Student Work

From Mech. Eng. 263 Design, Innovation, and Entrepreneurship

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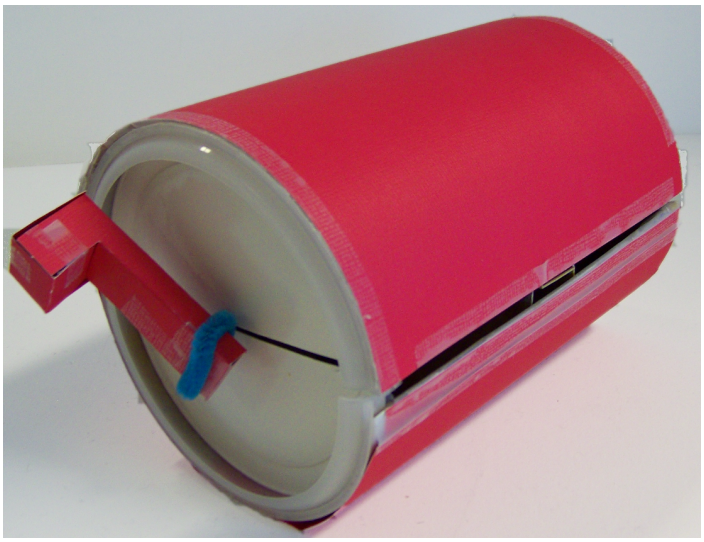
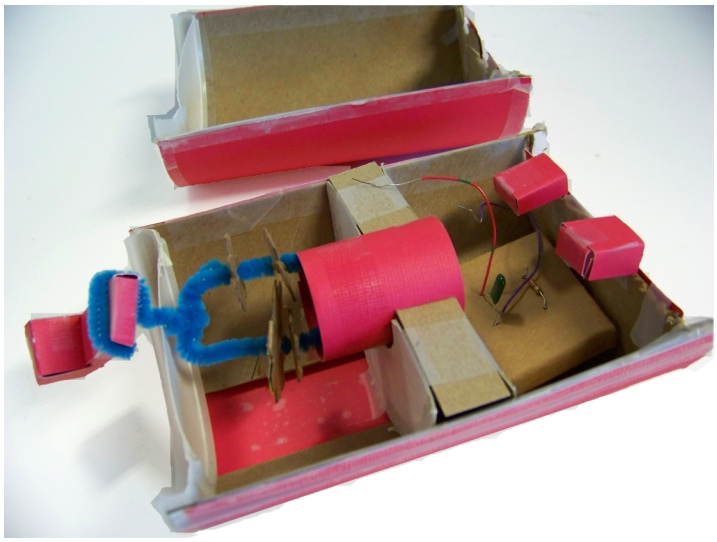
A Note About Student Work

Work in this portfolio of projects by prior students is arranged in chronological order, from oldest to newst. This order is used to demonstrate the change in teaching over time.





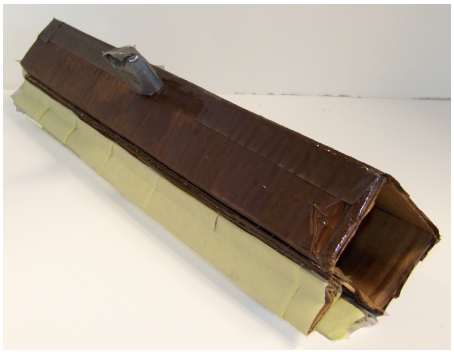
Mock-up of a hand-cranked cell phone charger

Early ME 263 Project Prototypes

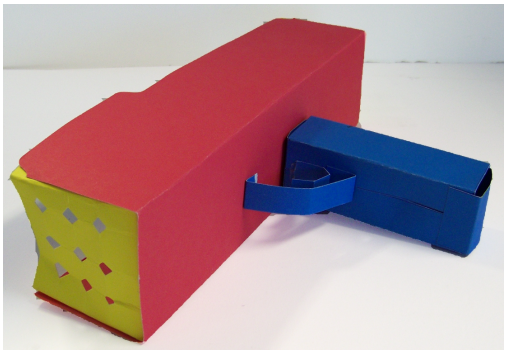
When I started teaching ME 263, the course required students to create their designs on paper only. Since I recognized that many students struggled to make realistic ideas, I offered extra credit if students would make prototypes of their designs. The prototypes pictured here are non-functional and contain many symbolic parts such as boxes and dowels representing motors and shafts.

