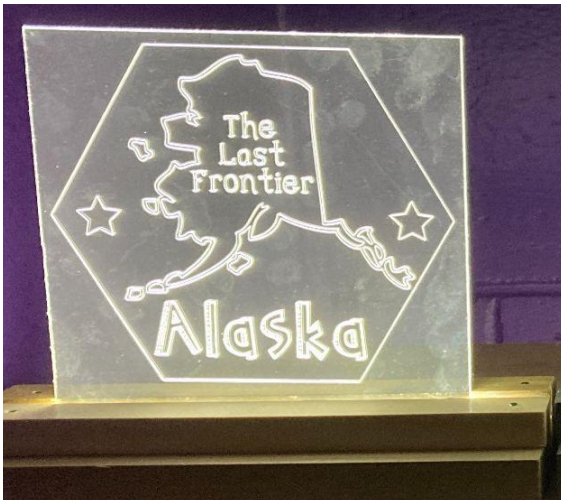

LED Edgelit Lights with Wooden Base

Grade level(s) I use with: 7th and 8th, I have done this with 5th / 6th during summer camp and it works great, just in my rotation of curriculum I've kept it at 7th / 8th.

Lesson Overview: this was my first lesson that successfully combined the work I like to do on circuits, with 2D design and some basic woodworking. The outcome is a personalized LED light that is engraved with a Cricut cutter (this year we will also add the option of scribed or engraved Glowforge images). Gives students experiences with lots of makerspace tools and the products typically produce that "this is so cool" response. I've never had a student fail to take their home - which is not true for any other project where I do get kids who complete it but only for the grade not because they want / like the product. Pretty cost effective too - I typically figure this is a $4 per light project.

Materials I use: this project definitely works better with some specialized makerspace equipment, I imagine it can all be worked around but this is what we use;

- Clear 3 mm (.125 inch) acrylic cut into 6 x 6 inch pieces with lasercutter (could be done by hand)
- Poplar hobby wood pieces from Home Depot (any piece of wood can work - these are $1.88 at Home Depot which is a

tough price to beat and they work perfectly.
- LED light strips (our are 7 inches long / 10 lights)
- USB connector for LED light strip
- Nails and stain to finish

Equipment I use:
- Cricut cutters with engrave tool
- Piranha CNC router for LED light groove
- Chop / circular saw to cut wood
- Bandsaw to create acrylic holder wooden sides
- Glowforge lasercutter as option to engrave image in acrylic
- Table sander to smooth / shape bases

Process -
This is a culminating project for 7th / 8th grade that allows for quite of bit of individualization while also being manageable provided you have sufficient equipment. We begin with a basic review of Cricut (we use Cricut Design Space as our platform - costs but I find it so simple to use that it's seems worth the $13 per month for a class account). Students create some simple vinyl stickers to review the process (since vinyl is cheap / acrylic is not) - I even do this on precut 3 x 6 inch pieces of vinyl since I find there is so much waste if I offer up larger pieces. I also have 6 x 6 vinyls available so they can begin to play with the scale since their acrylic pieces are precut to 6 x 6.

While they are getting refreshed on Cricut (they have done this as 5th / 6th graders) I also begin to build the wooden bases piece by piece since these tools take more supervision. I should note that I have 4 cricut cutters in our makerspace and find that is adequate to not create big backups with up to 20 students. We also do the design on ipads and I have those 1-1 in my space. Each cricut is connected to a dedicated laptop logged into the class Cricut account - so the workflow is to design on ipad, save to the cloud, and then find that file on the laptop and print on the connected cricut. This has been a pretty seamless process except that my laptops are old Macbooks and tend to be slow . . but it works :-) For the wood we cut a 24 inch piece of ¾ by 2.5 inch poplar into 3 eight inch sections - each light will need one full section. The "extra" section is split into 4 pieces each roughly ⅜ (.6 inch) wide - each light will need two of these that serve as the sides holding the acrylic in place.

I have created a piranha cnc file with the vcarve software that cuts a slot in the top of the wooden base that holds the LED light strip in place. These have to be cut one by one so that is

the slowest process, but since everyone tends to be pretty self-sufficient on the cricuts this works for me to focus on the wood.

The actual acrylic piece is first designs and printed on 6 x 6 cardstock as a prototype - using the pen. Lots of students have scale and placement challenges with getting their image in the size and location they want - I have found that this paper step is critical to avoid wasting a ton of acrylic. They also have to see that the bottom ½ inch of their acrylic will be blocked by the wooden sides - so I always have a couple test bases nearby so they can stick their paper prototype in and confirm they can see everything they want to see. Once they have a solid paper design they are set to switch the tool to engrave. Unless you have brand new cricut "stong hold" mats (the purple ones) you will want to encourage them to masking tape their acrylic or it will slide around and be ruined, just be careful not to tape where the map slides under the rollers - just on the top and bottom.

For the final assembly I have some 3 x 6 pieces of acrylic (waste designs work great) that I use to hold the side in place while students nail the two sides to the bases with 1 ¼ inch wire brads. It is really important that the edge of the acrylic aligns with the lights so I do this with the LED's turned on shifting side to side to find the best location and having students nail - takes a little trust as your fingers are relatively close to that hammer :-) I find it does help to pre-drill the sides as with hard wood poplar they will occasionally split and it also really helps students who often are not really proficient at nailing.

Once they are all assembled the final option is staining the base - the natural poplar looks great but many students like a reddish gunstock, black ebony or brownish honey. I do allow students to make 2 acrylic pieces if they finish as that keeps them engaged but unless they indicate that they want to do something as a gift we rarely make more than one base - just takes too much time.

Ongoing questions and ideas for the future:

This year I have much better access to Glowforge, so I'm hoping to include the option to vector cut the shape of the acrylic as well as give the option for a deeper / broader engrave - but takes alot longer than cricut and the process is more challenging so we'll see how that goes. Maybe something that I'll offer for the second acrylic only once they have completed the usual process although that sometimes leads to lousy, rushed first products :-) Time will tell on that decision.