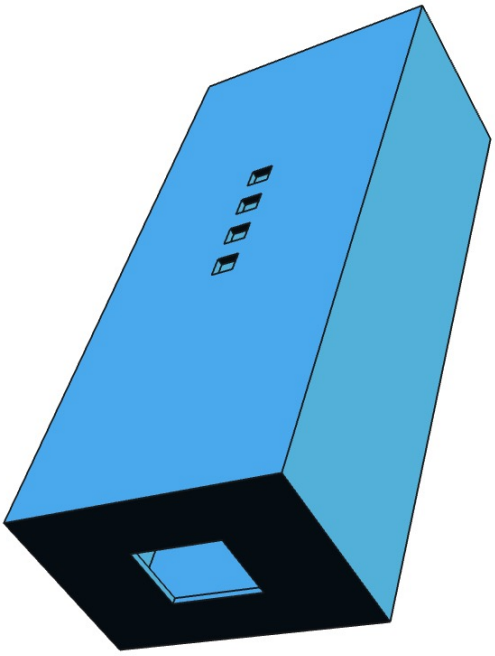
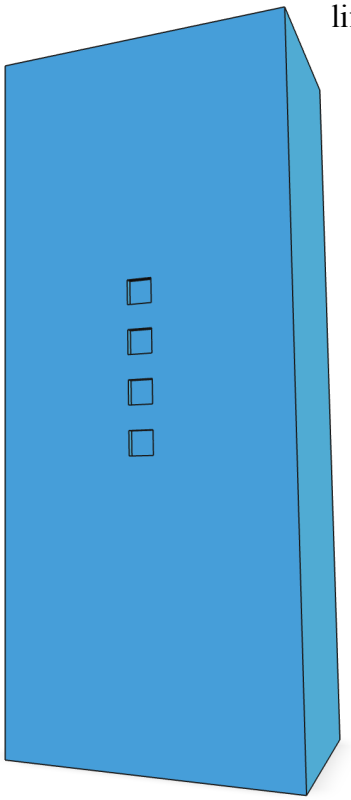
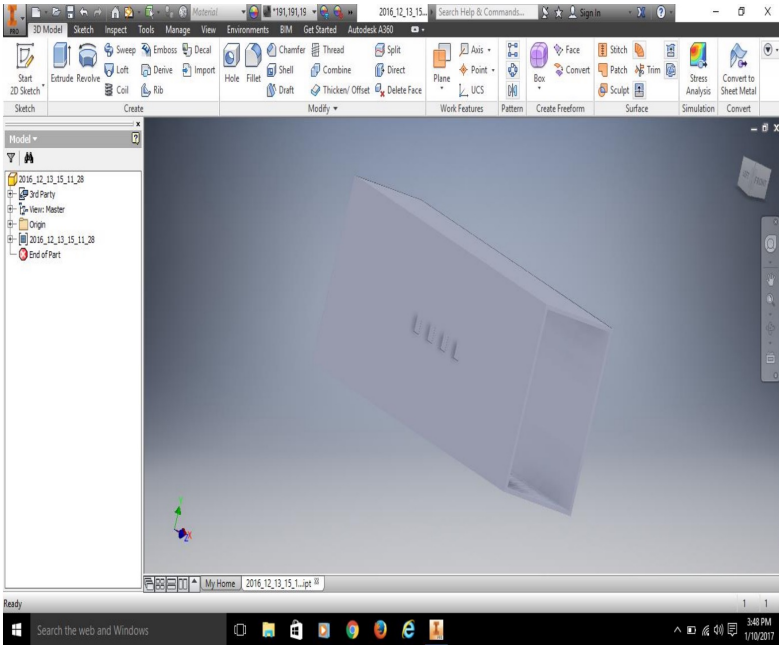
Battery Case and Protector

