Date	Start/end times	Minutes	Description
4/11/2017	12:00 pm - 3:00 pm	180	Researching about ferrofluids, electromagnetics, and touch screen. Bought samples ferrofluids and MICR toner ink print to make ferrofluid. Made a prototype of a electromagnetic, but realize it is hard to turn off due to magnetic force that is still in the metal.
4/14/2017	4:00pm-6:00pm	120	Brainstorming how the project works. I will be using solenoid, steppers, and limit switches. Also, checking the cost for the parts and magnets. Figuring out the cheapest way to present the concepts, but also making it still look appealing by choosing the right dimensions.
4/15/2017	6:00pm - 11:00pm	300	Designed the rows for the stepper motor to 3D print and 3D printing the parts. Made several prototypes.
4/18/2017	4:00pm-7:00pm	180	I showed my prototypes of the parts to the TA and still redesigning it. Some parts came in today. The others are still on the way.
4/21/2017	7:30pm-9:30pm	120	I just got my parts today and realize they are too small. I tested the stepper motor and solenoid, and they are too weak to perform the task I wanted them to do. So I order more parts but bigger parts
4/23/2017	8:00pm-11:00pm	180	I found some design for the parts that I need and I printed them. But, I realize I have to make my own parts. Also, I test the ferrofluids with the neo magnets and they perform very well. I put the ferrofluids in water and it demonstrated what I needed.
4/25/2017	12:00pm-4:00pm	240	I made printed a few parts, but I redesigned the parts and I had troubles with the 3D printer, as well. Mostly, I spent calibrating the 3D printer.
4/28/2017	7:00pm-12:00am	300	I designed the motormount and made several prototypes for it. I tested the mount on the stepper. Also, calibrating the 3D printer.
4/29/2017	3:00pm-5:00pm	120	I started the design for the bearing mount.
4/30/2017	5:00pm-8:00pm	180	I made two prototypes. I almost have it, but something was missing. So, I added a limit switch mount.
5/2/2017	12:00pm-4:00pm	240	Printed two part bearing mounts and ordered bearing for the bearing mount part. Soldered 5 limit switches so it is to connect them. Started working on the carriage for the solenoid.
5/2/2017	4:30pm-5:30pm	60	Demoed my 3D parts and told the TA what I ordered and what will I demo next week.

5/5/2017	8:00pm-3:00am	480	I got my bearings for the bearing mount and it fit perfectly. I printed my first version of the soleniod carraige and found out my solenoid is not strong enough to pull the magnet away from the ferrofluid. I ordered a 24V solenoid, timing belt pulley, and timing belt. I worked on 2nd version of the carraige and printed them out. I also went to Home Depot to buy 1/4 inch diameter rod. I connected the bearing mount with one end of the two rods and put the carraige in the middle and connect the motor mount at the other end of the rods. It did not slide smoothly.
5/6/2017	3:00pm-5:00pm	120	Finalized the parts and started printing five of each part. I had 1/4 inch steel rod and cut and connected them. The carraige glided very smoothly.
5/7/2017	8:00pm-2:00am	360	I still printing the parts. Just finished 2/5 groupset of the parts. Since I only had one row with metal rods, I just coded that part first. I coded the stepper to move and solenoid to output. (Using the small solenoid for now) After, use the limit switch. A lot of debugging and troubleshooting. Also, I burned one of my lithium battery. ALMOST EXPLODED! Also, I started designing the magnet slide.
5/8/2017	5:00am-6:00am	60	Printed the 3 groupset of the parts
5/8/2017	8:00pm-2:00am	360	I got the large solenoid and the other parts. I reddesigned the carraige to carry the solenoid. 3/5 groupset print failed. Restarted the print. Continued coding.
5/9/2017	12:00pm-4:00pm	240	I went to Home Depot to my wood and screws to make the frame. After, I put together the 3/5 groupset part with the rods and build the frame. I screwed the first row with the metal rods to the frame. Fits perfectly! Calibrated the movement of the stepper through my code. Printing the 4/5 groupset of parts. Working on code.
5/9/2017	4:00pm-7:00pm	180	Since I did not have a power supply, I powered my friends 12V battery source. Assembled the project. Working the code for demo. Finally, demoed
5/10/2017	12:00pm-2:00pm	120	i made a second version for the magnet slide.
5/11/2017	12:00pm-4:00pm and 6:00pm-9:00pm	420	making functions that move any row of the stepper to stpper 1 to 5. i also cleaned my code and change functiom names to make it look nice and easier to understand

13-May	2:00pm-4:00pm	120	I made a new version of the solenoid carriege and installed it. also, printed the magnets. this time the magnets dont fit
	Total time:	78	