CAD for VEX Robotics

(updated 12/27/18 with Solidworks V5 model link)

The question of CAD comes up from time to time, so here is some information and sources you can use to help your students get started with CAD.

First off, the nature of VEX in general, is a highly versatile prototyping system, and this leads to "tinkerbots" (for good or bad, how many robots are truly planned out down to the specific parts prior to building?). The team that actually used CAD for design (that is, CAD is done before building), will usually be an advanced high school team, juniors or seniors, and they will still likely use CAD only for preliminary design, then future mods and improvements will be tinkered onto the original design.

Here's some reality: most VEX people look at CAD to document their design and create neat looking renderings of their robots. (It's a whole different story in FRC, since these bots have to be designed and built right the very first time, powerhouse teams use CAD to design parts which are often CNC cut). If you don't have the time to learn CAD, I suggest taking pictures. Seriously, though, CAD stands for Computer Aided Design, not Computer Aided Documentation. It takes time to learn, which is why community colleges have 2-year degrees in CAD, or you can take weeks of training (paid for by your employer, of course). Basics, however, like assembling/constraining parts can be learned in a few hours, especially if you have a mentor to help out. To get started, modeling your existing robot(s) is a good way to learn, then you can do some real design work next year.

The two major industrial CAD packages are Solidworks, Inventor, and Fusion 360. There are some artistic drawing/modeling software out there too, but someone else will have to comment, as I don't use anything but Solidworks.

In southeast Michigan (center of the Automotive industry), most people use Solidworks or Catia (Catia is optimized for working on curves and surfaces like car fenders). According to our CAD instructor at MCCC, "nobody" in Monroe County uses Inventor. But elsewhere in the country, things are probably different. Check to see what your local community college is teaching, since they will do what local industry needs. We encourage our students to learn both packages (and SnapCad for the elementary IQ), but they all seem to prefer Solidworks in the end.

For Solidworks, you need a team sponsorship to get the software free. Go here: www.solidworks.com/sw/education/all-student-competitions.htm

to apply. You'll generally get enough licenses for the entire team, and it is an annual renewal.

For Inventor, go here

https://www.autodesk.com/education/free-software/inventor-professional

and for Fusion 360, go here:

https://www.autodesk.com/products/fusion-360/students-teachers-educators

These are free download for each person to get their own, no sponsorship is required.

For parts libraries, here's where you can find stuff:

The official CAD for every part can be found on the products pages in www.vexrobotics.com. Go to the part listing in the catalog, and you can download a .step (.stp) format file of every vex and vexIQ part. "Step" is a universal ISO part format that can be imported to most any software package. There are more versatile part libraries, however. In Inventor, there are features called i-mates which can help with assembly. Here's where parts libraries can be found: https://www.autodesk.com/education/competitions-and-events/vex/recommended-software#Kit-of-parts

In Solidworks, libraries are harder to come by, but you'll find parts in the "3d content central", and also Team 7479 has worked on a library of parts here: http://www.mediafire.com/download/3v7rf1xkqs7kh75/Team_7479_Solidworks_Library.zip

The parts in the 7479 library have an extra circular feature which I added to the VEX square holes to allow rotating concentric mates to be made. For a V5 update, you'll find a complete V5 Clawbot Trainer model here:

https://grabcad.com/library/vex-robotics-v5-clawbot-1

You'll have to make a Grabcad account to get it. This model has all the new V5 components except the camera, all as proper solidworks models. The assembly is mated for full motion. In this model, the structural parts do not have the circular features added: they are straight conversions from the VEX step files.

One day (don't hold your breath), maybe after I retire, I'll publish my pet project "minimum resource VEX parts" along with video tutorials made by our VEX-U team. This will be done for both EDR and IQ parts. "Minimum Resource Parts" are used in a basic configuration that rebuilds up to 1000% faster than full vex features, then, when design is done, convert themselves to full detailed VEX parts. I have the method, just not the time, to do it.