We decided to design a battery case for this challenge to help protect our batteries from the dangers presented in the Starstruck match. The design of our robot meant that the only feasible way to mount our batteries was on the sides of the robot. Because of this, they were in the most exposed region of the robot, and were held in by two VEX robotics battery clips. The VEX robotics Starstruck match presented another problem for our clip-mounted batteries, due to the nature of the competition, there was a constant danger of scoops lifting up and knocking the battery out of our robot. We decided that a battery case firmly screwed and nylocked onto the robot would be the solution to our problems. This case fully envelops the battery, and is firmly secured onto the robot itself, preventing the scoop of another robot from knocking the battery off and potentially damaging it. In order to create this case, we extensively measured the VEX robotics batteries so that we could create a design that fit the battery securely. In addition to measuring the battery itself, we also

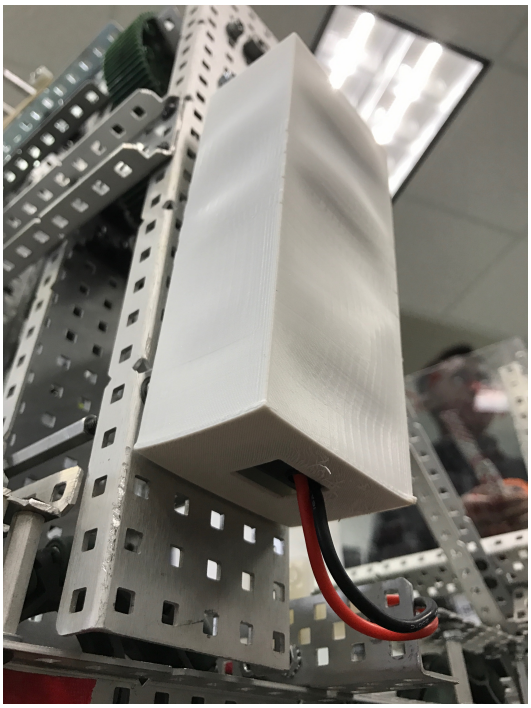




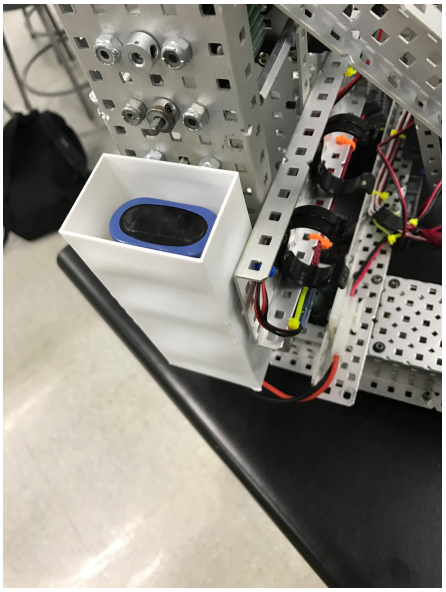
measured the plug for the battery cable. The measurements of the plug were necessary because



we then used them to make a hole on the bottom of the case for the plug to come out. We also had to create screw holes in the back of the case to mount the case onto the robot. Taking into account the weight of the battery and that of the case, we decided that four screw holes would be more than sufficient. We modeled our screw holes off of those found in VEX robotics metal, which we used for the measurements of our screw holes. With the measurement and planning stages complete, we designed this battery case with the use of Autodesk Inventor 2016 (pictured above). With the tool, we created the case using the measurements we took. Since the school we attend is an iPad school, we utilized the Autodesk 123D Design app to take screenshots of our model that you see , and have the model approved for printing by our robotics coach. Then we utilized the Cube Pro Duo 3D printer in the Maverick Robotics workshop to make our design a reality. The case (pictured to the right in early stages of mounting) took approximately two hours to print



