What are you going to do if you need to connect two c-channels at right angles? What about 30-degree angles? 45 degrees? Are you going to waste your time and use numerous screws and metal plates to merely connect two parts? Throughout this season, this problem has challenged our team, requiring us to construct convoluted workarounds. As a result, we designed a part to render it less grueling to connect c-channels or other parts at various angles, allowing them to better fit the specific functions of our robot.

Our part is relatively compact and straightforward. In layman's terms, it consists of two 2-by-2 flat plates, each attached to a shaft collar, which are able to rotate around an axle. The shaft collars allow for the adjustment of the angle at which the plates are positioned while also being able to fix them in place by stopping the motion.

We used Fusion 360's tools for 3D modeling to develop our part. This included the team feature which allowed us to collaborate on designs and create shared folders. We used the Education License of Fusion 360 (version 2.0.9305) and incorporated Fusion 360's official VEX parts into our design. To create our part as a CAD design, we learned how to use Fusion 360, including the various ways to create and modify bodies, manipulate existing parts, and even animate the design to precisely display its purpose. A majority of the innovative process was learning the countless tool functions in Fusion 360, like the specific way to capture images of our finished designs. We created new bodies individually for pieces that didn't exist and modified existing 3D models of VEX parts to ensure that our part would integrate seamlessly with any VEX robot.

3D design software helped us not only to learn fundamental CAD skills but to also develop important social and collaborative skills. During the process of designing our part, we learned how to cooperatively brainstorm together and work off of each other's ideas. However, since all of our discussions were done virtually, communication became an essential part of our learning process. Moreover, as part of our learning curve was not having any familiarity with all the tools in the software, this project gave us additional exposure to this type of CAD, as opposed to physically building. The process also helped us realize the value of using the connections and resources we have, especially in order to print our final design.

The 3D design software we used helped our competitive robotics team in several ways. By using a 3D design software, all members of the team were able to digitally plan out and edit the robot's design. Unlike using manual parts to design a robot, this software reduced both time and money. Modifying the robot's design to come up with the best possible outcome not only costs less, but also makes it significantly easier to make quick adjustments. Furthermore, a digital software gave us a more precise control while working with the design, making it easier for us to collaborate virtually and to move around parts. Creating an interactive model of our robot with a 3D design software let us visualize the robot and make the necessary alterations.

In the future, we will use 3D design software to accurately visualize and develop prototypes from individual parts to intricate robots. Whenever we have an engineering challenge requiring a well-formed design to share, our new knowledge of CAD will prove extremely useful. Understanding 3D design software in the future will be helpful as 3D models are used

across many industries to simulate physical products. As we head deeper into our education and careers, we will use 3D design software to improve our innovative and analytical skills.

The first design software that used mathematical equations to produce graphics was developed in 1953. Since then, virtual design has evolved to the highly advanced and efficient interface we use today. From the invention of pencils and couches to skyscrapers and satellites, design thinking has been a key part of any development process. Every STEM field promotes innovation and any career path we choose to potentially follow will involve using knowledge of the past to cultivate the knowledge of the future. 3D design software is the future of collaborative modeling. Having this knowledge will expand our visual imagination, jumpstarting our ability to innovate and communicate our ideas with others.