

CRANE COUNTRY DAY SCHOOL

Educating Kindergarten Through Eighth Grade Students Since 1928

INFINITY MIRRORS



Project Objectives:

This is our Eighth Grade capstone project. Students are given the opportunity to create an infinity mirror using their own creative design. An infinity mirror is basically a sandwich of a one way mirror on the bottom and a two way mirror on the top with NeoPixel strips along the inside edge that produce an infinite reflection for the viewer. Students can create a miniature infinity mirror as a necklace pendant or a larger mirror as a side table. The project gives students the opportunity to explore the physics of an infinity mirror, woodworking, acrylic and other material construction, electronics, housing fabrication, and programming.

Project Steps

- Step 1 - Demonstration and activity on the physics behind an infinity mirror
- Step 2 - Create basic prototype
- Step 3 - Sketch and design your own version of an infinity mirror
- Step 4 - Create technical drawings in Adobe Illustrator
- Step 5 - Create a cardboard prototype
- Step 6 - Create final housing
- Step 7 - Install electronics
- Step 8 - Programming

Tools and Materials:

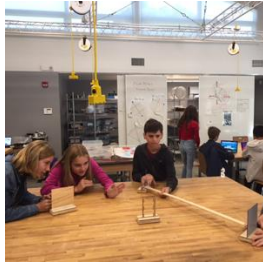
Estimated Cost:

Grade Range: Grades 6-8

Tools: Adobe Illustrator

Collaboration: Engineering

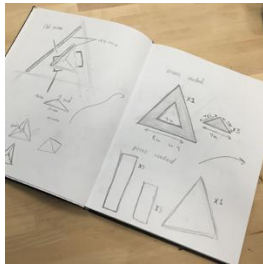
Step 1 - Demonstration and activity on the physics behind an infinity mirror



We invited an engineer in optics to give a talk on the physical principles behind an infinity mirror. Students learned about light transmission and reflection. We then challenged students to accurately measure angles of reflection by arranging three mirrors to reflect an object's image through a viewing window.

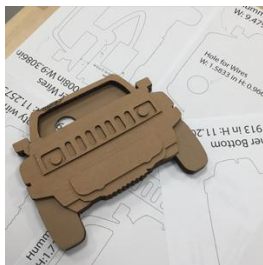
Step 2 - Create basic prototype

Students first created a basic prototype of a generic, predesigned infinity mirror housing out of foam core. This allowed them to get some experience using an x-acto knife and a straight edge. It also gave them a basic idea of how to construct an infinity mirror. We found a good prototype on www.instructables.com.



Step 3 - Sketch and design your own version of an infinity mirror

Students used the internet to research and explore different variants of infinity mirrors. They then sketched 5 possible designs in their sketchbooks. Student design examples included a lady's compact, a hand held mirror, a pair of glasses, a clock, and a wall mounted HUMMWW with the mirror in the windshield.



Step 4 - Create technical drawings in Adobe Illustrator

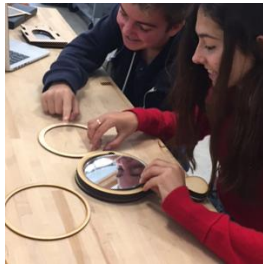
Finalized designs were done to scale in Adobe Illustrator with all parts included, all dimensions labeled, and materials and material thicknesses included. Students chose between wood/MDF or acrylic for their projects.

Step 5 - Create a cardboard prototype

The Illustrator files were then used to cut a cardboard prototype on the laser cutter. Students were given their electronics: Gemme micro controller, the necessary length of Neopixels, and a LiPo battery. They made sure that these components



fit into their prototype, along with any other mechanisms they would be using i.e. clock mechanism.



Step 6 - Create final housing

Fixing any errors discovered in the prototype, students perfected their Adobe Illustrator files and printed their final infinity mirror housing in acrylic, MDF, or birch plywood on the laser cutter. Some students chose to make the housing on conventional machines like the table saw or bandsaw. Care was taken in using the right bonding materials for their housing: wood glue for fibrous materials, Acryli solvent for bonding acrylics, and epoxy for mixed materials. Students sanded, primed, and painted wood materials for a professional finish.



Step 7 - Install electronics

Students soldered their Gemmas, neoPixels, and any other electronics they would add like switches, LEDs or external triggers that would activate the NeoPixels.

Step 8 - Programming

Using the Arduino IDE, students downloaded and modified existing code from the Adafruit Neopixel library. They also wrote simple code to alter the light sequence and color and timing of their display to create different moods and effects for their infinity mirrors.

For more information about this project you are welcome to contact Crane Country Day Schools Design and Engineering Teaching Team, DesignAndEngeeringTeam@CraneSchool.org.

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