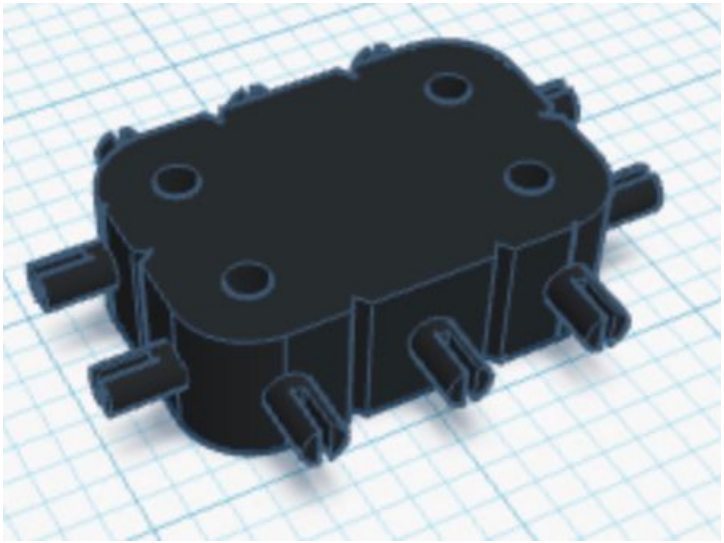
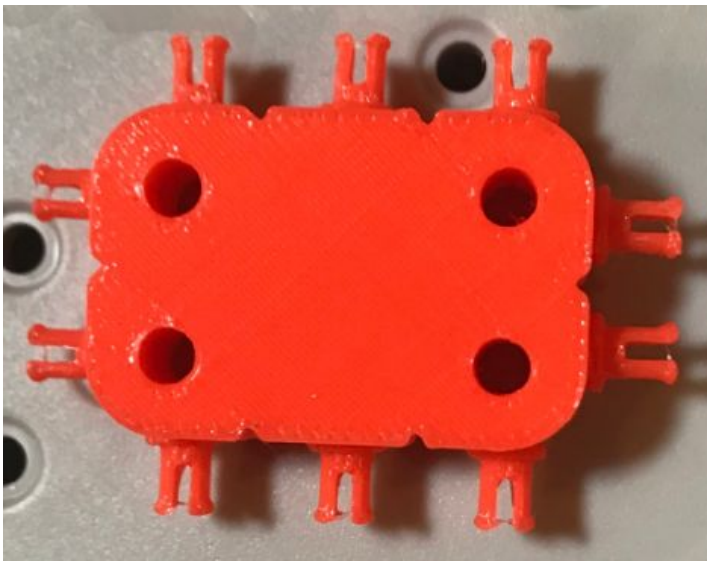
Vex IQ Linear Slide Bracket

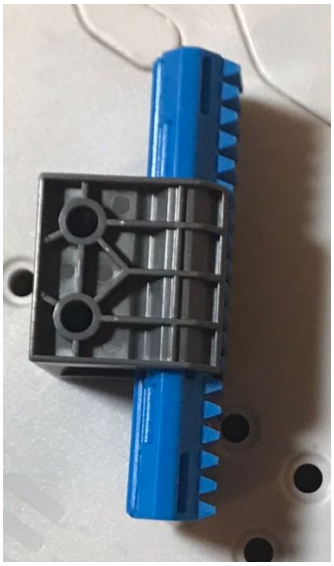




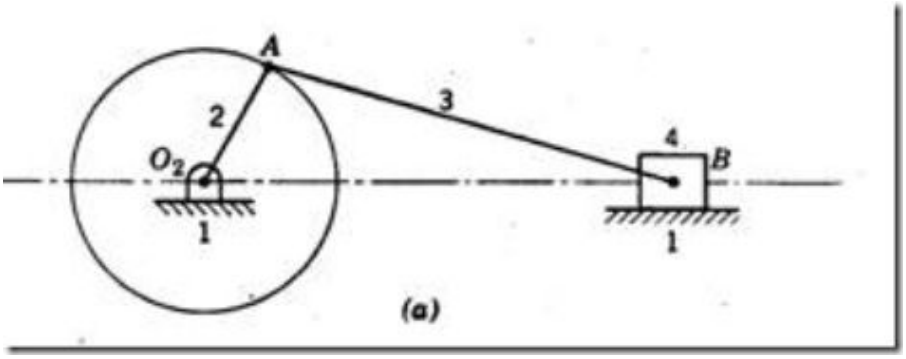
Team 4040A Bears St. Joseph Regional Junior High School

