Educator Guide

Empowering Creation in the Classroom

Education
glowforge®

Introducing Glowforge

What Glowforge is all about

"Desktop creating offers the same power that desktop computing did when I was a kid. It takes technology out of industry and makes it accessible to a new generation of children, who can use it to build our future. From kindergarten to grad school, educators and students across the country are making the technology of the future their own with Glowforge. And together, I want to make it available to everyone."

—Dan Shapiro
CEO and Co-founder
Glowforge, Inc.

Our promise
Glowforge brings students' ideas to life in minutes.

Our vision
We believe in a future where kids think first about making the things they need, rather than buying them.

Our mission
We're invested in preparing the next generation for the future by giving them the opportunity to experience the joy of creation.

Our values
Comprehensive Learning Solution

Easy to Use

Built for Every Class

Fosters Innovation

Proven Choice in Schools

How Glowforge is used

Glowforge is a 3D laser printer that cuts, engraves, and scores hundreds of materials at the push of a button! It takes the power of a factory and makes it safe for students, for worry-free creation in any classroom, from kindergarten to high school. Glowforge integrates seamlessly into existing curricula, so educators can spend more time teaching and less time planning. Plus, students, educators, and parents alike can experience the magic of creation with the easy-to-use Glowforge App.

With hundreds of lessons created and tested by educators, the Glowforge community makes it easy to connect with a network of creators. From teaching and learning, to organizing and decorating classrooms, to entrepreneurship and fundraising, Glowforge fosters student engagement, imagination, and, most importantly, fun!

Who Glowforge is for

This adaptable 3D laser printer is the right tool for anyone who wants to create projects. Glowforge pairs with any curricula or subject, so teachers and parents alike can better cultivate innovation, self-expression, and creativity in their kids. With the push of a button, anyone can create a perfect print!

Teachers

- Empower students to think creatively, use tech effectively, and hone crucial real-world skills.
- Spark students' imaginations and their own as they watch creative ideas come to life.
- Take design challenges and problem- and project-based learning to the next level.

Administrators

- Effectively support student outcomes and success in schools and districts.
- Provide students opportunities for real-world connections in the classroom.
- Nurture school culture with custom-created designs and solutions.

Students

- Develop self-confidence by learning and applying valuable skills while exploring new subjects and career pathways.
- Unlock imagination while solving real-world problems, creating custom designs, meaningful solutions, and collaborating with others.

School Community

- Engage the community in supporting students and schools to achieve their goals.
- Create custom fundraising opportunities or events with help from the Glowforge.

Why educators love Glowforge

With Glowforge, students embrace their curiosity and get excited about learning. Glowforge provides opportunities for students of all ages, preschool to postgraduate, to experience the joy of creating! Even students who've never used Glowforge can hold their finished creations in a matter of minutes.

Glowforge's state-of-the-art technology and easy-to-use app encourage students to hone their digital skills and knowledge in order to prepare them for their future careers. Grounded in research and practical real-world applications, this comprehensive learning solution helps educators easily connect key pedagogies and disciplines with skills application, making real-world learning not just possible, but tangible.

Fosters innovation with hands-on experiences

Glowforge's state-of-the-art printing technology and easy-to-use design application support experiential learning, encouraging students to foster innovation and hone their creativity and problem-solving skills with real-world fabrication tools. Lessons such as Operation Organization (bit.ly/3sOhsf6) and R3Design Studio (Repair, Repurpose, Recycle) (bit.ly/3wD2LOe) challenge students to identify a customer's need, problem solve to design a solution, build and test a prototype, and print and deliver a customized design.

Promotes learning through experimenting and prototyping

Using Glowforge in your school fuels Design Thinking by empowering students to engage in critical thinking with hands-on experimenting, prototyping, and creating to meet challenges and solve problems. In lessons like Customized Pegboard (bit.ly/3Nu2LWv), students have the opportunity to engage in design thinking protocols to identify needs and creatively craft solutions that serve others in their schools.

EDUCATOR SPOTLIGHT

Foster innovation

As an educator, Casey is always looking for ways to help his students bring their ideas to life. No one could have imagined the incredible ways Glowforge would unlock new methods of making for both Casey's students- and himself!

"The Glowforge has been really effective as a beacon for drawing new students into our curriculum. Being able to jump from your design to the Glowforge, cutting it, seeing if your components align... it has revolutionized the way students are making work."

—Casey Curran
Studio Supervisor and Educator
Cornish College of the Arts

Hear more →

bit.ly/3MLgY5a

Offers applied skills in action

Glowforge lessons like Imagination in 3D (bit.ly/3Gc5JMQ) and Customized Games (bit.ly/3PCMhgu) provide opportunities for students to become makers and innovators. They apply critical thinking skills, explore their own creativity, and use cool features like the Trace and Print tool (bit.ly/38Lwhs3), all while leaning into the excitement of creation. Students see these ideas come to life before their eyes through iteration, designing, printing, and assembling!

Paves career pathways of the future

With its dynamic technology, Glowforge provides access and entry points to excite and encourage students to explore STEM- and STEAM-based careers. Students step into roles that offer hands-on opportunities to apply interdisciplinary knowledge in science, technology, engineering, art, and math. You can see this in action in the Animated Servo Robot lesson (bit.ly/3GjSPMT), as students combine the app's amazing design functions with the simplicity of micro:bit coding to create and program their very own motorized robots.

Glowforge allows students to step into roles of the future by solving real-world problems through the relevant application of soft and technical skills such as critical thinking and problem-solving. Career and Technical Education (CTE) comes alive with lessons like the Tiny Home Challenge (bit.ly/3LzHK3u), where students put their architectural and engineering skills to the test by designing an energy-efficient Tiny Home.

EDUCATOR SPOTLIGHT

Built for every class

When Patrick added a Glowforge to his technology lessons, suddenly his students could spend their time creating and experimenting (instead of struggling to learn complicated software). Teaching students how to use Glowforge only takes a few minutes, so Patrick gets to spend the rest of his lessons exploring concepts and skills that his students will use for the rest of their lives, no matter what the future holds.

"Glowforge has transformed how we approach making and innovation with even our youngest students. It's been quite magical having this machine. We keep our Glowforge on a low table so that even the youngest students can walk up to it and open the lid. It's become a regular part of the school day."

—Patrick Benfield
Innovation Director
The Magellan School

Hear more →

bit.ly/3MMbFyD

PART 2

Getting to know your Glowforge

How your Glowforge works

Traditional 3D Printer	Glowforge 3D Laser Printer
Uses additive fabrication	Uses subtractive fabrication
Slowly builds up layer by layer of material to create a print.	Starts with a piece of raw material and carves, engraves, and sculpts the final form.

Did you know Glowforge uses a beam of infrared light the width of a human hair to print? The glass tube inside your Glowforge operates like a neon sign, glowing when electricity is applied. Specially tuned mirrors amplify that light and create the laser beam that prints the designs you and your students create together. Because Glowforge uses subtractive fabrication, it works with hundreds of materials and prints quickly, with some prints finished in as little as two minutes.

Anatomy of your Glowforge

Let's take a quick tour of the parts you'll need to know.

Front

Lid
The see-through lid allows you to watch your designs come to life.

Printer Head
Where the laser arm is attached so it can seamlessly move around the machine to cut, score, and engrave.

Lid Camera
A wide-angle camera takes a picture of your material so you can place and situate your design elements where you want them on the material.

Rail
What the Laser Arm is attached to to move the print head around.

Passthrough Slot
(Pro only) A slot in the front and back that allows you to print with materials that are 20" wide, up to ¼" thick, and as long as you want.

Crumb Tray
A black, metal tray with honeycomb to support the material and catch leftover print bits.

Button
Push to make the magic happen!

Blinking White: Ready to Print—Press to start or to pause while printing.

Teal: Broadcasting signal for connecting to the Wi-Fi.

Yellow: There is an issue that must be resolved for printing to resume.

Rear

ON/OFF Switch
Main power switch for the Glowforge.

Exhaust Connection
Where you connect the exhaust hose to a vent or the air filter.

Passthrough Slot
(Pro only) Same as front.

