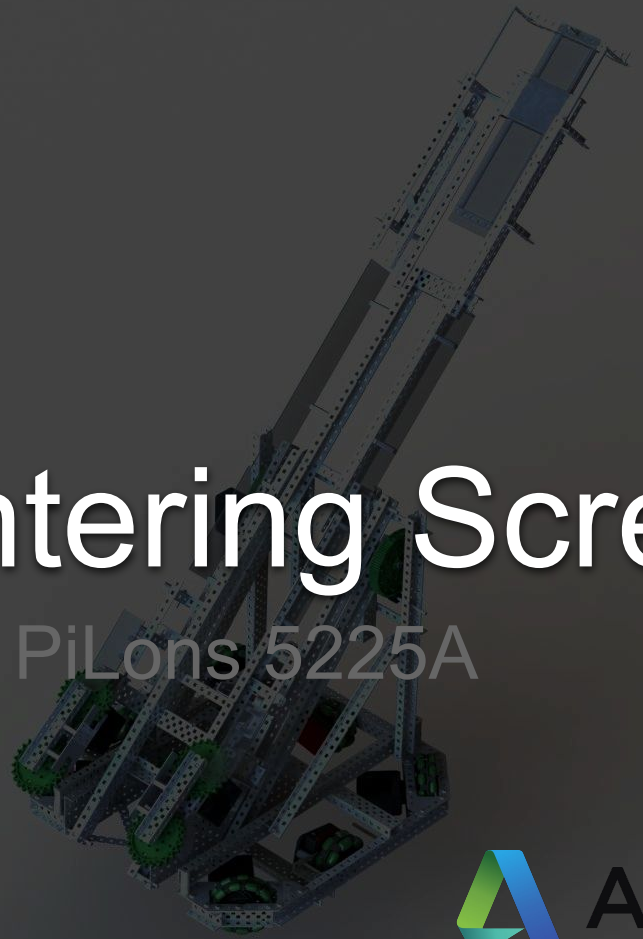
Self-Centering Screw

E-Bots PiLons 5225A



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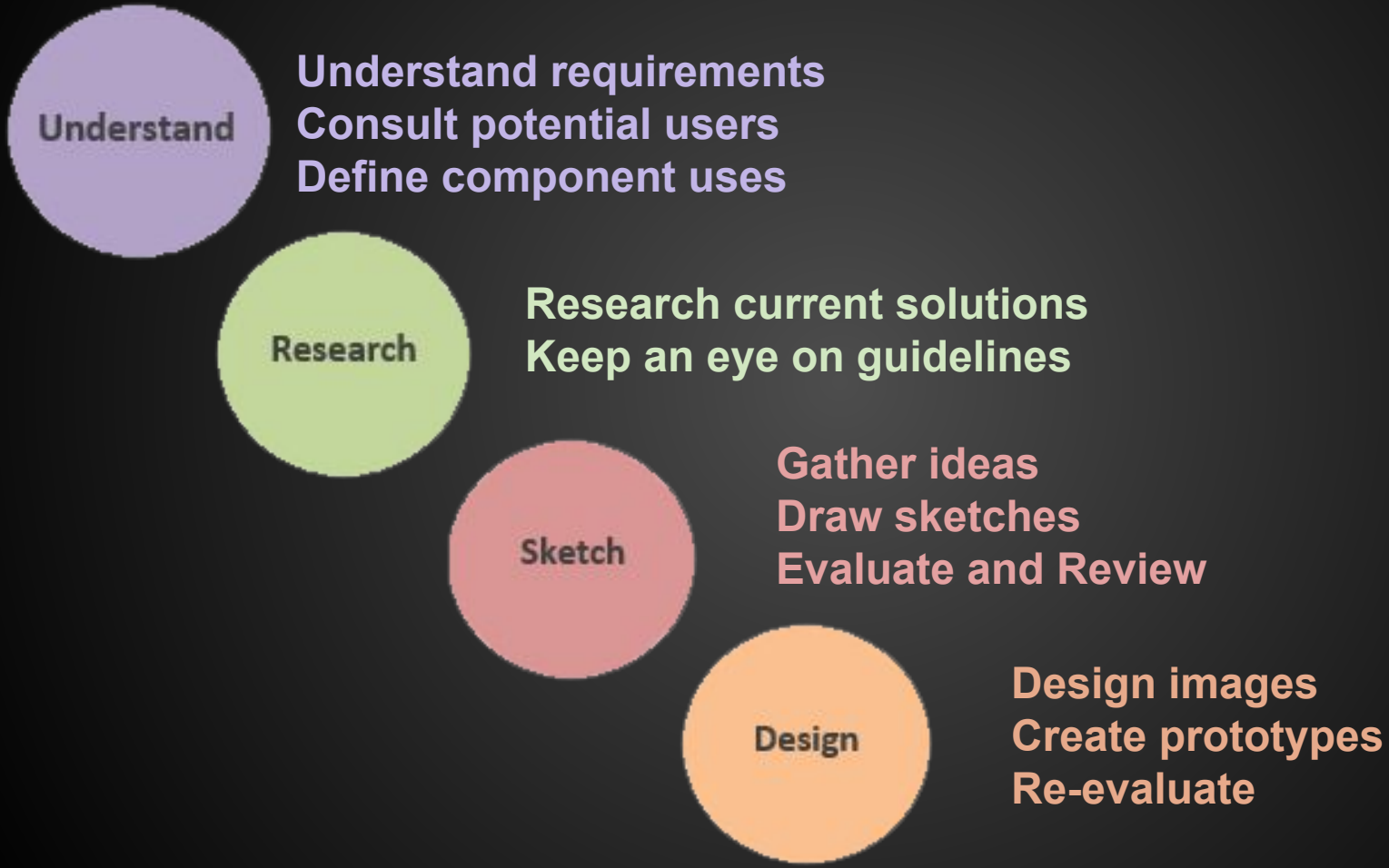
Make It Real CAD

Engineering Challenge

Summary

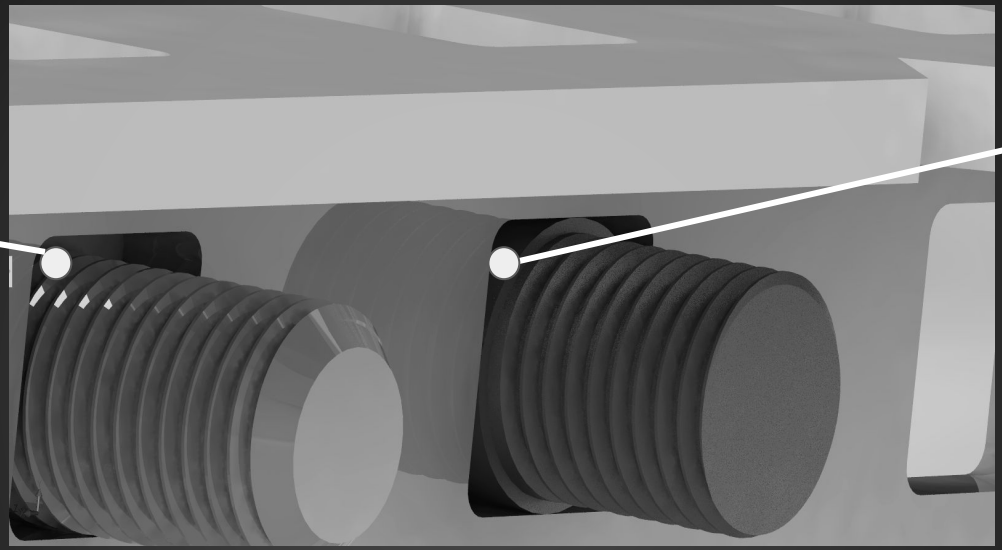
The self-centering screw does exactly what the name suggests; there is a small lip under the screw head that is built to perfectly fit itself into a hole on VEX metal components without any play whatsoever. This is to make the process of mounting and centering screws on the robot significantly easier and more precise. In developing this solution, we used a thorough design process.