Purpose

When our team was brainstorming ideas for a potential Vex IQ part that would be useful, we thought back to some of our previous designs. One that really stood out was our state championship robot from last year, which used linear motion. The claw had to move up and down, and needed a smooth surface to slide on. We ended up using the only existing type of linear slide (pictured below) and it was awkwardly shaped and difficult to build with. We wanted to design a part that could help in a variety of situations where linear motion is used, such as shooters and slider crank mechanisms (also pictured) by providing a smooth surface for a bar to slide on. It can be applied to large or small mechanisms and is easy to attach to a robot.



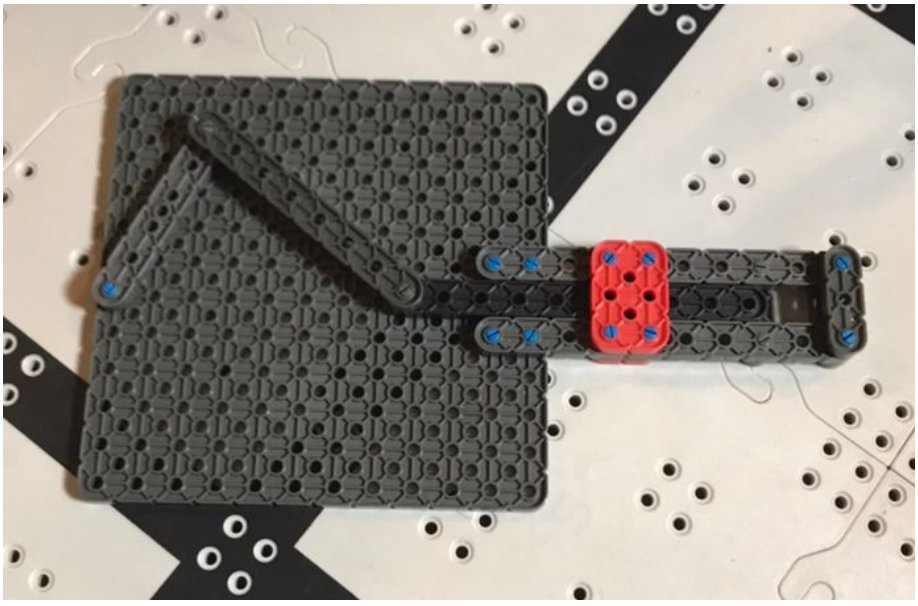
The only smooth linear slide that is currently a part of Vex IQ