Setting up your Glowforge

Unboxing

The box and packaging is specially designed to protect your Glowforge during transit. Be sure to keep the box and packing materials, you'll need all the original parts: boxes, handle locks, foam, plastic wrap, and important orange and red bits if you have to have your Glowforge serviced. Replacement packing materials are $249.

Consider a Location

Access

Who will be using the Glowforge: students, educators, administrators, other staff? Will they be able to access it directly or through an educator? Will students have access to it outside of classroom hours?

Usage

Will it be running all day? Will multiple educators and classrooms be using the same machine? Will there be a schedule for reserving access for projects or class periods?

Visibility

Where can you locate your Glowforge so everyone can watch the magic happen? Ensure there is enough room for students to gather around the printer without knocking the machine or the ventilation tube.

Ventilation

How will you keep your space well ventilated? You should only operate your Glowforge unit when it is exhausted to the outdoors or through the Glowforge Air Filter.

- Does your space have a vent or window? Great! Connect your venting hose to a 4" outdoor exhaust vent, the same as used for a dryer, or extend it out an open window and allow the hose to extend out at least three feet from the window unobstructed.

- Is your space windowless? No problem! The Glowforge Air Filter (bit.ly/3abV67x) lets you put your Glowforge anywhere. It sits on the ground near your Glowforge printer and cleans the air, allowing you to operate it anywhere in your school!
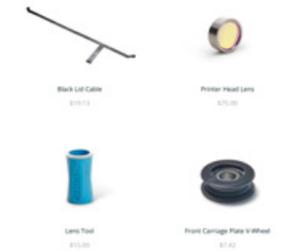
Prepare a Surface

Glowforge needs a surface that is hard, flat, and stable to ensure accurate prints, free movement of the doors, and to prevent misalignment or damage. Consider choosing a low enough surface so students of all ages can access the Glowforge and watch its magic!

PRO TIP

Use a cart

If your Glowforge is going to be shared from classroom to classroom, you will want to use a heavy duty cart that properly fits the Glowforge. Make sure if the cart has a lip, it doesn't interfere with the door opening or the Pro Passthrough slot.

Additional Glowforge products and information

Product and information		Description
Air filter (bit.ly/3abV67x)		The air filter lets you use your Glowforge anywhere without having to have a vent or window
Spare parts (bit.ly/3yV5Fj9)		Lost a part or need a replacement? Glowforge has you covered from shipping materials to replacement lenses to air filter cartridges. Whatever you need, you can find it here!
Unboxing & Setting Up Your Glowforge (bit.ly/3yV5jJ6)		Find step by step directions and videos in Unboxing & Setting Up Support.
Glowforge User Manual (Full) (bit.ly/3acjtU9)		Use the Glowforge Manual to explore safety information, a set up guide, and servicing and support information.
Help Center **Safety** (bit.ly/3H6ebdb) **Learn by Doing** (bit.ly/3LGadfK) **Servicing** (bit.ly/3Nwzk6d) **Troubleshooting** (bit.ly/3Gc75aj9)		Find answers to many of your questions and it's online, so it is always up to date.

Materials

With Glowforge, there is a world of materials all around to use. Your Glowforge can print objects using hundreds of beautiful materials like leather, acrylic, hardwood, fabric - items you can find just about anywhere! Glowforge can cut through materials that are up to ½" thick and engrave on materials up to 2" thick when you remove the crumb tray.

Found materials

Glowforge also works great with found materials that may be collected and used later or maybe even rescued from the recycle bin. Keeping these materials on hand for future projects will save time and money! Here are a few materials that are usually readily available and inexpensive that work well with the Glowforge.

Cardboard	Copy paper and cardstock
A common material found in abundance in most schools, so save those boxes! Cardboard is excellent for creating props (bit.ly/3eDt5BK), characters (bit.ly/3GaDH4v), or costumes (bit.ly/3wCFnJW), engaging in design challenges, or prototyping before using a more expensive material.	These materials work great to create lanterns (bit.ly/3Gaswb67), trifold designs (bit.ly/3NzTahk), or greeting cards (bit.ly/38IMIFz).

Be sure to research what materials are made of to ensure they are laser-safe. Contact the manufacturer, inspect their safety data sheet (SDS), and/or consult an expert to determine if each material is compatible with the CO_2 laser inside the Glowforge unit. You can also check out the Glowforge Community page where users have tested most materials and share the best settings to use for perfect prints.

It is imperative you do not skip material research. Some materials are not laser-friendly and can give off fumes or catch fire. Learn how to evaluate other materials on Glowforge TV Basics with Bailey (bit.ly/3Lz7Yne).

PRO TIP

Pop of color

You can purchase colored cardboard and cardstock from crafting stores or online. These can add a pop of color to projects and make designs more interesting!

PRO TIP

Remember!

Don't leave Glowforge unattended when printing projects.

Proofgrade Materials

If you want to skip the material research, you'll love Proofgrade materials. They are sourced, prepared, encoded, and lab-tested for perfect printing with Glowforge every time. Each piece of Proofgrade is uniquely encoded, so your Glowforge can automatically choose the lab-tested settings for perfect prints.

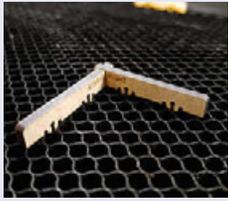| Material	Techniques & Notes	Types of Projects	Sample Project
Leather	Great for wet forming and embossing	Bags, bookmarks, bracelets, accessories, and wallets	Illuminated Cuff Bracelet (bit.ly/h6D3yZb) Step-by-Step Tracker (bit.ly/3wJgWjQ)
Plywood	Great for engraving Core is stronger in one direction than the other Edges are unfinished	Scale model designs, wall hangings, and desktop accessories	My Life, My Mixtape (bit.ly/3a6tqdt) Community Shadowbox Dioramas (bit.ly/3wC5wZW)
Acrylic	Great for heat molding, inlays, contrasting engraves Transparency type: Clear and Opaque and Finish type: Glossy or Matte	Jewelry, kitchen or bathroom goods, and window or display-case effects	Bucket Fillers (Pass it On!) (bit.ly/3wFx374) Illuminated Solar System (bit.ly/3sUB4hH)
Veneer	Great for stickers, layering, inset into contrasting plywood or hardwoods Finished surface with an adhesive backing	Keyboard or laptop covers, labels, name tags, and menus	Slide Up Veneer Card Holder (bit.ly/3Gf5f8B)
Hardwood	Great for exposed edges Surfaces and edges are finished	Desktop accessories, gifts, heirloom-quality keepsakes like boxes, jewelry, and plaques	Roll the Dice (bit.ly/3akebxN)
Draftboard	Great for prototyping and decorating with paint Unfinished surface takes paint and adhesives	Structural and decorative wood projects. Prototyping before printing a final version using finished materials	Multiuse Photo Booth Props (bit.ly/3NwA8MR) Customized Games (bit.ly/3PCMhgu)

Purchase →

bit.ly/38bPF5L

Useful tools you can print for your Glowforge

Print tools help you keep materials in place as you print! Pins are great for holding down lightweight material like cardstock and holding down scraps of material so you have less waste. Magnets work great for holding thinner materials like veneer and cardboard in place. Guides help get the perfect line up every time when you are printing duplicates and want them to be identical. Below you can find a variety of tools created by Glowforge Community members to help in every situation.

Tools		Tool Description
Honeycomb pins bit.ly/39Hy3Mp		These easy-to-print pins fit in the honeycomb on the crumb tray to hold smaller scraps and lightweight materials in place while the laser is running. These pins insert at an angle.
Right angle fence pin bit.ly/38hep8k		These pins create a fence that ensures materials line up perfectly every time. They help ensure there is consistency when printing multiples of the same design.
Straddler pins bit.ly/3Gdtcvd		These pins are great for holding various materials in place and perfect for using as a placement guide! They can be inserted at a different angle than honeycomb pins.
Magnets bit.ly/3an2Kxf		Using magnets on slightly warped or very lightweight materials like paper help keep the material level, in place, and give a more consistent cut. Wrap a piece of duct or gaffer tape around the magnet creating a tab to easily lift it off the honeycomb tray.
Guides bit.ly/3w3g9Qu		This design combines magnets and fence pins for placing materials securely on the bed every time with easy-to-lift off tabs built into the design.

