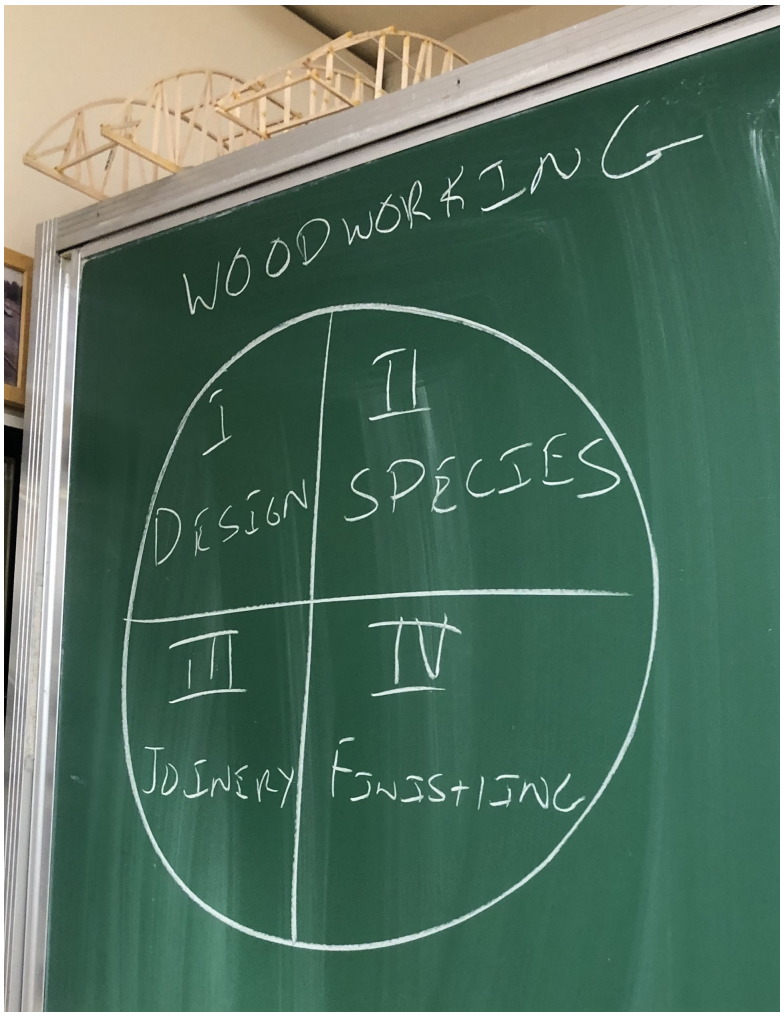
BUILDING STEAM SKILLS PROJECT

MICHAEL KUMARESAN

The Building STEAM Skills course was a fantastic hands-on experience covering the basics of woodworking and the use of power tools. By the end of the class, we constructed our own Adirondack chair using African mahogany. Along the way, we learned a lot about the different components of the chair's design and how to use various tools and techniques to bring the project to fruition. The class was useful for me in particular because I am a member of the faculty that teaches in the STEAM department of the high school. Although I haven't taught the Design and Build class yet, it could be in my schedule at some point in the future. One of the main units of study in Design and Build is woodworking, and this STI course provided some good insights that can be taken into teaching that class. Below are some of the key takeaways for me that can be incorporated into the woodworking unit of the Design and Build course.

(1) **The overview** - One very helpful "big idea" to take into any project is the 4-stage process involved in any woodworking project:
   (a) Design - this is the most difficult part of the project where one has to decide how exactly to construct the project from the base lumber. In the case of this STI course, we were provided with a template of the different components of the chair (legs, arms, back slats, supports, etc). For a beginner level class, having pre-fabricated templates can be a big help and a useful guide. It lowers the barrier to entry for more novice students. However, eventually, one would want to train students in being able to come up with reasonable designs on their own from scratch.
   (b) Species - this refers to the type of wood being used and is the largest portion of the budget.
   (c) Joinery - there can be many interesting and clever ways to join pieces of wood together. The simplest way (which we applied in this project) is to use hardware to do all the joinery. Stainless steel hardware is strongly recommended as it is weather resistant and much easier to work with (for example, screws that are neither flathead nor Phillips are easier to work with because they do not strip).
   (d) Finishing - this refers to any coloring or top coats that need to be applied to the project. The instructor's recommendation was to buy lumber in the natural color that is desired for the final outcome so as to avoid staining. In this particular project, just a single coat of seal is required to make the chair weather resistant (but even this is optional).



(2) **Power Tools** - We used a wide variety of tools in this project. The most important ones and some tips I took way from working with them are listed below:
   (a) The Band Saw - this was a key tool for cutting out parts of the chair using the template. The band saw allows for curved cuts and is a very versatile type of saw. One important tip is to make sure the piece of wood you are maneuvering around the saw is manageable terms of size and shape. Also, patience is key with the band saw. Figuring out the right turn direction is very important to make sure cuts follow the right path.
   (b) Router - the hand router as well as the routing table is very important for giving a more aesthetic and safe look to the chair (see below on rounding edges). It allows for rounding and other interesting designs on the edge of the board and helps to give the furniture a much more professional look as well as a more comfortable experience for the user.

(c) Sanders - these tools are key to smooth out imperfections and make the final product look really nice. Having several sanding options can be very helpful in reducing the time required to build the project. The spindle sander can be very helpful on curved and circular cuts. The belt sander can be very good on longer straight edges to smoothen things out. Finally, the orbital sander is very versatile and helpful in tackling any piece of the project.

FIGURE 0.1. Working with the Band Saw

(3) **WOODWORKING TECHNIQUES** - There were several key techniques we covered to give the chair a nice look.

(a) Plugging holes - joinery for this project was accomplished using bolts and screws. In the case of the screws, we used a countersink to hid the screw through the wood. The wood then needed to be covered by a plug with glue and sanded. These plugs were cut using the drill press. Plugs are important for hiding holes and other spots that may not look as professional on the project.

(b) Rounding edges - to avoid having sharp edges where the user would make contact with the chair, we rounded out edges of the various pieces. For straight edges, this can be done on the routing table.

For curved edges, it can be done manually using the hand router. Rounding out edges is very important for someone using the chair so that they do not encounter a sharp part of the chair. It also gives a nice aesthetic look to the piece. Note that any areas where wood is making contact with wood do not need to be rounded.

(c) Using spacers - in order to have symmetry with the use of slats in the chair design, spacers were cut. This was a key step because it made it easy to place the slats in the right position so that everything on the chair looked symmetrical.

(4) **Time Management** - In order to get the project done, it is important to have specific goals that can be accomplished at the end each day. I fell behind a little bit on the first day due to a mistake in cutting the legs for my chair. I had to start over and stayed late to make sure I was on track. On Day 3 I also stayed late to get ahead and was the first to complete my chair with quite some time to spare. Time management is key and pacing yourself well so as to finish is important. However, rushing through work can lead to mistakes which may be hard to fix, so taking one's time and being patient with the work is also very important. One key idea here is to remember that perfection is impossible. There will be some mistakes and some things that do not align perfectly. But with some ingenuity (and sanding!) one can often fix these issues and have a really nice final product despite some imperfections in the process.

Figure 0.2. Final Chair Design