Our Design Process



What's the problem?

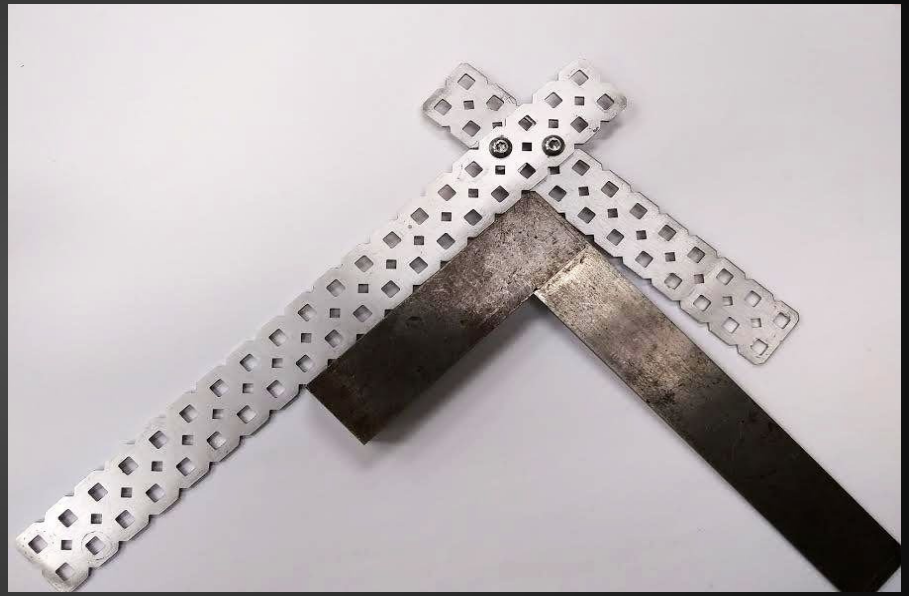
Understand



A big issue we saw that many teams have is that they spend lots of time trying to align and center all their pieces. Teams have to do this because the VEX screw is smaller than the hole in the metal pieces, allowing them to move around. This is a huge issue because it allows parts like our drivebase to be bent and misaligned, which would cause our robot not to drive straight.

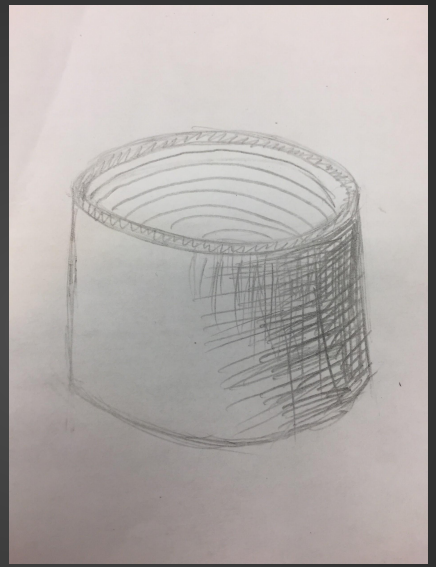
Research

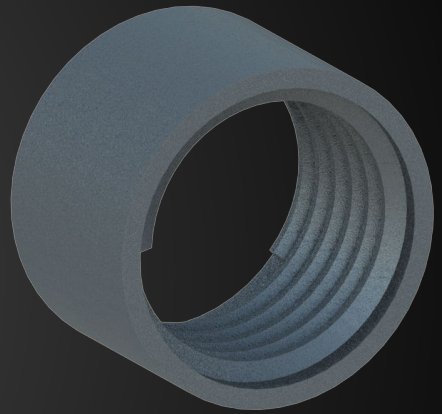
We realized that our build team spent significant amounts of time trying to square certain parts of the robot, and doing so was one of the major challenges less experienced builders faced. So, consulting our builders, we set off to brainstorm solutions.