PART 3

Putting your Glowforge to work

Using the Glowforge app

The Glowforge web-based app allows you to create your own designs from scratch, upload and customize catalog designs, or import a design from third-party software.

Glowforge accounts

| Glowforge Print	Glowforge Premium
A free lifetime subscription.	An annual subscription service.
With Print, you can use third-party design software to create designs, then upload your files and print them on the Glowforge. You can create Glowforge-compatible files from various software platforms like Adobe Illustrator, Inkscape, CorelDraw, Adobe Photoshop, GIMP, Autodesk 360, & Sketchup. Printing is as simple as dragging and dropping the file directly into the Glowforge app.	Premium allows you to access the design tools in the Glowforge app, including the creative tools, graphics and font library, various customization tools, and thousands of catalog prints at no extra cost. Premium accounts also have unlimited design storage! Most schools and organizations opt for this option.

Logging in and managing users

The main account owner is the first person to set up the Glowforge app and will be responsible for creating accounts for other users. You will want to think about who this main account owner will be. Ideally, it should be someone who has easy access to your Glowforge, can assign and approve account requests, and has a good understanding of how to safely use the Glowforge.

Setting up your school's first account

Go to glowforge.com/create-account. Fill in the required information, including an email to which you have access. Glowforge will send you a confirmation email. When you open the email it will prompt you to create a password.

You will need to have the physical printer accessible to you to begin setup. Click the Begin Setup button, and Glowforge will walk you through the process. Your Glowforge must be connected to the Wi-Fi during the setup process.
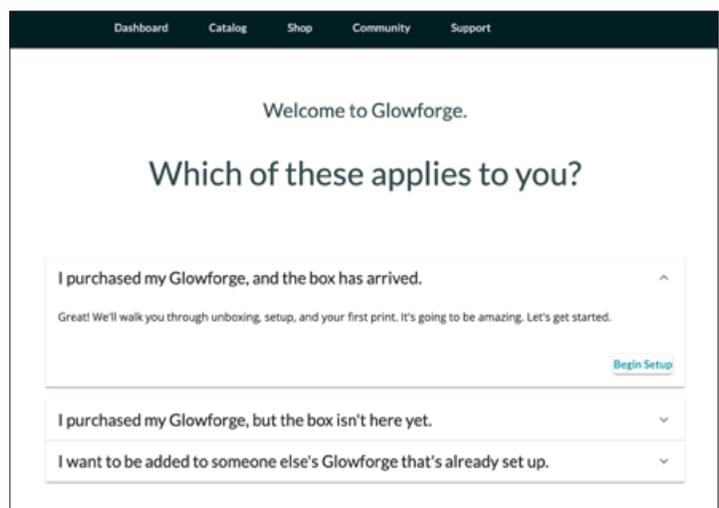
Setting up additional user accounts

The main account owner can add other users manually in the app, or the user can request access at glowforge.com/create-account. Requesting access requires a valid email address to access a link from Glowforge to create a password and activate the account.

The main account owner can approve requests, create unlimited users for the Glowforge, and designate who has access to the Premium options.

PRO TIP

Print or Premium?

You don't have to pay to use Glowforge software, but you can upgrade to Premium for premium features. CTE and art classes may only need a Print account to upload their designs from a third-party design software to the Glowforge.

Setting up additional users

You may need to create a user account for other school community members like those in PTAs, PTOs, or booster clubs. After you set up these user accounts, users will be able to purchase catalog designs using their own credit card or PayPal account and upgrade to Premium if they choose.
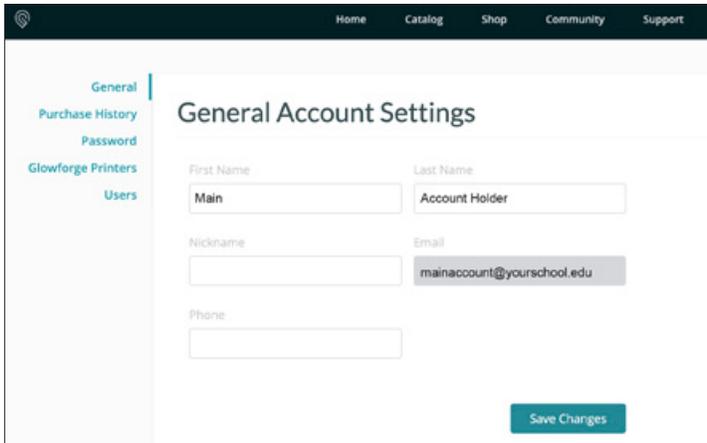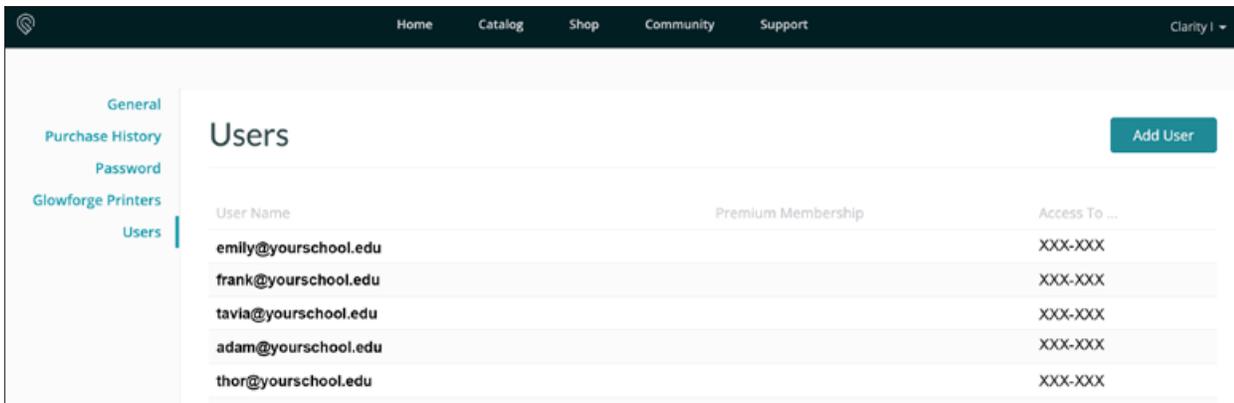
Using catalog designs

The Glowforge design catalog is full of ready-to-print functional and beautiful designs! Premium users have access to a collection of beautiful designs that have been tested and proven to print perfectly on Proofgrade material every time.

Getting started is so easy! Simply search the catalog, select a design, and it will automatically load into the Glowforge app. Position the design on your material in the app, push the button, and—just like that—you are creating with the Glowforge!

For catalog designs that are more complex or use multiple materials, you may notice multiple prints for the design appear in the app dashboard. This is completely normal. Prints are numbered and even reference the specific material you'll need! Print them in order and follow any instructions in the design details window.
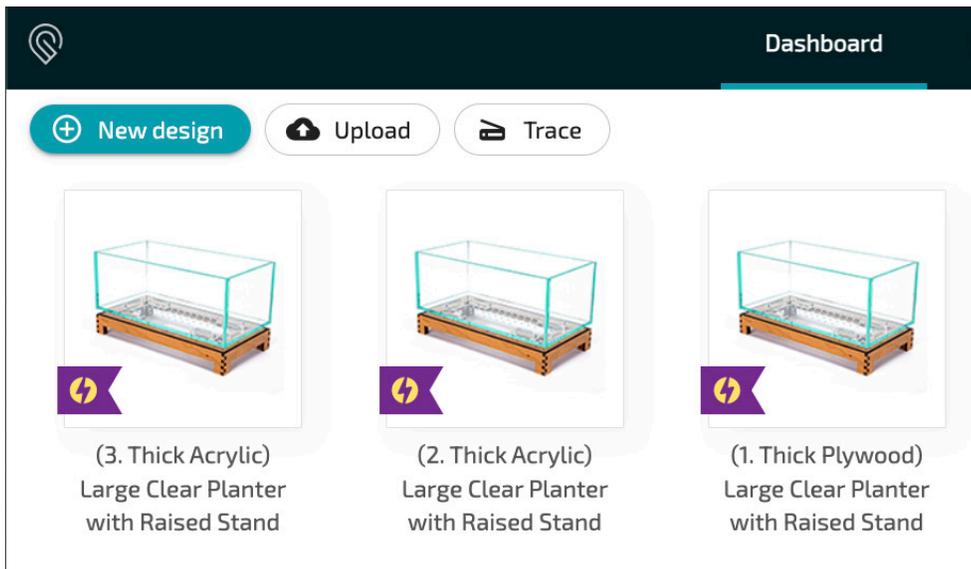
Once the design has loaded, you can use the tools to customize the design for your needs! In the next section, you will learn how to add decorations or text using the Premium design tools in the Glowforge app. Change the size! Try different materials!

