

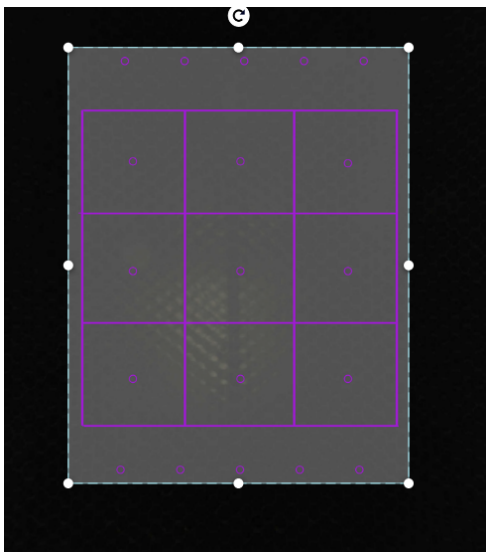


Creating Two Wooden Games from a 2 x 6

Grade level(s) I use with: this has been a great lesson for 5th and 6th graders this year

Lesson Overview: - we start with a 19 inch 2 x 6, standard construction pine for each student, then here are the basic steps:

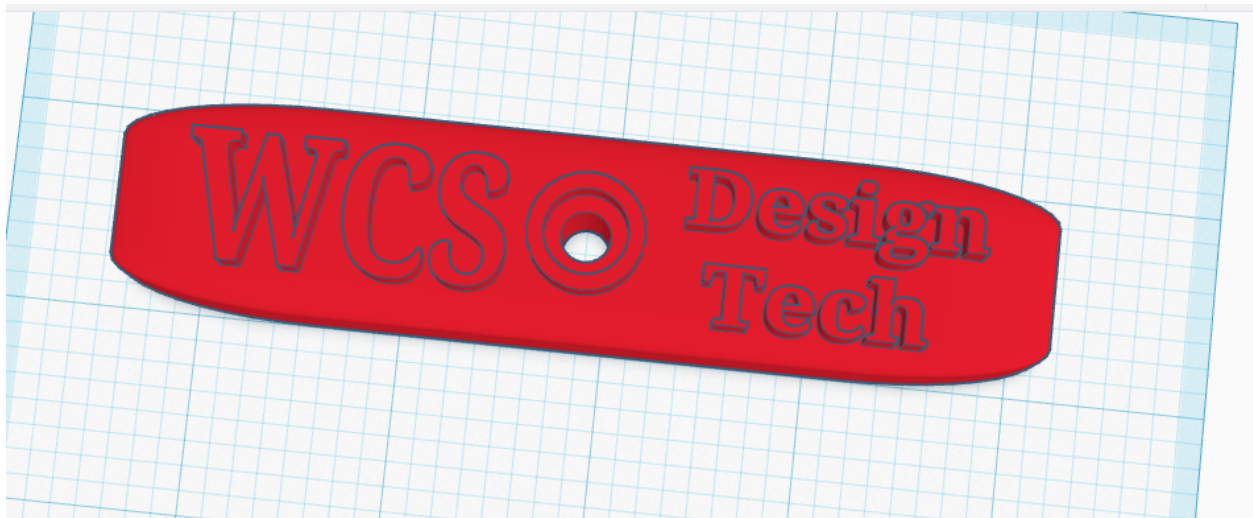
- Measure a 10 inch block that will become 8 frogs on a log and practice pieces, and a 7.5 inch piece that will be Tic Tac Toe - cut with chop saw (could be hand saw but then there is a lot of sanding). I use the saw hand in hand with my 5th and 6th graders - not independently. For most this is the first time they have ever handled a power saw.
- We then use the band saw to cut the 10 inch piece in thirds (I preset the fence to about $1\frac{3}{4}$ inch). One becomes their game piece (some like to make two) and that also gives everyone a test board for learning to drill.
- Lots of sanding - we have 3 options in our wood shop - 3 bench sanders with a dust collector, by far the best option but the power scares lots of kids. Palm sanders that are a great option especially for edges, just takes longer and can make waves on the big flat surfaces but not a big deal. And hand sandpaper . . .