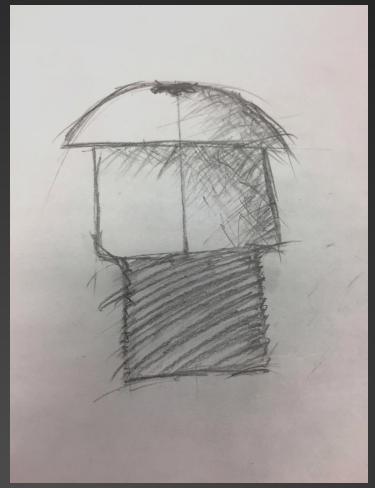
Sketch

Our initial idea was creating a thin metal sleeve that fits perfectly onto a screw and is the perfect size to center in a VEX metal component hole. The only problem with this idea was that it would be so that it would be too hard to manufacture, due to how thin the metal would have to be.

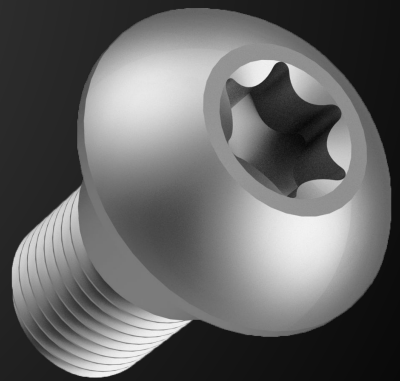




We then decided to design a self-centering screw that would perfectly align the metal pieces, eliminating the need to square up the parts, saving builders and teams lots of time.

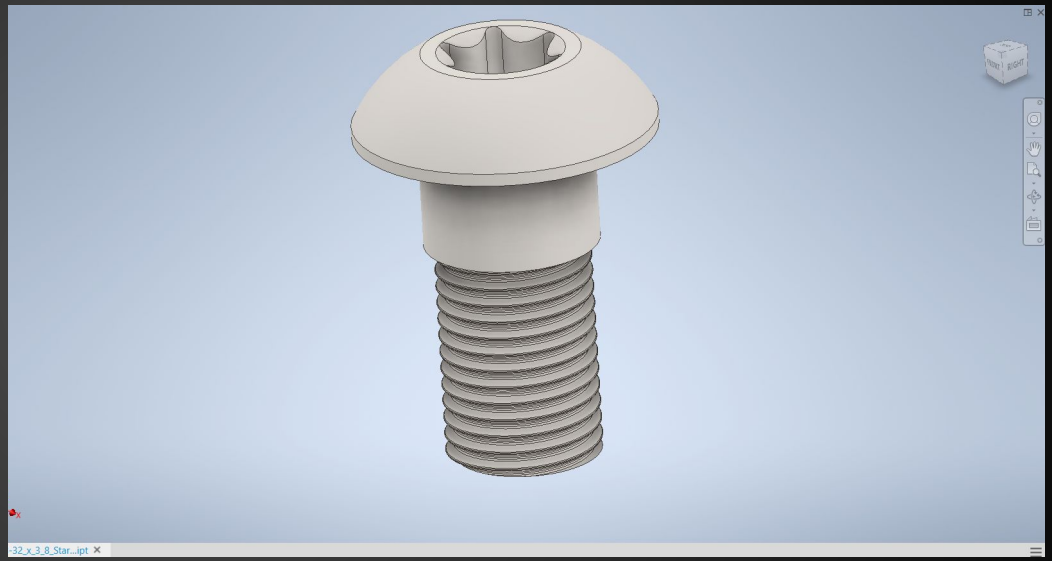


Sketch



Design

We used **Autodesk Inventor Professional 2020** to CAD our part, and then rendered it in **Blender** to give it a more professional looking render with a more realistic metal finish. We were initially having issues trying to make the screw head because it isn't like a philips head; just a cross. But we eventually figured out how to do it. We then added the lip of the screw and the threaded part. We had some issues trying to make the thread because inventor doesn't make a real thread so we had to download a addon called **Coolorange**..