This initial effort to improve the course was very beneficial for the students, even though their first prototypes were created after they had developed their ideas. In subsequent semesters, I continued to strongly encourage student prototyping. I also asked for higher-fidelity prototypes and requested that students make prototypes earlier in the concept generation phase. The changes in my section proved very beneficial to the students and I was able to convince the course instructor that creating the prototypes was beneficial for the students and that the added requirements did not increase the overall burdern of the students.

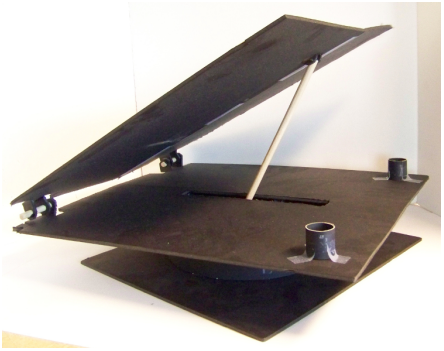
The course now requires that all students make two prototypes: an initial low-fidlelity one and a more mature "medium"-fidelity prototype. Response from the students and faculty has been very positive.



Ice-removing windshield wiper

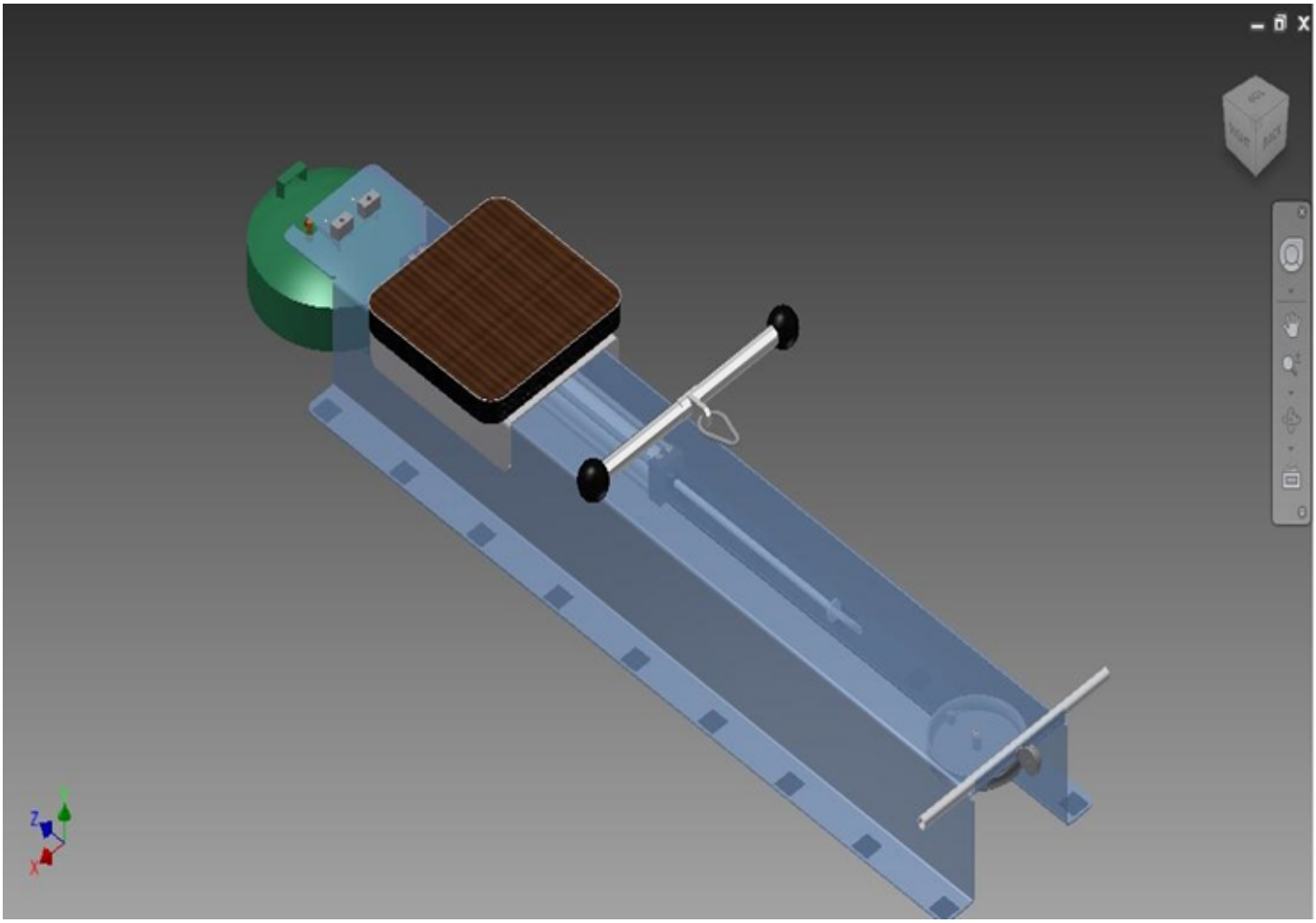


Water "shotgun"

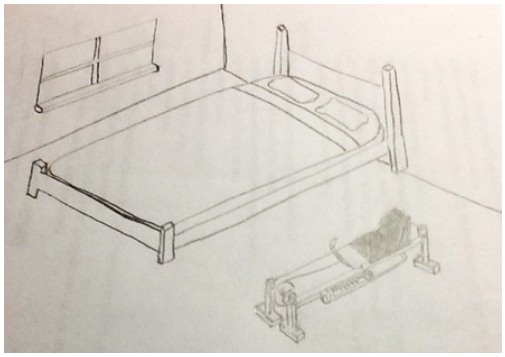


Seat lift for disabled car drivers

Seat cushion for disabled drivers

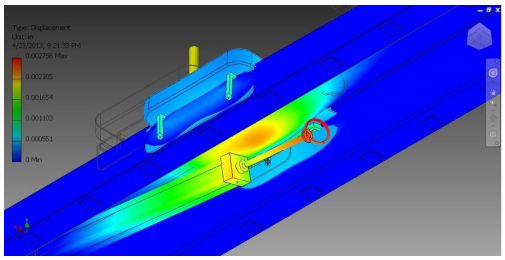


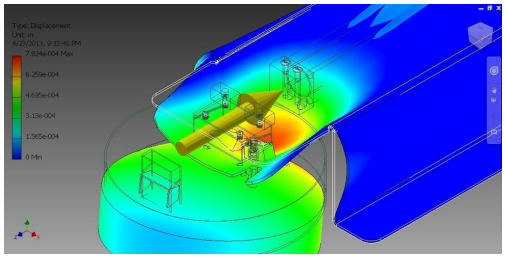
Gruntmaster 6000 Rowing Machine

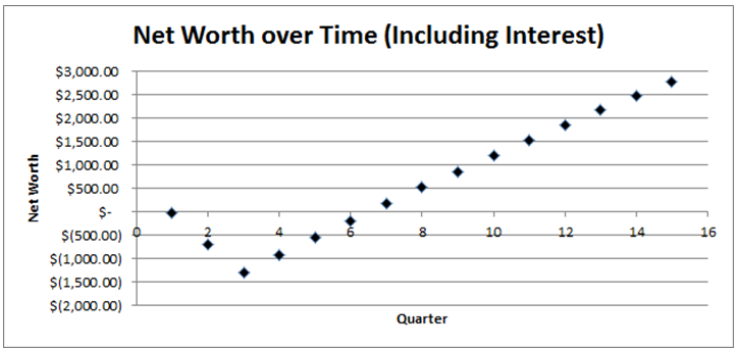


One semester, the students were instructed to create the next generation of exercise equipment. This team created a rowing machine that used a pneumatic cylinder rather than weights. This design was created before prototypes were required for the course.

The team went beyond the course requirements by performing a finite element analysis. The analyses required for the course include the House of Quality, weighted decision matrices, an economic analysis, and engineering analyses of the students' choice, among other requirements.



