

Lesson Title: Exploring Digital Design and Laser Cutting with the Pen Tool

Objective:

- Students will learn to use the Pen Tool in graphic design software to trace a multi-layer house design.
- Students will understand the principles of layering for laser cutting and design a multi-layer house project.
- Students will gain hands-on experience with a Glowforge laser cutter.

Materials:

1. Computers with graphic design software (Adobe Illustrator, Inkscape, or similar).
2. Glowforge laser cutter (or access to a local maker space with a laser cutter).
3. Plywood or acrylic sheets for laser cutting.
4. Rulers, pencils, and erasers.
5. Projector and screen for demonstrations.
6. Safety gear, including safety glasses.

Introduction (10 minutes):

- Begin with a brief discussion about the importance of design in various fields, from architecture to technology.
- Introduce the project: designing a multi-layer house using the Pen Tool and cutting it with a Glowforge laser.

Activity 1: Introduction to the Pen Tool (30 minutes):

1. Demonstrate the basic functions of the Pen Tool in the chosen graphic design software.
2. Guide students through creating simple shapes and paths using the Pen Tool.
3. Provide practice exercises to ensure students are comfortable with the tool.

Activity 2: Designing the Multi-Layer House (60 minutes):

1. Present the house design concept, emphasizing the need for multiple layers for a 3D effect.
2. Allow students to sketch their designs on paper before moving to the computer.
3. Assist students in translating their sketches into digital designs, using the Pen Tool to create the various layers.

Activity 3: Preparing Designs for Laser Cutting (30 minutes):

1. Instruct students on how to organize and label their design layers for laser cutting.
2. Discuss the importance of color-coding or layer naming for easy identification.
 - a. Be sure they use an orange stroke to trace the pieces they would like to cut (no fill) and use a blue stroke to trace the design elements they'd like to score.

- b. Encourage them to use the copy/paste feature to speed up the process of tracing bricks, siding, etc.
 - c. Have them use the shape builder tool and pathfinder (unite and minus front) to create window designs.
3. Introduce the technical specifications for the laser cutter (e.g., material thickness, cutting speed).

Activity 4: Laser Cutting Demonstration (20 minutes):

1. Provide a brief overview of laser cutting safety procedures.
2. Demonstrate how to load and set up materials in the Glowforge.
3. Show the process of sending a design to the laser cutter.

Activity 5: Hands-On Laser Cutting (90 minutes):

1. Divide students into small groups.
2. Have each group take turns laser cutting their designs.
3. While waiting for their turn, students can assist each other in refining designs or preparing materials.

Activity 6: Painting and Assembling pieces

1. First have students paint the exposed layers that will be visible from the front of the design.
2. Use paint markers to first paint and then let all the pieces dry.
3. Glue the many layers together with wood glue.
4. Let dry.

Conclusion and Reflection (20 minutes):

1. Allow each group to present their finished multi-layer house projects.
2. Facilitate a class discussion on what worked well, challenges faced, and lessons learned.
3. Emphasize the importance of precision in design for successful laser cutting.

Assessment:

- Evaluate students based on their design creativity, proficiency with the Pen Tool, and the successful execution of the laser cutting process.
- Encourage peer assessment during the presentation of projects.

Note: Ensure that safety precautions are strictly followed during the laser cutting process, and students wear appropriate safety gear. Always adhere to the guidelines provided by the Glowforge or the specific laser cutter being used.