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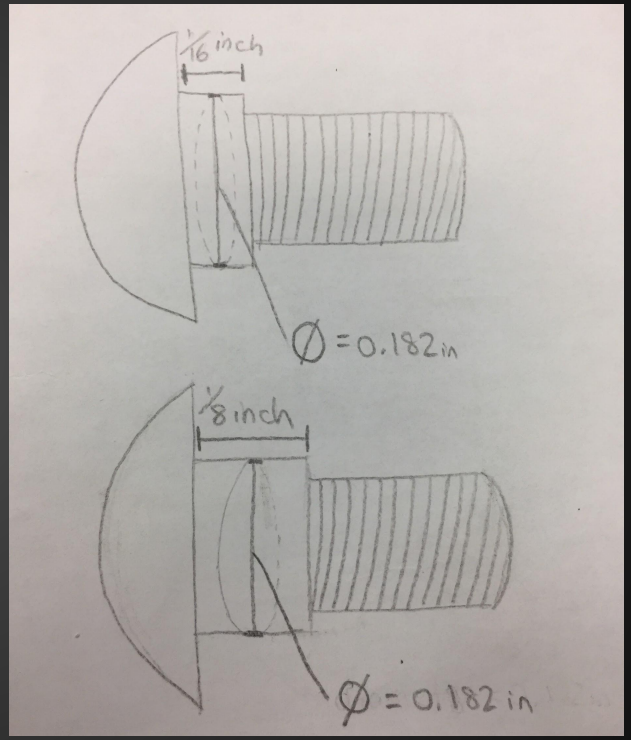
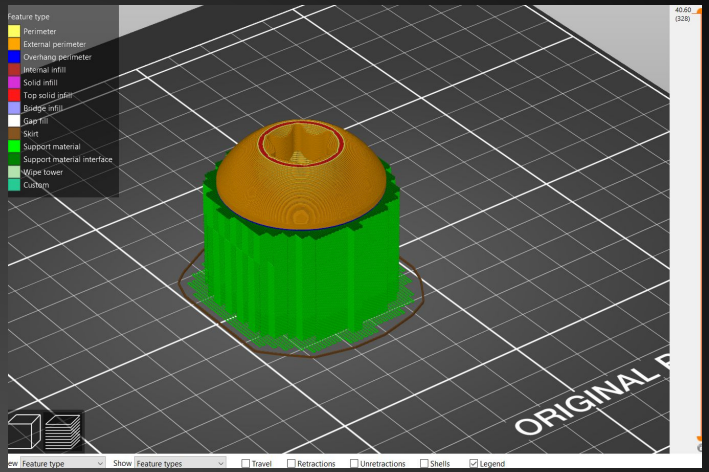
Design

There would be 2 sizes for the lip: 1/8in and 1/16in. Each size would be made between a 32nd-64th of an inch smaller than those measurements to allow the nut to continue to screw into the metal and hold the parts together with a small amount of compression. The reason the screws would be available for both sizes is so that the lip can be used with either one single piece of building material, or two pieces that are flush with each other.