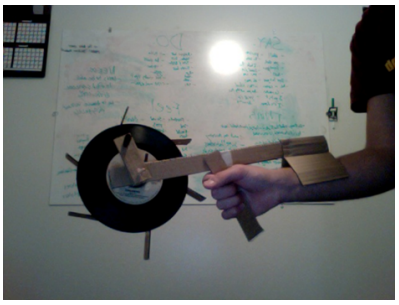


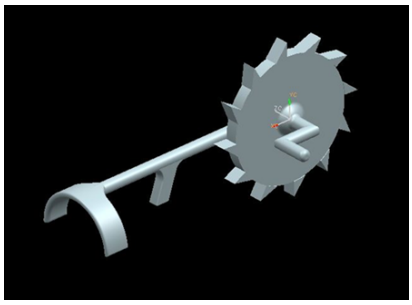


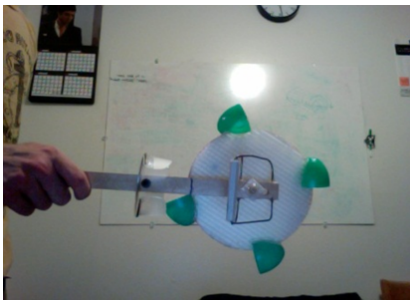
The "Bagger 263" Digging Toy

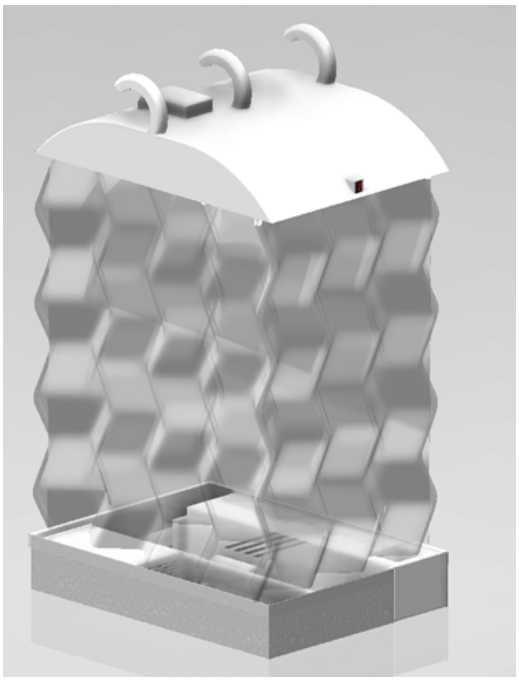
The semester that this design was created, the design prompt was to create an innovative toy. The team that called themselves the Purdue Toy Company researched other childrens toys. As they did so, they found a toy for todlers called "Mr. Digger", which is a shovel that resembles a backhoe which kids can wear on their forearm. Inspired by this, they researched other digging machines and found the Bagger 288 - the largest digging machine in the world This machine uses a large rotating wheel with scoops along the circumference.

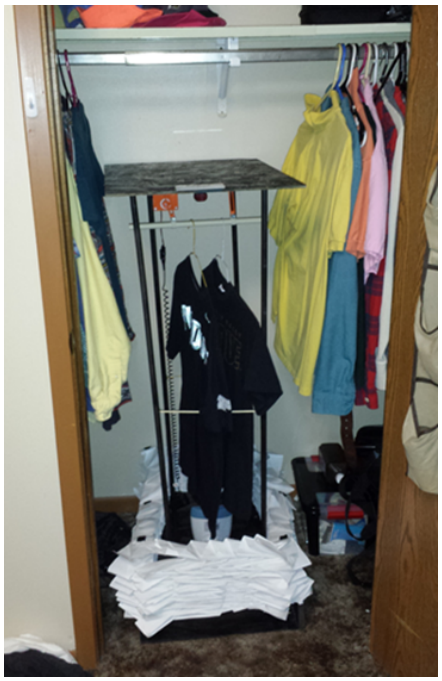
The Purdue Toy Co. team then developed a digging toy based on the Bagger 288 and tested it with children at a Purdue day care facility. The kids loved it. The team was so excited about their design, they created a working prototype, despite prototyping not being a requirement for the course yet.









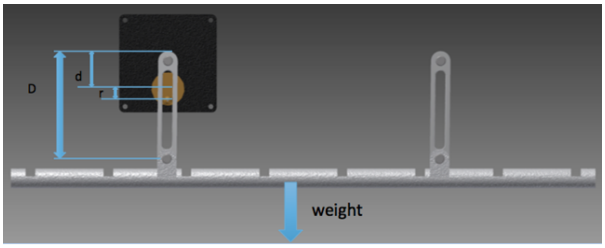


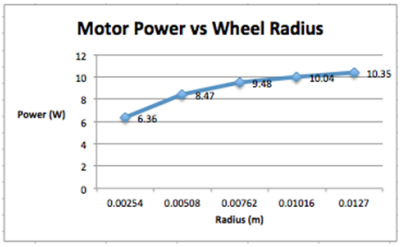
The Illuminated Steps Pheonix Closet Steamer