- Then we use our glowforge lasercutter to vector cut this outline that defines the tic tac toe squares as well as where we will drill $\frac{5}{8}$ dimples to hold the marbles - 19 total, 9 for the actual gameboard and 5 on each end to hold the marbles before they are played. Be sure to use the score setting as engraving would take forever. I made the template right in the glowforge app. The boxes are all lines and I triple score them side by side to give it width and depth.

- Then lots of drilling - 9 holes in the frogs on a log, since it is 10 inches long they can just put one hole every inch. My golf tees fit well in $\frac{3}{16}$ in holes but figure there are lots of different options. Great lesson in depth control as variation is very obvious when you put them side by side.

- The marble dimples are with a sharp $\frac{5}{8}$ inch drill - takes alot of practice to get the trigger control so that the drill rotates slowly. It helps if the holes are prepunched with a big nail so the drill head doesn't wander as easily.
- We use the drill press and a $\frac{1}{2}$ inch forstner bit to drill 2 deep holes in the end of the tic toe board so there is a place to hold the marbles. I don't let the students do this independently as it requires careful vise clamping and things could go bad quickly - they control the handle and I supervise the board.
- We 3d print a closer - basically a rectangular block that can be screwed in the middle and rotated to cover / uncover both holes. At this point I just do these for them due to time but would love to get a bit more 3D printing self-design work and I know they can handle it. We have 7 Prusa Mini+ printers to make it feasible to do this with classes too.



- Final step is decorating - there are usually 2 popular options - posca acrylic markers and cricut vinyl, usually some combination. I especially like to introduce the cricut cutter with this project since it can be an “anchor” for students if they have to wait for a sander or drill.

Materials and equipment I use:

Standard home depot kiln dried 2 x 6 x 8 ft - cuts into 5 approximately 19 inch pieces

Hand drills with $\frac{1}{4}$ inch and $\frac{5}{8}$ inch drill bits

Drill press with $\frac{1}{2}$ inch forstner bit for marble holes

Chop saw and band saw for initial cuts

Table sanders, hand sanders and sanding blocks

Cricut Maker vinyl cutter for decoration decals

Multicolor golf tees for 8 frogs game

https://www.amazon.com/gp/product/B0CH9MZ92P/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

Multiple color marbles for tic tac toe

https://www.amazon.com/gp/product/B09VN149JM/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&th=1

Butcher block oil for finish -

https://www.amazon.com/gp/product/B004Z14EFM/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

Related links:

Here is the slide deck I use for this project - feel free to copy / modify at will:

<https://docs.google.com/presentation/d/1-FM-dP7oSRjGBZLJ1pq3yKbnUjeptZR27EF1QTcrHfU/edit?usp=sharing>

Here is a text version of the solution to 8 frogs on a log:

Here is the solution to 8 frogs on a log, the puzzle you made

1234 = Pegs on the Left Side of Puzzle

O = Blank Space

abcd = Pegs on the Right Side of Puzzle

1. 1234aObcd
2. 1230a4bcd
3. 1203a4bcd
4. 12a304bcd
5. 12a3b40cd
6. 12a3b4cOd
7. 12a3bOc4d
8. 12aOb3c4d
9. 10a2b3c4d
10. 01a2b3c4d
11. a102b3c4d
12. a1b203c4d
13. a1b2c304d
14. a1b2c3d40
15. a1b2c3d04
16. a1b2cOd34
17. a1bOc2d34
18. aOb1c2d34
19. ab01c2d34
20. abc102d34
21. abc1d2034
22. abc1d0234
23. abcOd1234
24. abcd01234

And this same solution in a video created by one of my students:

https://drive.google.com/file/d/1_UjXv71EUiHdvGqpcDboNXLOfbni6-4/view?usp=sharing

Ongoing questions and ideas for the future: