music – Print instrument prototypes to explore acoustics
 - Benchmark: Perform appropriate dynamics and technique
- PE/Health – 3D-print anatomy models of bones and joints to use in injury prevention units or sports science studies
 - Benchmark: Analyze biomechanics and anatomy in movement

Additional resources

- [Stratasys F123 Series Support Center](#)
 - Comprehensive access to manuals, specs, FAQ's, and more

STEMbound support

- [Partnership in Planning request form](#)
- Additional in-class lesson support available upon request

Video tutorials

- [How to load Material on F170](#)
- [Calibrating the Stratasys F123](#) (same as F170)

User manual

- [Link to F170 User Guide](#)

Certifications/micro-credentialing

- STEMbound micro-credential course (link coming soon- check [STEMbound website](#) for updated information)