Purchasing Designs
PRO TIP

Some designs are available for an additional cost. When purchasing a design, there are usually two options: you can pay per print, good for a one-time only print, or you can pay a slightly higher cost for unlimited prints, good for printing the design as many times as you need!

Design Customizations
PRO TIP

When customizing or resizing catalog designs, be mindful of joinery such as slots or finger joints; they may need to be adjusted. Try using cardboard or draftboard first to test print the design to check fit and save any joinery issues on more expensive materials later!
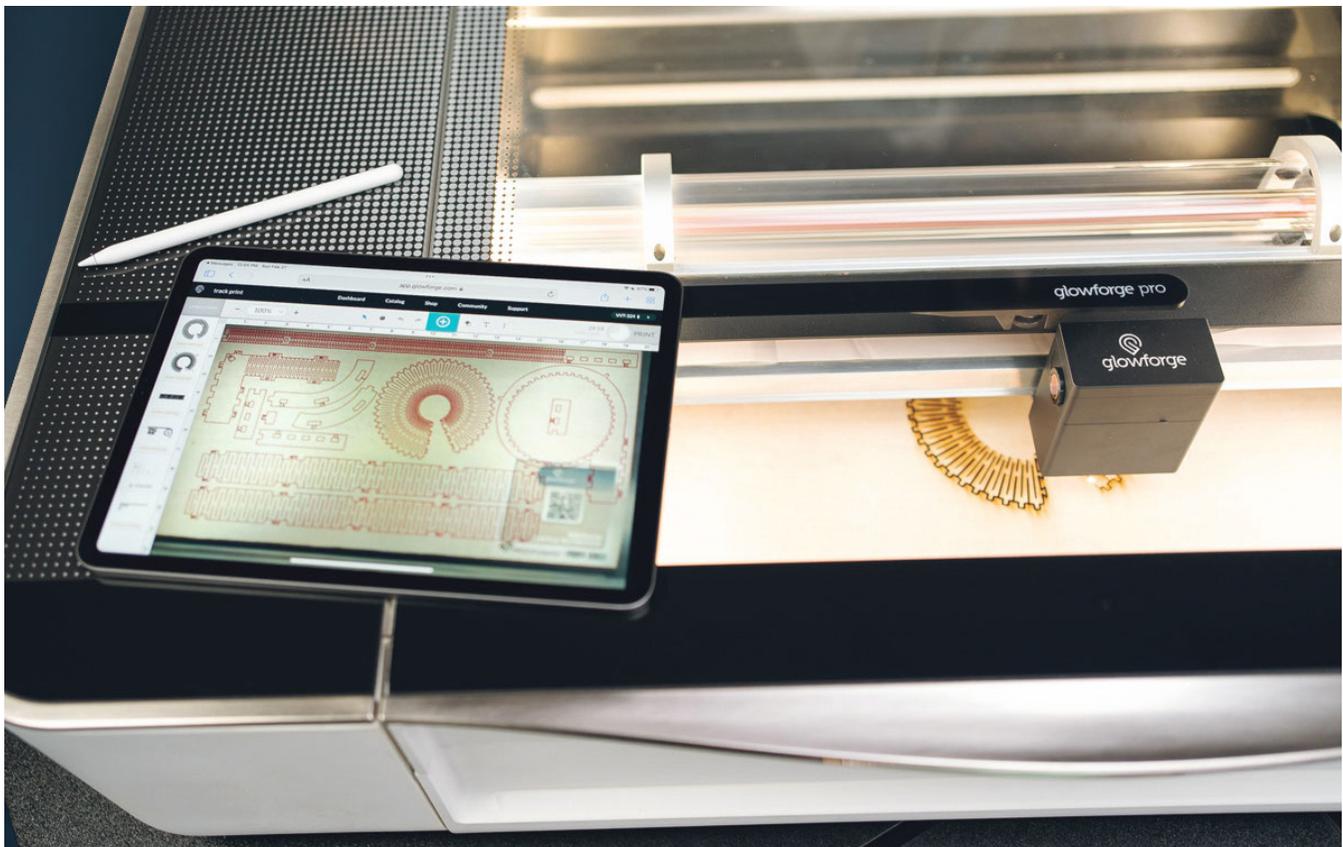
Designing with the Glowforge app

The Glowforge app allows you to customize and create designs from scratch! If you can dream it, you can design it! Design with a core set of tools in Glowforge Print like cut, score and engrave, upload a design, and the trace tool. Premium users have access to the full set of design features students need to bring their ideas to life. The design tools can also be used to add customizations to any design from the catalog.

Laser design basics

Before you continue, it's useful to understand the three things your laser does.

Cut	Score	Engrave
The laser moves slowly along a path, at full power, to cut all the way through the material.	The laser moves quickly along a path at lower power to draw a line that does not go all the way through the material.	The laser moves quickly back and forth, turning on and off thousands of times per second to create an image on the surface.

Glowforge App Dashboard

When you sign into the Glowforge App, you will see your dashboard. At the top left, there are three buttons. Quick links to the latest information on your Glowforge can be found in the bottom right of the Dashboard window.
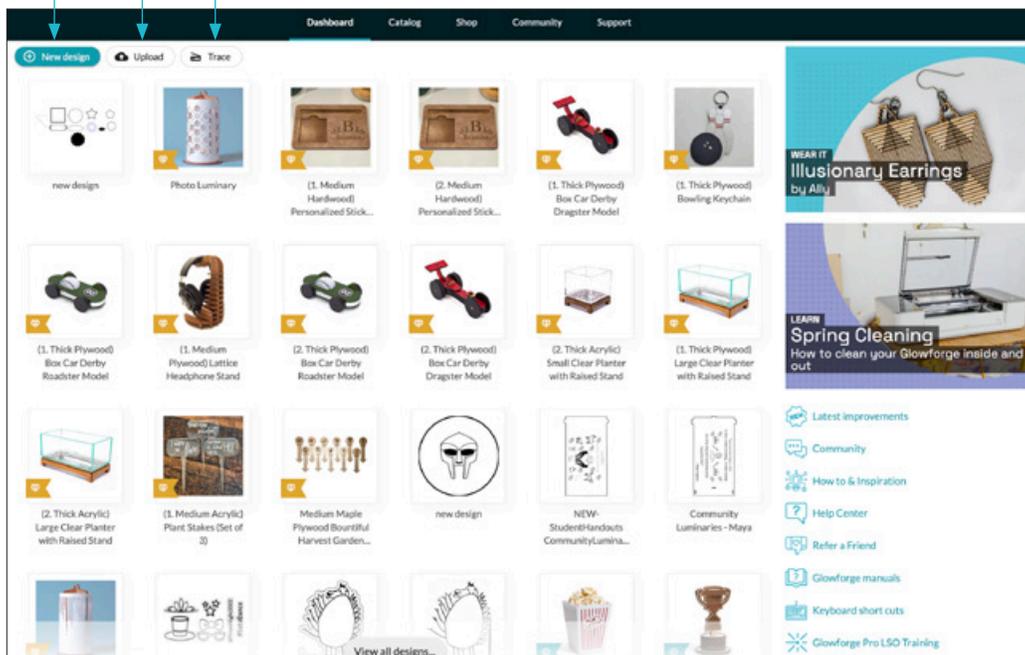
New Design (in Teal)
Enter the Glowforge App interface to create from scratch.

Upload
Upload PDF/SVG/DXF files from third-party design software to print with your Glowforge.

Trace
Create a design from something (e.g., a hand drawing or a photograph) that you place in the print bed.

Latest improvements
Find out what Glowforge has improved to make using your Glowforge even easier!

