The part created was an adjustable standoff, and it was created to make the process of sizing standoffs easier. Since Vex sells pre-measured and pre-cut standoffs, they have set sizes. But, the need arises for our team and other teams where a standoff is needed in a place where the set sizes do not fit perfectly, usually from 1-2 inches. Using this standoff, teams can change the size of their standoffs without having to purchase multiple standoff sets or use too many set screws to connect standoffs. This revolutionary part takes away all of that hassle.

 This part works by coming in two pieces, and inside and outside part. The outside part looks like any other 1-inch standoff, but it has a hole at the top. The inside piece is a hollow metal tube with a standoff head. The inside piece slides into the outside part, and then they are placed together using a screw. The user is then able to slide the inside piece as far out as they need up till 2 inches. Once the user stops at the proper measurement they require, they just have to place a screw inside the hole in the outside piece, and then tighten it until the two pieces are sturdy. The screw is placed into the inside piece much like a shaft collar onto a shaft where the setscrew is being pushed into the side of the shaft. The piece shown is only for use from 1-2 inches, but it can also be reproduced for use in between all different sizes of standoffs along with being accommodating for those set sizes as well.

 This part could be used in many parts of the robot. As shown in the picture, it could be used to connect two pieces of metal with wheels in between for a drive. If a team wants to decrease the size of their robot to fit well within the 18X18X18 size limit, they may have spacing that is non-compliant with standoffs they have. The adjustable standoff can be used to connect those two pieces of metal together, and if the team decides to change again; they do not have to go searching for different size standoffs because they can just adjust the size of the standoff they are using. This part could also be used for attaching a lift to a drive, or attaching the two sides of a lift together. We had run into this problem ourselves when making our robot. We had changed our lift to make it bigger than it was before to accommodate for some internal changes. The distance between the two pieces was changed, and we were not able to use 1 inch or two inch standoffs. If we had the adjustable standoff, it can fit the right size, and even be changed if we were to change it back for any reason. Another piece of the robot that this could be useful for is attaching the shooter to the robot or giving it more support. When we placed our shooter on our robot, it was attached but not structurally sound. The plan was to place a standoff connecting the shooter and the piece of metal behind it, but we noticed that the space was between 1 and 2 inches. With the adjustable standoff, we could fit that space perfectly and have the shooter attached better.

 We used Autodesk Inventor Professional 2019 to create or model. We used the tools sketches using circles, polygons, slots, extrude, patch, measuring tool, and thicken/offset. The sketches using circles was used to create the holes for the screw. The polygons tool was used to shape the standoffs. After creating the base using the polygons tool, the extrude tool was used to take the base and make the standoff 3D. The patch tool was used to create the inside piece of the adjustable standoff by creating a closed shape and then molding around that. The measuring tool was used to figure out the dimensions needed for the part itself. Finally, the thicken/offset tool was used to extend certain areas of the part. All these tools used made it quite simple to create our model for this challenge.

 From this project, we were able to improve our creative thinking by coming up with a new part that Vex does not have. It caused us to think of something new that people would benefit from, but is still relatively simple that Vex could possibly make in the future. The plan is definitely use 3D design in the future for creating models of our parts to see a visual representation of our ideas. As we go on to engineering jobs, CAD and other 3D design tools will be very useful to create models of ideas without spending money to physically create it till the full plan is completed. This software is very useful for a competitive robotics team because they are able to create 3D models of their ideas before they actually build it. They are able to take this model and use it as a guide to help them build the physical part, and they can do a simulation of the model working straight on the software.

 Overall, this challenge gave us a great experience where we were able to think outside the box and create our own part that Vex could possible use one day. We had mainly tried to keep the part simple so that it would more efficient to make in a factory if it were to be created in real life. This challenge had really opened our eyes to the universe of tools that are out there for us to use on 3D modeling that we may not have used before. This challenge actually helped us sharpen our CAD skills, so that hopefully they can be very useful in our future robotics adventures and our careers.