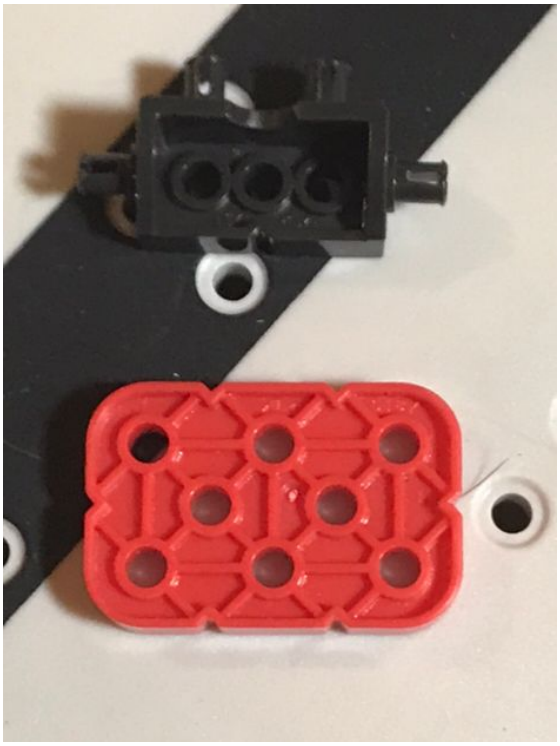
slider crank mechanism

Prototyping

The first thing we did was prototype alternate linear slides using existing parts. This was not to only figure out what shape we wanted our part to be, but to make sure our concept wasn't easily built using the pre existing parts in the kit. We were very thorough on this as we fortunately have access to all of the odd parts that can be found on the IQ online store. Below is a prototype of a large slider crank mechanism that we made. Not only is it difficult to attach to structures, the sliding bar (the black one) gets caught on the ridges of the slide we made, which slows the mechanism down and makes it inconsistent. The second picture is of the two parts we used as our inspiration. (one of them is an aforementioned "odd part") We wanted to combine the general shape of the 2x3 with the convenient attachability of the bracket. It would also be smooth so a 1x1 bar like the one in the prototype could slide over it easily. Two of them could easily be stacked to prevent the bar from popping up as well.

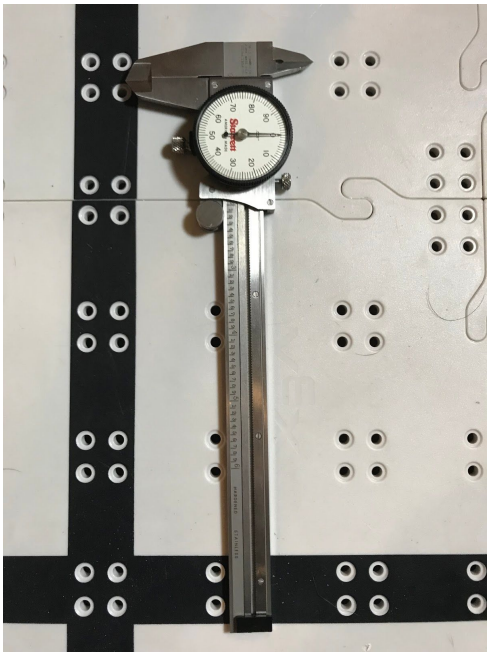


Our prototype of a slider crank mechanism

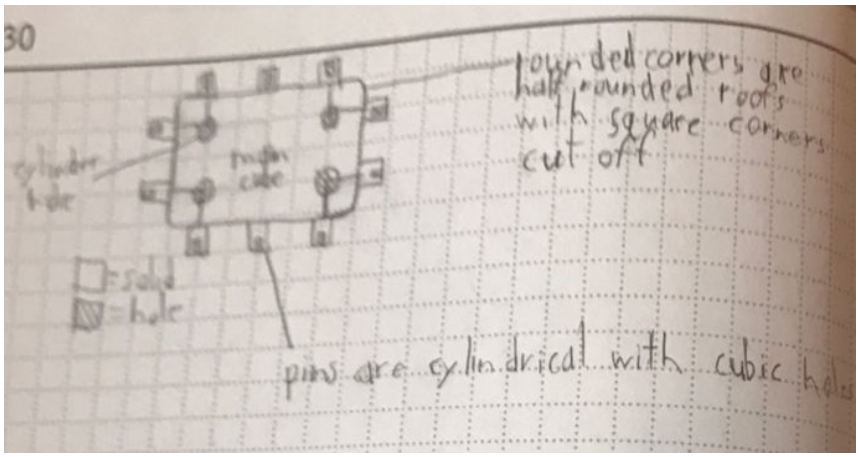


Design Software

The software we used to make a 3D design of the part was Tinkercad 4.4, the most recent version. We used it because we'd had experience using it in the past and it uses simple geometric shapes, like Vex IQ parts. We first drew a sketch of the part breaking it down into more basic shapes to make drawing it in Tinkercad easier. The next thing we did was change the grid in Tinkercad from metric to inches because Vex IQ parts have holes a half inch apart and are a quarter inch high. We used a highly accurate measuring tool called a dial caliper to get the dimensions of the parts we wanted to incorporate.



