

Name of Lesson: Self-Supporting Arch Bridge, Leonardo daVinci Style....

Objectives/Task: Using CNC technology, encompass the history, engineering and science that is used to construct a self-supporting bridge that has roots back to the mid 1400's. This will be done by the instructor demonstrating to the students, and then have the students create a project of their own to demonstrate back to the class.

Review:Where the learner is:

- Break the ice with the following questions (have the bridge setup on display)
 - What types of materials and joinery are used to hold bridges together?
 - Knowing the answers to the following question, ask how if all that is needed to hold bridges of today together, how can the bridge example in front of you hold together with no ropes, fasteners, or welds?

Overview:Where the learner is going:

- Give a brief overview of how the bridge works; the parts are cut to fit together, and the more weight one stacks on the bridge the stronger it gets.
- Show the students how Leonardo daVinci and many others from that time period created a foundation to engineering still used today.
- Explain how the bridge was cut from a CNC woodworking router and its capabilities to create more in-depth projects (give examples).
- Touch base on designing and building and how they need to flow together.

Lead-in: "What would you like to learn from this assignment?"

Presentation:How the learner will get there:

-Present to the students a pile of the pieces to build the bridge. Explain how nothing will be used to hold this bridge together except for the bridge's own weight. Assemble the bridge piece by piece showing the students how it self supports its pieces. Load the bridge up with weight to show how strong it is. Remove the weight, then pull out one of the pieces from the middle of the bridge and watch how the entire bridge collapses. This will show the students how each piece has a purpose.

Exercise:How to make sure the learner gets there:

-Cut several of these bridge projects out with the ShopBot. Gluing, sanding and staining will take some time and those tasks can be taught during this time if the students have not yet had experience with this. Let the students alter the part lengths, quantities and even materials used. Split students into teams to see who can build the strongest bridge that withstands the most weight. Using this self-supporting bridge style, can a bridge be built that supports a student to walk across? Stretching the length of the pieces can span a further distance, but what does it do to the strength? Depending on class time and class size this exercise can be modified to fit your curriculum the best.

Summary: Checking to see if the learner got there:

-Oral questioning and discussion in class:

-Why is it important to try different sizes and materials while designing?

<http://www.nireland.com/bridgeman/Bridging%20Materials.htm>

-Call on several students and ask them questions on how to improve strength, why this method of a bridge is not sufficient in today's infrastructure?

-Any questions of your own that fit the demographics of your class?

Extra info for the teacher:

How long does it take to cut?

It takes just over 30 minutes to cut this file...

How long does it take to glue the parts together?

Spreading the glue and clamping all the parts together does not take longer than 30 minutes. However the glue needs to set up overnight before a load can be applied.

How does the whole bridge concept work?

<http://ask.metafilter.com/38289/Hot-to-build-da-Vincis-selfsupporting-bridge>