Glowforge Community
Meet a group of incredible folks also using the Glowforge who love to help you brainstorm, troubleshoot, and experiment. The Glowforge Community is a great place to find inspiration, discover answers to questions you might have, and connect other Glowforge users. Community members also have great tips and tricks for using your Glowforge!

How to & Inspiration
Explore step-by-step first prints to help you learn what you can do with your Glowforge by doing it!

Help Center
Troubleshoot and get answers to your questions by searching the Help Center library.

Glowforge Manuals
Get a quick link to the Glowforge manual, the air filter manual, and the compact filter manuals.

Keyboard Shortcuts
Access a quick reference guide to helpful keyboard shortcuts.

Free Glowforge PRO LSO Training
Use the Glowforge Pro Laser Safety Officer (LSO) Training Materials to help you comply with your LSO responsibilities and ensure that you operate your Glowforge Pro safely.

Glowforge App Top Toolbar

Material Settings
Get the perfect settings for Proofgrade. After scanning the QR code the settings load automatically. If you are providing the material, this is where you can enter the thickness of your materials in inches.

Hand
Pan the work area in the app. It moves the area, not the design.

Redo
Replace the last action and restore any actions that were previously undone using an undo.

Shape
Insert a line, square, circle, star, or polygon.

Text
Choose from over 900 fonts to add text to your designs.

Zoom
Zoom in or out of your design to be more precise with placement and design.

Arrow
Select elements of the design on the app.

Plus
Add artwork from the robust icon, graphic, and artwork library in the app. Here you can search and add artwork to your designs. The option to trace and upload files is available here too.

Triple Dots (More)
See next page.

Undo
Remove the last action and undo the actions in the order you did them.
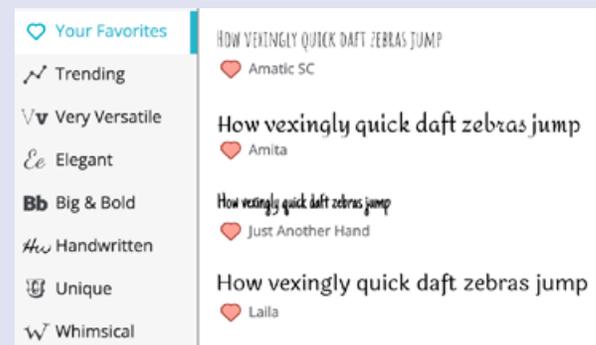

Shape tool

PRO TIP

- Holding shift while drawing a line gives you a perfectly horizontal, vertical, or 45° angle as you adjust the size.
- Holding shift while resizing a square, circle, star, and polygon allows you to create shapes without aspect ratios.
- Square and Polygon: Lets you create other shapes. You can choose the number of points (3-50) for your shape and/or round the corners.
- Star: Change the number and sharpness of the points and round the corners.

Text tool

PRO TIP

Save your favorite fonts by selecting the heart under the font. It will save into the Favorite folder at the top of the fonts page.

Your Favorites — HOW VEXINGLY QUICK DAFT ZEBRAS JUMP — Amatic SC
Trending — How vexingly quick daft zebras jump — Amita
Very Versatile
Elegant
Big & Bold — How vexingly quick daft zebras jump — Just Another Hand
Handwritten
Unique — How vexingly quick daft zebras jump — Laila
Whimsical

Glowforge App Top Toolbar (continued)

Refresh Bed Image

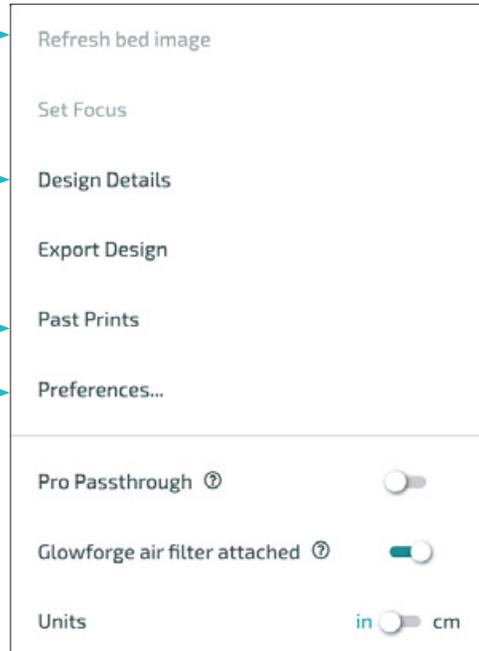Clear the last image taken by the Glowforge camera so you can place your new design.

Design Details

Access instructions for assembling your print from the catalog.

Past Prints

Revert to a previous version of a design.

Triple Dots (More)

Refresh bed image

Set Focus

Design Details

Export Design

Past Prints

Preferences...

Pro Passthrough ⑦

Glowforge air filter attached ⑦

Units   in   cm

Set focus

Measure the distance between the printhead and the top of the material at a spot you choose. This allows the laser to focus precisely during printing.

Export Design

Export the design you made in the Glowforge app as an SVG file to bring into another design software. Note: Glowforge catalog designs cannot be exported.

Pro Passthrough

Turn on passthrough if printing larger prints. Once you've selected Pro Passthrough, you'll see a zoomed-out image of the bed with a dashed line.
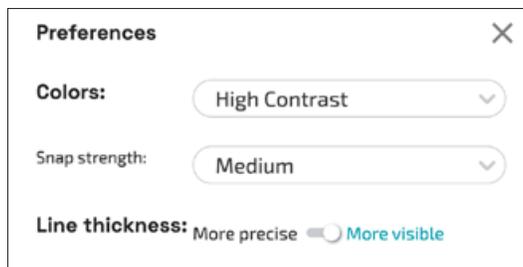
Glowforge air filter attached

This should be on if using the air filter unit or off if filtering through a vent or window.

Units

Change the in app measurements between inches and centimeters.

Preferences

Preferences   ✕

Colors: High Contrast

Snap strength: Medium

Line thickness: More precise ⬤ More visible

Colors

Change color contrast options in the app.
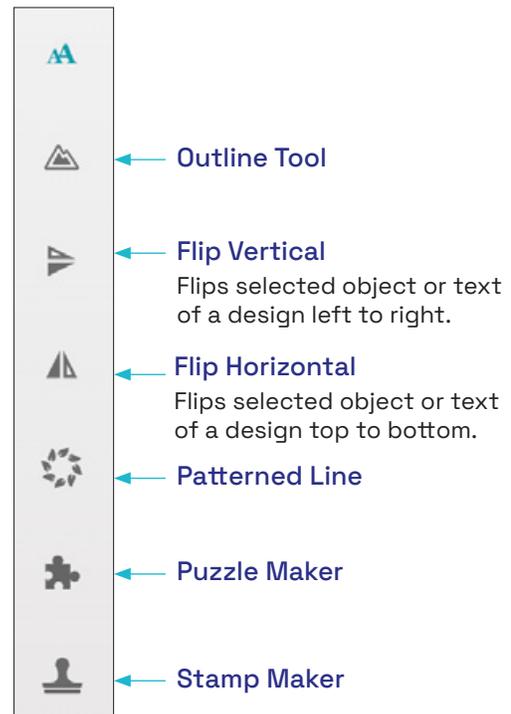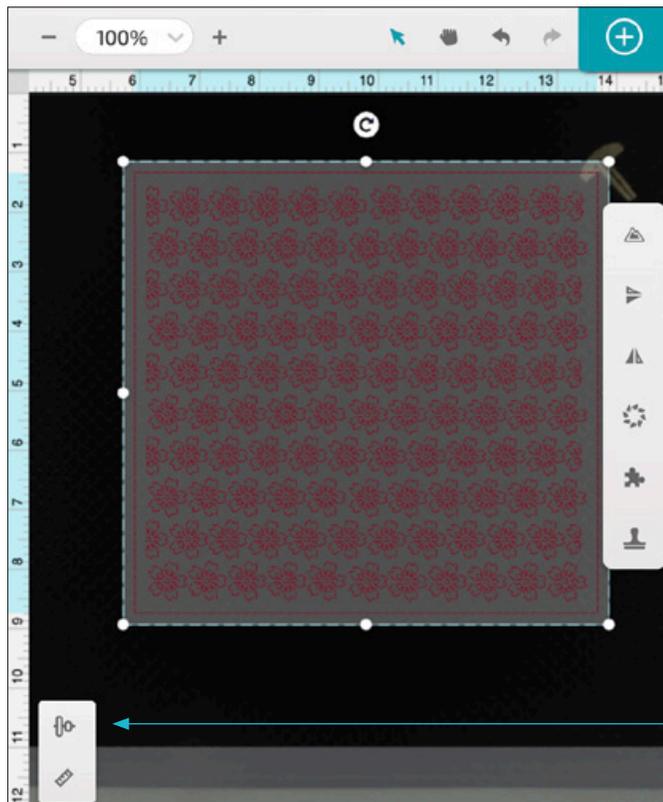
Snap strength

Show guides for placing items in varying levels: low, medium, high, and very high.