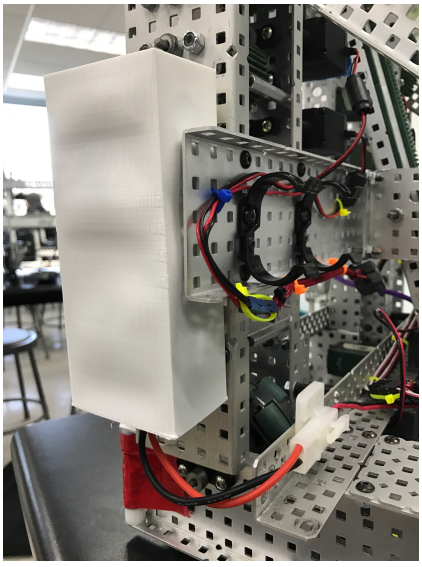
and once retrieved, we screwed it onto the robot and tested the robot with it on. These tests were

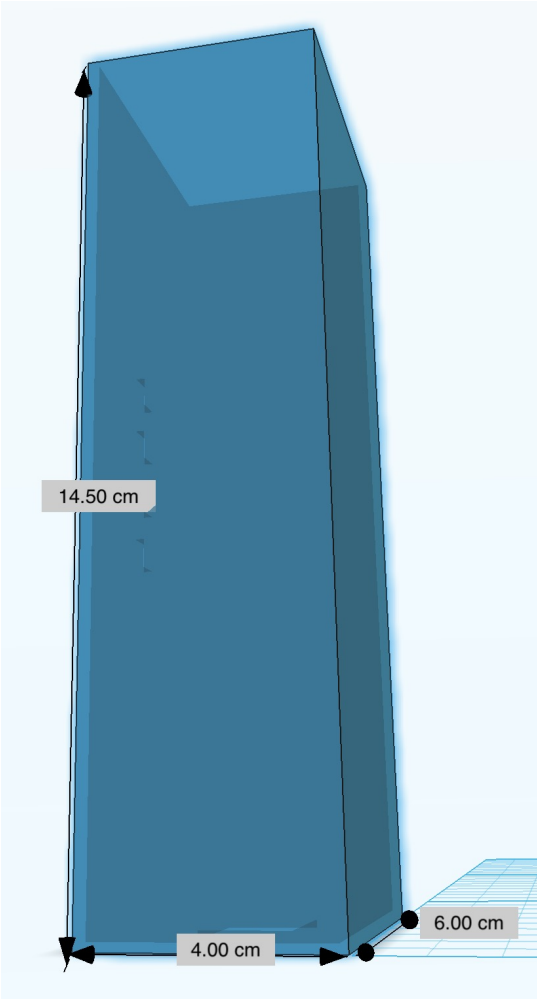


conducted to ensure that the part was securely fastened onto the robot and did not fall off. Our testing resulted in success as the case kept the battery protected, and we were able to plug the cable in through the hole in the case and into the cortex with relative ease. Though it is not feasible to test the ability of the case to remain secure while being hit by another robot's scoop in the robotics classroom, we are confident in its abilities to remain attached during that situation.

Conclusion and Reflection

When reflecting on our design, we came to the conclusion that the weight of the battery with the case was overestimated, and that four screw holes were not necessary to hold it up. In the design process it was expected that four screw holes would be more than adequate, but we added them to make sure that in the event that it was heavier than expected, the design would still work as a prototype. In future designs, we would only use two screw holes to support the case with about four centimeters between them. This would ensure that the holes would have adequate





distance between them to secure the case in a stable manner. We also decided that the case could have been a little bit smaller so as to make a tighter fit around the battery, the reason why we made it bigger than necessary in the design process was that we were unsure how the thickness of the plastic would interfere with the measurements listed in the program and that it had the potential to make the opening smaller than required. The final measurements for the length, height, and width of our case can be seen in the screenshot to the right. To conclude, we are satisfied with the final design of our case and are confident in its abilities to both securely hold, and protect our batteries.

What We Learned

From the process of planning and designing our object we learned many things about both Autodesk Inventor and the process of 3D printing in general. We learned about how to use measurements to create a container to hold something. We also learned how to make holes for properly securing a 3D printed object onto another object with screws. The tools and tutorials associated with Autodesk Inventor allowed us to quickly learn how the process works and create a design of our own. We are happy with the result of our project and are confident enough in our knowledge of Autodesk Inventor to use it in future 3D printing projects.