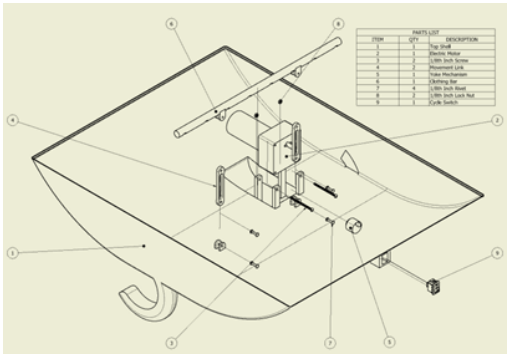
The team Illuminated Steps decided to tackle the problem of ironing clothes when time and space are both limited. They researched existing steaming systems and found that most are thousands of dollars - well beyond the budget of students and young professionals.

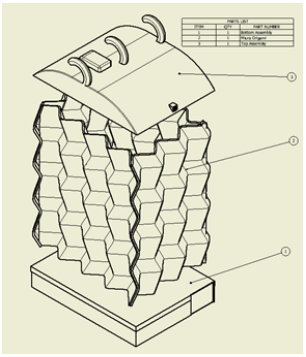
To address this issue, they developed a system that can be stored on the floor of a closet and used in place. The steamer system has the steaming unit on the floor along with stored water. Clothing is hung from the bar inside the closet and the sheath encloses the unit during the steaming operation. While the clothes are steamed, a mechanism in the top portion gently shakes the clothing to prevent them getting wet and to distribute the steam evenly.

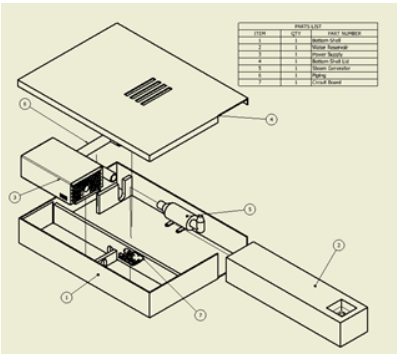
The students used the Mioraori Fold to create a sheath that had no lateral transformation and would reduce forces at the corners of the folds. Like the other teams, they did several engineering analyses to validate their concepts prior to their final build.