Line thickness

Choose between more precise or more visible lines.

Other tools

Other tools appear when an object is selected.

Outline Tool

Flip Vertical
Flips selected object or text of a design left to right.

Flip Horizontal
Flips selected object or text of a design top to bottom.

Patterned Line

Puzzle Maker

Stamp Maker

Ruler

Change the position, size, and scale of selected items. Choose what part of your artwork you want to remain in the same spot, and use the 3x3 dot array to indicate the center, a particular edge, or corner of your selection.

- Change the X and Y positions to precisely move selected objects.
- Set a selected object's W (width) or H (height) dimension to resize it.
- Use the 3x3 dot array to control whether the changes are relative to the center, edge, or corner of the selection.
- By default, your selection scales proportionately. Click the link icon to make it stretch instead.
- Hold down the shift key when resizing to reverse the lock icon behavior.

Align option

Align shapes, artwork, and text top, middle, bottom and left, center, and right. This also allows you to evenly space selected items.

Design File Naming Convention

When creating a new design the file name defaults to 'new design', so deciding on a naming convention is helpful for users to find and manage design files on their dashboard.

To create a naming convention consider the following:

- Adding a name or initials: first initial last name
- Adding a date: helps define versions or old files for deletion
- Adding a class period or educator initials: determines which project is for which class

| 22-04 C.Gilbert P8 | 22-04 E.Russo P5 | 22-04 J.Smith P3 #3 | 22-04 J.Smith P3 #2 | 22-04 J.Smith P3 #1 | 22-04 K.Jackson P4 |

The naming convention might be the date in yy-mm student first initial and last name format and a period or educator's initials. Example: 22-04 J.Student P3 ER.

Renaming a Design

In the Glowforge app, the file's name is in the top left of the app. Clicking on it allows you to rename the file.
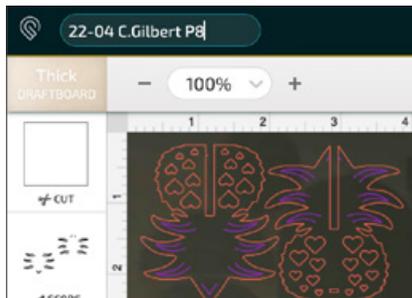
You can also rename the file in the Dashboard view by clicking on the design image, then the triple dots in the top right corner, and clicking rename.

PRO TIP
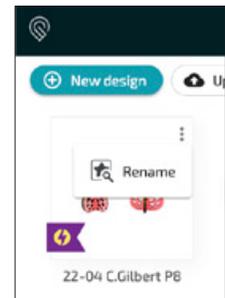
Searching for Designs

If you don't see your design on the first page of the Dashboard, you can search for designs by name. At the bottom of the screen, click on the "View all designs…" button. On the new page, there is a sort button in the top right and a search by name box

Cool tools and features

Tools	Tool Description
Trace and Print (bit.ly/38Lwhs3) 	Glowforge makes it easy to personalize your designs with custom artwork using the Trace option in the Glowforge app. All you need is a white piece of paper and a black marker. You can write a quote or a personal note, draw an original design, or trace something. Once your artwork is created, you can pop it into your Glowforge, and hit Import Artwork, and then the Trace button. Now you can choose what parts of the image to engrave, or if it is a closed shape—cut it out. Resize and position your drawing onto your design and have a one-of-a-kind print!
Pro Passthrough Slot (bit.ly/3gD2vZf) 	Passthrough is only available on the Glowforge Pro. Pro Passthrough software lets you print oversized designs that wouldn't normally fit in the Glowforge tray. This allows materials 20" wide, up to ¼" thick, and as long as you want! The software allows you to upload your design and then prompts you to move and align the material through the printer as it completes each section. Note: You will need to remove the Pro Shields before you print, and remember to replace them when you are done.
Outline Tool (bit.ly/3wFRwdr) 	Create a flowing cutline around your design with just one click. Select a collection of SVGs, text, shapes, or anything else then click. Drag the slider for a wider or narrower space between the line and your art. You'll create beautiful designs in just minutes.
Patterned Line (bit.ly/3ayUxSR) 	Add stunning details to your design with just a few clicks or functional designs such as stitching holes or tabs that hold small parts into the sheet you're cutting them from.
Puzzle Maker (bit.ly/38ykYdM) 	Quickly and easily turn any artwork into a puzzle with just a few clicks. Create puzzles out of engraved photos, or create an original design, then apply the Puzzle Maker tool, and the Glowforge will instantly add puzzle piece cuts to your design! Just like that, you have a hands-on learning tool!
Stamp Maker (bit.ly/39MTdqS) 	Turn your artwork or design into a stamp. Create your own inspiring quotes for grading, create a logo for a class project or let students create stamps with their original designs for creating customized art! The Stamp Maker inverts your artwork, so it is raised up when you print it. Print a handle and add ink to start using your custom stamp!

Uploading a design

Glowforge lets you print files created in third-party design software that you might already use with your students. Simply convert the files to a Glowforge supported file: PNG, JPG, PDF, or SVG, and upload them to the Glowforge app. With this feature, authentic learning quickly moves from ideation to design to print!

Task	Tools		
Software for exporting The Glowforge can Engrave from a JPG or PNG image file, and it can Cut or Engrave from SVG and PDF files. This means you can create something in popular software you already use, convert it to one of the supported files, and print! No design experience required!	**Apple Keynote** Allows exporting of PDF, JPG, and PNG files.	**Google Slides** Allows exporting of JPG, PNG, PDF, and SVG files.	**Microsoft PowerPoint** Allows exporting of PDF, JPG, and PNG files.
Design software for cutting and scoring These software options are great for creating advanced designs with complex shapes. They can also be used to create dimensionally accurate designs that slot together like boxes, mechanisms, and other 3D objects.	**Inkscape** (bit.ly/38fduFm) A professional quality, free, open-source vector design software.	**Adobe Illustrator** (adobe.ly/3PDCx50) A professional-grade vector graphics software, an industry standard for graphic designers.	**CorelDRAW** (bit.ly/3yXD8ck) An advanced layout and publishing software used to create and print designs.
Software for photo engraving Photo editing programs are useful for enhancing photos and images for engraving. These programs are best for preparing images to be engraved and perfect for retouching photos for engraving or creating grayscale images for 3D engraving.	**GIMP** (bit.ly/3yXSygQ) A free, professional-quality, open-source image and photo editor that easily resizes, recolors, crops, rotates, and manipulates images.	**Adobe Photoshop** (adobe.ly/3PDCx50) A professional-grade image editing software used to edit and enhance photographs and images.	
Software for 3D designs Computer-aided design (CAD) programs are a great tool if you need to create 3D models and designs! While you can't directly upload 3D models to the Glowforge app, this software allows you to design a 3D object, export it into a 2D design, and then print it with Glowforge. CAD programs are great for modeling and testing complex 3D prints before printing and for creating height maps for 3D engraving projects.	**SketchUp** (bit.ly/3NBW6tc) A 3D modeling software that lets you create and edit 3D models with simpler and more intuitive tools.	**Fusion 360** (autode.sk/3sTZ7NC) A commercial computer-aided design and drafting software used to create 2D and 3D designs.	**AutoCAD** (autode.sk/3yXDosc) A commercial computer-aided design and drafting software used to create 2D and 3D designs.

Experimenting and prototyping

Experimentation and prototyping are essential practices in the learning and design process. Glowforge is an invaluable tool for supporting the desire to improve, invent, and design. Students can apply real-world skills and knowledge to modify devices and tools or design unique, new solutions.

Experimentation leads to opportunities to discover new ideas and allows students to approach problems from different perspectives. Encourage students to explore materials they use in different projects. For example, try using a light-colored acrylic instead of engraving wood so they can write on it with a dry erase or wet erase marker and reuse the design class-to-class or year-after-year!

Prototyping a working model requires students to use logical thinking skills as they innovate their ideas. It helps students lean into the design process as they build and test their ideas, evaluate their solutions, and refine those solutions by gathering feedback from peers and community members. Engineering challenges can be designed, tested, and redesigned into a perfect print using low cost and readily available materials like cardboard.

PRO TIP

Designing with Cardboard
Check out all the ways you can use cardboard to make connections from the Exploratorium (bit.ly/3LYuCj7).

PART 4

Teaching and learning
with your Glowforge

Consider your goal

Glowforge helps you teach your students concrete skills that they learn by doing! To get started, consider your goal for the learning experience. What will be the most effective project to facilitate learning for students?

Do you want to create tools for learning or tactile experiences for your students?

- Tools like the Noticing Patterns (bit.ly/3wLY9rq) spiral drawing set help students explore lessons on curves, radius, and radial symmetry in math and art.
- Create your own layered map for a geography lesson making abstract concepts more tangible.

Do you want students to solve a real world problem?

- With Glowforge students can build and test their designs. The iteration process strengthens their learning and understanding. Try the Tiny Home Challenge (bit.ly/3LzHj3u) to get started.
- Create an authentic product for a project-based learning unit. Use the Glowforge app to design a solution, print it, test it, and redesign it!

Do you need students to be exposed to different design skills?

- Glowforge works with many design programs that support SVG, PDF, JPG and PNG files types. Students' designs become a reality they can touch and manipulate or redesign as often as needed.
- Using the Glowforge reinforces spatial reasoning skills, the ability to think in 3D, as they design. This is a critical skill in the STEM/ STEAM fields that students can practice in the classroom.

Skills development

Skill	Application
Analytical thinking and innovation Tackle a complex problem by collecting and evaluating information and designing creative solutions!	Student engagement skyrockets when they choose real-life issues in their community to iterate on or solve. Students will love designing solutions to repair, repurpose, or recycle everyday items that might otherwise be thrown away in R3design Studio (bit.ly/3wD2L6e).
Design Thinking Observe end users to empathize, brainstorm, prototype, and test ideas.	Students use empathy and innovation during the design process to make the best design for the intended user. Get your students focused on purpose as it affects the end-user with Robotic Arm Helper (bit.ly/385CyVB).
Active learning Involve students in hands-on and meaningful ways to increase engagement and improve learning and understanding.	Create learning tools that can help students visualize their learning. Hexagonal Thinking (bit.ly/3yWUtCt) is great for getting students to think critically and creatively while tangibly mapping this thinking.
Complex problem-solving Identify what is happening, define the elements of the issue, consider solutions and act to resolve the issue.	Students will execute more elegant designs and seek out challenges as they explore all of the capabilities of the Glowforge. Encourage students to explore endless possibilities by experimenting and prototyping with Glowforge's design tools!
Critical thinking and analysis Observe and identify challenges, then define a creative solution.	Students get hands-on experience creating designs, challenging the limits of different materials, working through issues, and designing creative solutions! Exploring the Miracle Hinge (bit.ly/3LLAJEs) gets students exploring the capabilities of the Glowforge beyond a flat, two-dimensional print!
Communication and coaching Convey ideas to team members and guide others to help them achieve their goals.	Students love learning in teams. Use Assembly Instruction Designers (bit.ly/38LWGW5) to challenge students to first assemble a helicopter without instructions, and then write instructions that communicate clearly, concisely, and sequentially reproducible results.
Creativity, originality, and initiative Remove constraints and give students new ways to solve problems or make their ideas come to life!	Students can create anything they imagine and design using the Glowforge app. Encourage students to explore the design catalog for techniques they hadn't considered. Educators can visit a section in all of the lessons called Reimagine that offers alternate ideas for using the design in other meaningful ways or inspiration for the next activity!

The Glowforge lesson library

The Glowforge Education Lesson Library (bit.ly/3IE223Z) features dynamic learning experiences that offer educators the support to facilitate students in planning, creating, customizing, printing, and using their designs. Based on themes like improving everyone's experience at school, practicing design thinking, collaboration, prototyping, STEAM, project-based learning, and civic engagement, you can find something for any subject area or grade level!

Anatomy of a lesson

These lessons, created by educators for educators, include:

Reflection questions

to provide opportunities for metacognition and formative assessment

Pro tips

to provide best practices for teaching, learning, and creating

Enhancements and extensions

for ways to remix and reimagine the experience

Assessment support

with single-point rubrics for both educator and peer assessment

Grade and standards alignment

with scaffolding for adapting up or down

Resources and handouts

to help frame and support the learning experience

Lesson overview

to set the context and build excitement around the learning experience

Thematic questions

to balance between content knowledge, technical skills, and soft skills

Getting ready guidance

to help educators prepare for the learning experience

PRO TIP

Mix it up

Remix and Reimagine ideas help you ideate how a design might work for your class or a specific project. They are great ways to extend the learning or enhance the lesson you are working on!

Classroom management

The Glowforge is a magical device for students and educators alike. Use these tips to keep things running smoothly during your projects.

Design anytime, anywhere

When access to Glowforge is limited by physical space, you can still teach with it! Since the app is web-based, you just need access to the Internet to create and send designs to the printer.

If there is no access to the Internet, students can still use alternatives such as Google Draw, Captivate, Tinkercad or any other third-party design tools. Once Internet access is restored, simply upload your design and voila!

One way to successfully approach Glowforge projects is to give students the assignment with time built in to explore the parameters and really understand the objectives. Next, students can brainstorm their solutions using a design process to facilitate ideation. After ideation, students can digitize their design using the Glowforge app or a design software of their choice. They can even take a picture of their design and upload it as a JPG to the Glowforge app. Once they print their prototype, it's time to test it and reiterate their design based on real-world feedback!

Time management

Glowforge can only print one design on one material at a time. Remember to build in time to stagger printing.

Some prints can take longer to print depending on the design or the material. Glowforge will tell you the print time at the beginning of your print and you can pause printing at any time by hitting the white print button. Printing will resume when you are ready with another press of the button. Note: If you open the lid or click Cancel, it will cancel the print.

Introduce students to the tools in the Glowforge app before they log in for the first time, making sure to discuss:

- Naming conventions for files
- Creating a print
- Tools available
- Resizing a design
- The difference between score, engrave, and cut
- Grouping and ungrouping
- How to order different elements of the print

Student experts

As students learn and become familiar with Glowforge, they can help each other. Utilize their know-how, creativity, and imagination with student expert roles. A few suggested roles include:

Role	Description
App Architect	Do you have a tech-forward student who likes to push buttons to see what will happen? Encourage this student to help others master the possibilities of the design tools and learn the ins and outs of the app.
Construction Coach	Have a student who loves working with their hands and building things? Ask them to assemble the prints or coach their classmates on assembling more complex prints.
Design Developer	Have an artistic student that thrives on creating or who is very visual? This student can help others with concept development or design in the planning or post-printing phase.
Printer Pro	Have a student enamored by the Glowforge printer? The printer cannot be left unattended while printing, so this student can watch the printer and alert you to any issues while you are facilitating learning experiences.
Materials Marvel	Have a student that loves to organize or is passionate about recycling? This student can organize the materials and suggest the best use of scraps so that waste is limited and you get the most out of your materials.
Experimentation Expert	Have a student who likes working through a challenge? This student can help classmates through the prototyping phase when their design needs iteration. They can troubleshoot the design with their classmates and make suggestions to make it function as intended.
Tip Titan	Did a student discover a way to streamline a process or a suggestion for using the app more efficiently? This could be any student any day you are working with the Glowforge. Students discover and master tools really quickly, so don't lose out on their wisdom. Add these suggestions or ideas to a document or Glowforge journal to refer to for the next project.

