Vex Online Challenge 2019-2020 - CAD - Vex IQ Piece Submission
Guion Creek Middle School - 48466A - Pike Township - Indianapolis, IN

How do you connect two universal connectors without too much space the them? We searched the list of parts and found that a connector did not already exist. We could not find a piece that would join the two with very little space between and snap them in place. The part that we are submitting solves this issue. This part would be used to connect two universal connectors directly, making a universal connector that can turn smoothly at multiple angles. We noticed that the universal connectors get stuck when attempting to turn them with a small shaft connecting them. The connector we are submitting is like an idler pin, but has two square ends.

We wanted this piece to help with this year's squared away challenge. It helps by allowing us to pick up cubes and keep them parallel to the ground. The balls would be on the cube so we needed the cube to be parallel to the ground to prevent the balls from falling off the cube. The arm would grab the cube from the middle, and the arm needed to be controlled with a motor. Since the motor is heavy, we needed to put the motor quite a distance from the claw to keep the balance while driving. This required a combination of universal connectors and shafts to reach the arm and turn while the robot is in motion to raise the cube to different heights. When connecting the two universal connectors with the smallest shaft, it made the universal connectors lock up. This would not have been a problem if we had this part.

Using Tinkercad (https://www.tinkercad.com/) and the Vex IQ library, we found a 1x1 idler pin (part #228-2500-073). We also found an online converter (https://www.makexyz.com/convert/step-to-stl) to convert the .step file of the idler pin into a .stl file. We started by placing two idler pins in the Tinkercad workspace. Then, we constructed the design by splitting two 1x1 idler pins in half, leaving the square side for each of them. Next, we

rotated one of the halves, and then combined the two pieces to create one part that has square ends on both sides (see Figure A).

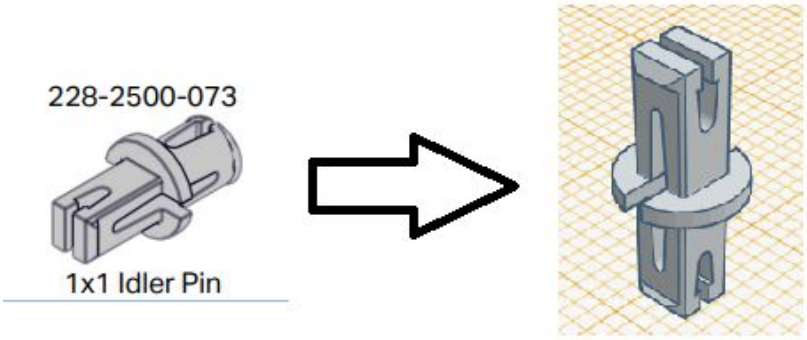

Figure A

With the new part, the two universal connectors would be able to snap in place with very little space in between (see Figure B).

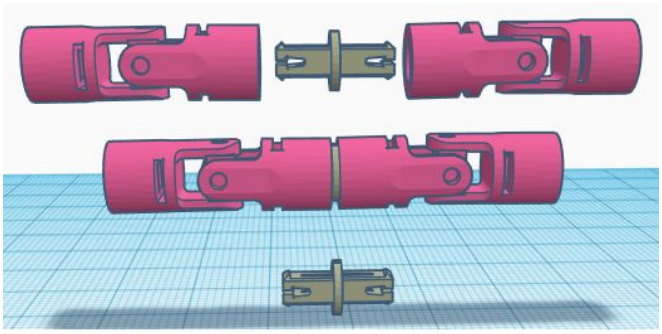

Figure B

This would allow us to raise and lower the arm without the universal connector locking up.

During this process, we learned how to draw even small objects with great detail and manipulate them to create other objects. However, as we were trying to print, we discovered that tolerances on 3-D printers make a big difference on the outcome of the printed part. We tried to print the part with a 3-D printer that had a 0.05 nozzle and were unsuccessful. However, we found someone that had a 0.04 nozzle. This nozzle printed the part so well that we were able to use it to try out our idea. We will use 3-D software in the future to design our robot and test it. It

helps our team because we can easily build a robot online and everyone would have a robot to work on. The software would help us in our future careers by letting us build parts in 3-D before building them by hand. It would also allow us to look at very large objects from a different perspective. And, as our design shows, it would help us magnify very tiny objects to get a better idea of how they work. Then, we could print different ideas to test them under multiple conditions.

This project has really encouraged our team to learn more about 3D design and printing. Tinkercad was relatively simple to learn and use. This experience has created another pathway for our educational journey. We are excited about the opportunities we have in the future.