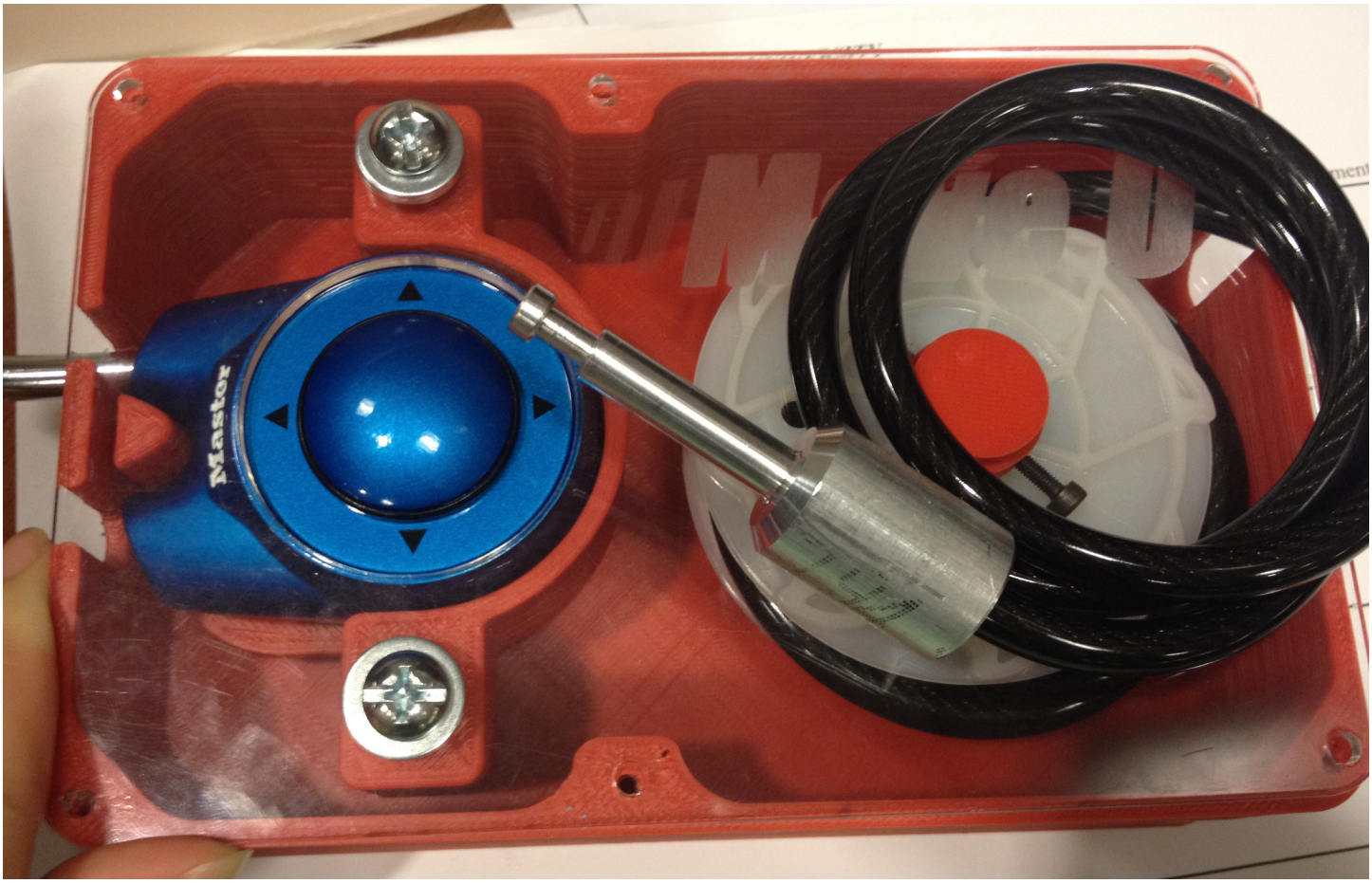




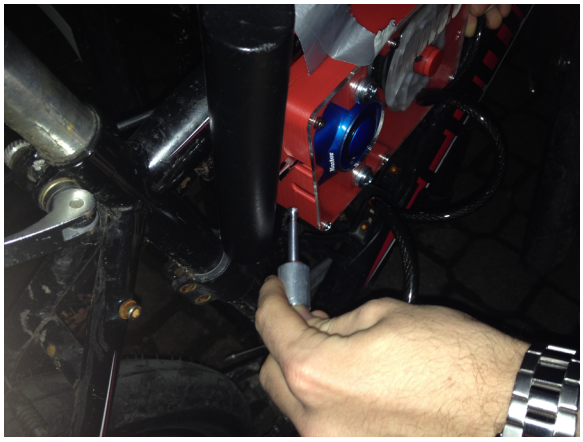








The MOVE-U Ergonomic Bicycle Lock



This student design combines several ergonomic concepts into a single design. The inspiration for this project was the difficulty of using a bicycle lock quickly enough to make it useful for use on campus.

Ergonomic considerations include

- Slide combination lock for use with winter gloves
- Attached to bicycle to improve time to lock
- Reeled cable to eliminate tangling
- Package designed to mount inside the triangle of the frame so that when the lock is closed, the only possible configuration is for the frame to be inside the loop. This makes improper use difficult.

In the prototype shown, the team laser-cut the top plate cover from acryllic to make the internal mechanisms visible.

The lock deters theft by using strong anchor points between the reel and the clasp. Additionally, the design was evaluated using engineering analysis.

The BOCE Mount for the Go-Pro Camera

The BOCE Mount was conceptualized by a team that identifies as BOCE. Their design was to improve the experience of using a Go-Pro camera mount. The current camera mounts on the market allow the user to screw the camera onto a mount, but can only be adjusted by rotating it in one direction. This arrangement and the fact that the camera is attached to the mount by screws both prevent users from changing the way the camera is oriented in the middle of an adventure. It also makes it difficult to share the camera with other friends also on the adventure or to switch it from a bicycle hanlebar to a helmet.

The BOCE team considered this problem and came up with the idea of a quick-release mount. Their design can be turned 90 degrees by simply pulling the side pin and rotating the mount. It can also be quckly moved from one base to another without risking that the screw or nut will fall out. The team is currently enrolled in a technical elective course where they will work to patent their design and market it.