Collaboration

Teamwork makes the design work! Collaborative learning develops higher-level thinking skills while boosting students' confidence and self-esteem. It is important when planning an activity to ensure that all students play an important role to keep engagement high and ensure the participation of all team members.

When students are working collaboratively, we recommend groups of 2-3 students max.

- Have students plan out their design before using the Glowforge app. This will minimize the amount of time they use the app if computer access is limited.
- Encourage students to explore and play with the app to find design elements to add to their projects.
- As one student uses the app, encourage the others to give guidance from any plans or prototypes they developed before printing.
- Encourage groups to rotate their roles frequently so everyone gets a chance to use the app and develop their design skills.

PRO TIP 💡

Ambassadors Program

The Education Ambassador program (bit.ly/3yWVf5T) is designed to recognize and celebrate educators who are creating amazing things. It is where you can share designs, lesson plans, ideas, and innovations with fellow Ambassadors who successfully use Glowforge in their classrooms.

Preparing for a lesson

Pre-upload and rename files

With your own designs, you can quickly duplicate and rename the files. If you are working with younger students or you need to get started on a project quickly, consider uploading the design file and renaming them using your naming convention before you begin the learning experience.

Note: Catalog designs cannot be opened in multiple instances with the same login. One group must customize and print the catalog design before another group can open the same design, reset it, and make it their own. Plan to build in time for this process.

Preparing to print

While students are in the design phase, make a checklist of the materials you will need for printing and ensure you have the materials on hand well in advance. Conversely, you can challenge students to create with the materials available and use scrap pieces for their design.

Print process

Intentionally build in time to have students reflect on the process of designing and printing with the Glowforge. Need inspiration? Our lessons have reflection questions included! Also, remember to encourage students to watch Glowforge generate their prints in real-time. The wonder and magic of the printing process is something not to be missed!

Customizing your finished print

Having the right tool on hand for when you are working on assembling or customizing your finished print is essential to a smooth process. Creating caddies for organizing your tools is an excellent time-saving idea! Stock your caddies with:

- Paint pens and markers to customize draftboard, cardboard, or paper prints
- Glues for wood and acrylic projects
- Sandpaper in fine grits to finish edges or rough up surfaces for gluing or painting
- Resealable storage bags or bins for collecting printed pieces for a design
- Crafting materials to customize prints, (i.e., googly eyes, pom poms, chenille sticks, paints, feathers, buttons, self-stick foam shapes, felt, fabrics, etc.)
- Black markers to use for creating Trace designs

PRO TIP

Additional Materials

Consider using double-sided tape, magnets, keychains, 3M Command strips, and/or VELCRO® to further customize the designs you create and print.

PRO TIP

Mixing Mediums

Try mixing materials when printing a design for interesting effects. Various colored acrylics or woods mixed with acrylics create eye-catching designs.

Storage and maintenance

Materials storage

Keep your materials print-ready with the following storage tips.

- Store your materials flat. Upon arrival, immediately store your materials in a cool, shaded, and dry place.
- Stack materials on a clean flat surface. Stacking warped material on top of other warped material can make warping worse.
- To prevent discoloration or damage, keep materials out of direct sunlight.
- To ensure your materials stay flat, stack heavy objects on top of your materials. Humidity or heat may cause your materials to warp temporarily. Try these suggestions to help restore their shape:
  - If your materials have to be stored in a humid area, wrap them with plastic wrap or shrink-wrap to keep moisture out.
  - Set heavy objects on top of your material. Distribute weight evenly on top of the material. If possible, use a flat object like a textbook.

Maintenance

Always make sure your Glowforge is turned off before cleaning!

Keeping your Glowforge clean is important and easy. To get started, make sure you have a few materials on hand:

- Zeiss Lens wipes
- A soft cloth or microfiber
- A cotton swab
- Compressed air
- Isopropyl alcohol

PRO TIP

Cleaning Guidance
For a step-by-step walkthrough for cleaning your Glowforge check out this video on Glowforge TV Essentials—Cleaning Your Glowforge (bit.ly/3sQC3q7).

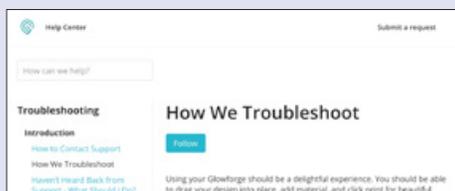| Floor & Crumb Tray Clean when necessary	Cameras and Lens Clean after 40 hours of printing	Precision Mirror Clean after 120 hours of printing
Any bits left in the tray can prop up your material and cause printing issues. Lift out the tray and dispose of cuttings in a trash bin. Use a cotton swab to get any bits stuck in the honeycomb.	Dust may collect on the cameras, windows, and lenses and impact printing. Use a Zeiss lens wipe to remove dust, and take care to avoid touching these areas with your fingers!	The precision mirror is located inside the printer head. Dust may collect here too! Use a Zeiss lens wipe to remove dust and replace the mirror in the printer head.

Safety tips

Before you begin

- Read the Glowforge User Manual (bit.ly/3acjtU9) before using your Glowforge printer, and ensure any adults who use it read it too!

- When using the Glowforge, children require the supervision and assistance of an adult at all times.

- Lasers are subject to regulations and standards, particularly when installed in an educational institution. Ensure that you comply with all applicable rules.

- Do not touch the head or arm of the Glowforge unit while the power is on. If you do so by accident, turn the Glowforge off, then back on again to prevent the possibility of damage.

- Parts of this product are made of glass that could break under impact. Should that happen, be careful to avoid injury by broken glass pieces.

- Do not use the Glowforge if the glass or case are damaged or modified! Any damage or modifications could allow dangerous contact with moving and/or electrical parts and/or allow infrared and ultraviolet light, heat, smoke, and fumes to escape.

- Free Glowforge PRO LSO Training: a PDF of the Glowforge Pro Laser Safety Officer (LSO) Training Materials to help you comply with LSO responsibilities and ensure that you operate your Glowforge Pro safely.

Stop using your Glowforge immediately if

If any of the following occur, immediately turn off the power switch, unplug the unit and contact support@glowforge.com. Do not use your Glowforge again until the issue is confirmed as resolved by support.

- The default settings for a piece of Proofgrade material do not cut through the material even after cleaning the lens and windows

- There is a fire in the unit that persists after the laser turns off

- The head stops moving but the laser is on

- The unit's button turns any color other than white, yellow, or teal

- You see any damage or discoloration to the case

- There are any cracks or chips in the glass tube or lid

- You see any moisture present inside the Glowforge unit

- You see any damage to the interior components of the Glowforge unit

- You notice unusual light coming from the unit that was not occurring previously

- You notice an unusual sound coming from the unit that was not occurring previously

Need more help? →
bit.ly/3Gw9SGJ

Where to explore next

Resources	Description
Glowforge TV (bit.ly/3yX9qUZ)	Videos from Glowforge including Livestreams, Glowforge Essentials, Basics with Bailey, and Step-by-Step Channels that will get you up and running in no time and get your creative ideas flowing. They even have a series from Glowforge owners with their favorite tips & tricks!
From Start to Finish YouTube playlist (bit.ly/3yU1PXv)	How-to quick start video playlist on YouTube from Glowforge. These short videos focus on printing with different materials while using your Glowforge.
Print using Inkscape (bit.ly/3LP2RGW) **Introduction to Inkscape** (bit.ly/3yX9wvP)	Step-by-step guides on the free vector graphics editor, Inkscape, to get you creating even more with your Glowforge. Inkscape is used by Glowforge Support to help you troubleshoot your designs if you run into trouble.
Become a Catalog Designer (bit.ly/3PFbl6E)	Step-by-step guide for submitting your design. If you create an amazing design, you can submit your creation to our design catalog for others to purchase and enjoy.
Submit Your Own Lesson (bit.ly/3bHyZS9)	How-to guide to submit a lesson to help other educators integrate the Glowforge into their courses. Or share a great classroom management tip with the education community.
Glowforge Ambassadors Program (bit.ly/3yWVf5T)	Apply to become a Glowforge Education Ambassador and get exclusive access to the Edu Team, events, and more!

Education

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