Dial caliper



Our sketch to simplify drawing the part in Tinkercad

Drawing the Part

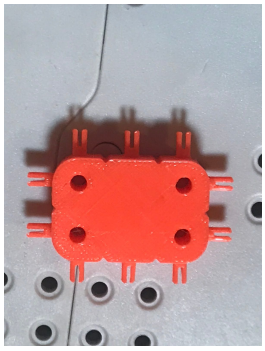
The next step was drawing the part in Tinkercad. After our preparations described above, it was fairly simple. We scaled the basic shapes and holes included in the sketch. Then we used the alignment tool to make them evenly placed. Finally, we combined the shapes, forming a solid piece. After we printed our first prototype we added ridges on the pins to make them fit better. That was also fairly simple, as the ridge was basically a flat cylinder. This step in our process confirmed that

Tinkercad was the right software for us to use. It didn't take us long to make the shapes and draw a complete part.

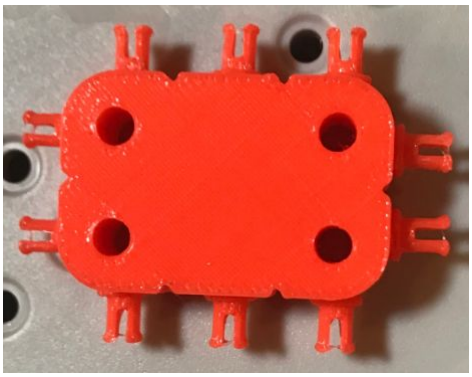
The Tinkercad toolbar

Printing

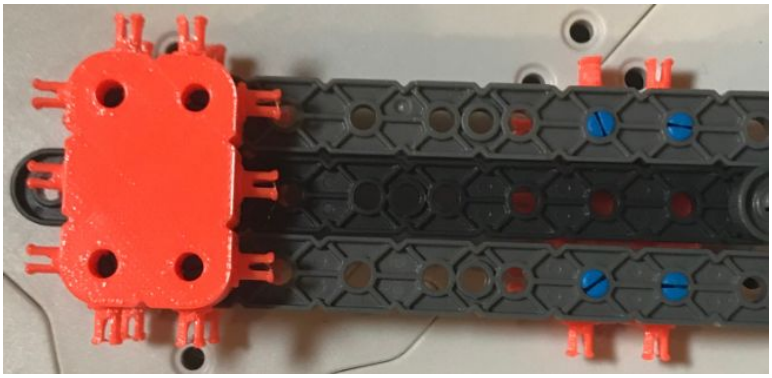
We downloaded the stl file from Tinkercad and imported it into the Afinia 3D slicing software. The printer used was an Afinia H-400 series desktop printer. We used PLA plastic for its strength and flexibility. Below are pictures of our two prototypes.



Our first prototype, which printed well, but the holes and pins were too small



The second prototype, with better developed pins than the first



The bar slides easily with the new part, and can be attached to anything

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Conclusion

For this section I am going to be a little more personal. My name is John Larochelle and I an 8th grader from Manchester, New Hampshire. This was an interesting challenge for our team because it combined our ability to use CAD and Vex IQ. We were able to improve our understanding of the Vex IQ system and Tinkercad while being imaginative and creative. It was fun to think of a gap that could be filled and create a custom part to do so. I learned how to model a precise part to meet a specific need as well as work on CAD with a teammate. I will probably use tinkercad and other 3D modeling softwares in the future as I have already used them for many school projects and will continue to do so. They are a helpful and neat way to create a model or convey an idea without using art materials, which can be fun but aren't very accurate. A way CAD can be useful in a robotics team is that it can allow you to make an accurate 3D prototype without building if you don't have the parts or time to make a physical model. I don't really know what my career will be yet, but I think CAD will be a part of it somehow. What I do know is that I want to have a career in a STEM field, and CAD or 3D design can apply to many of those areas. At the bare minimum it helps me with certain computer skills, which are becoming more and more necessary for any job nowadays. Team 4040A sincerely thanks you for reading our proposal, and I hope that it met all of the necessary requirements and reflected the thought and effort we put in.