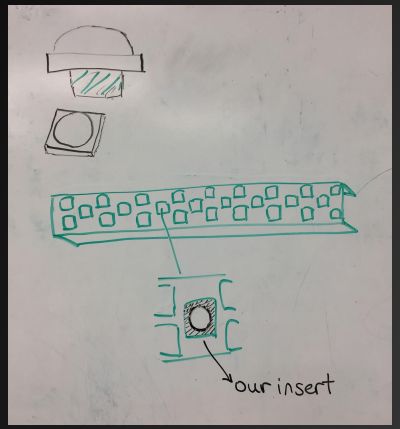


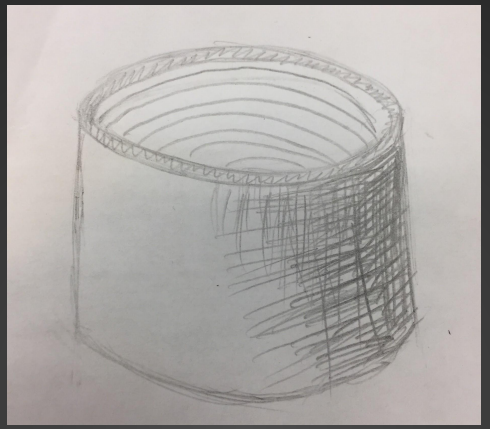
Design

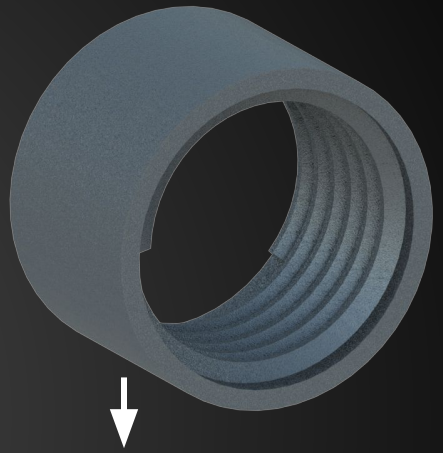
One of our team members owns a Prusa i3 mk3s which allowed us to 3D print out one of our screws in the accurate size and one that was scaled up so we could examine it in more detail.

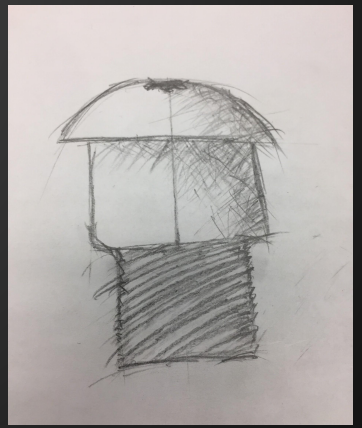


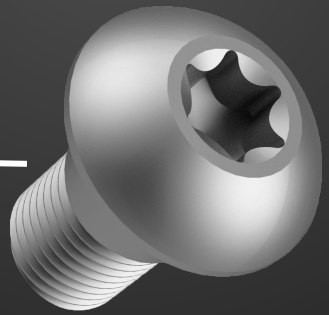
Our Design Process







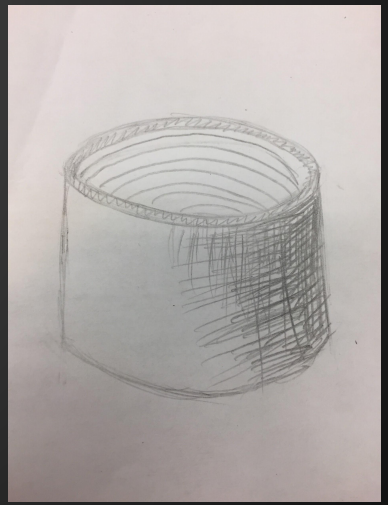




Conclusion

In the completion of this project, we learned collectively how to CAD, how to create 2D sketches, and **we had a lot of fun!** We have previously used CAD software to CAD our robot subsystems, however, we have learned new skills such as altering pieces and making our own creations from scratch. Being a competitive robotics team, we will greatly benefit from digitally planning and designing any build changes before physically creating anything. This will help with deciding dimensions, understanding how different parts will interact with each other, and save time.

We will also be able to integrate this into our future careers (mechanical / civil / electrical engineering) and potentially future VEX U teams our members may join, since 3D printing is legal. CAD opens up so many possibilities for creation; we are thrilled to have learned so much throughout this innovative and educational process!

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Thank You!
@thepilons
team5225@gmail.com