



(Group 1) 1.1.6 Compound Machine Project

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Mr.Brown POE period 3, 9/15/2022-10/10/2022

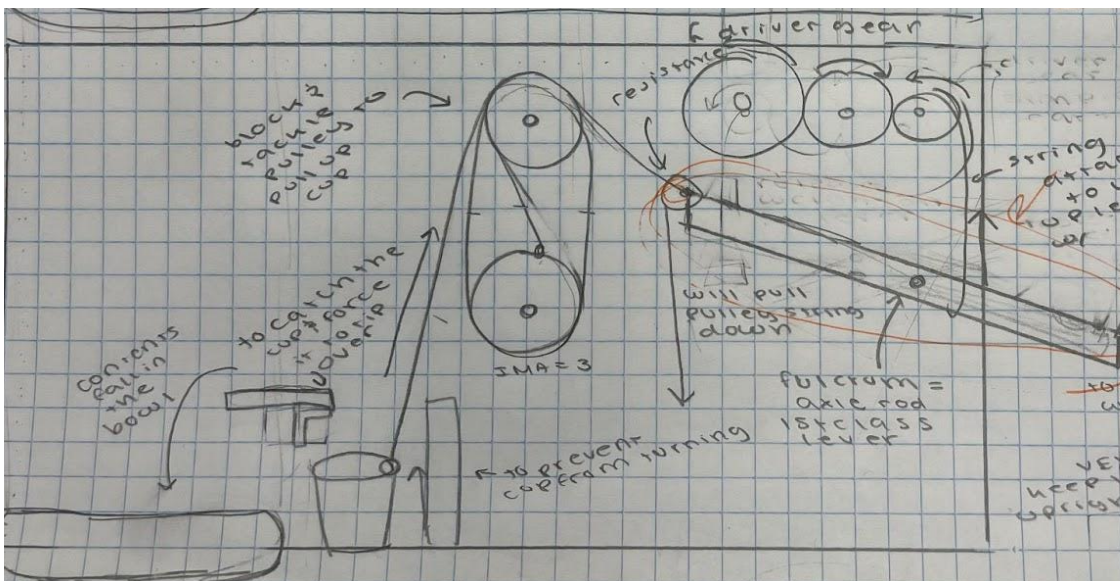
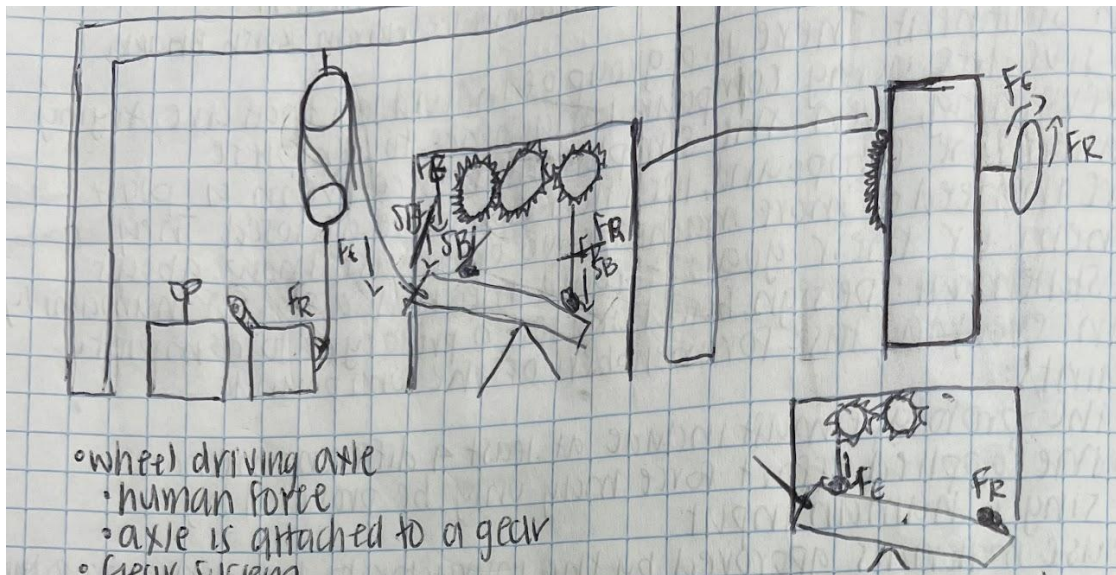
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Design Brief

Client	There is a group of individuals who live on an island called the Compound, trying to live life using simple machines for everything, including simple tasks.
Designers	Srividhya Chandramouleeswaran, Sriya Burra, Krish Bhakta, Ethan Chau
Problem Statement	The individuals at the Compound need more simple machines to complete everyday tasks. We need to build a simple machine using VEX parts for those individuals that can repeatedly complete the same task successfully. This compound machine must consist of several simple machines.
Design Statement	We will design, build, and test a prototype to complete an everyday task for the members of the compound.
Constraints	- The prototype must include at least 4 different simple machines. - The applied effort force may only be provided by a single human input. - Materials must be approved by the instructor. - There may be only one VEX baseboard in the assembly.
Deliverables	- Two different compound machine designs per group member for brainstorming with annotations and a description. - Final design proposal with an isometric or multiview sketch of the chosen design. - Project log for each individual with documentation of changes and summaries of progress. - Create a Gantt Chart. - Individual calculations of mechanical advantage. - Record a video describing each simple machine.

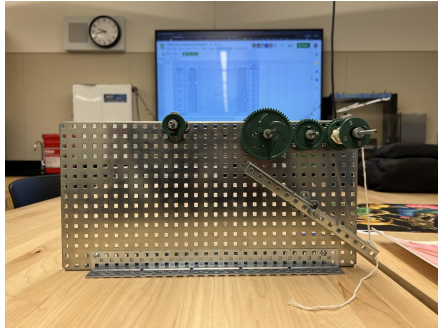
Pre-Design Photos



A wheel driving axle is used to move a gear system of 3 gears. The wheel will be the human force and the axle is attached to the driver gear. The gears were originally going to drop a weight onto a lever but we changed it to lift one side of the lever using string in order to actually make it a 1st class lever. The lever will be attached to a pulley system (block and tackle) consisting of 2 pulleys, a movable and a stationary one. The effort force for this is from the part of the lever that will go down, thereby pulling the string downwards as well. The pulley is attached to the watering cup. Due to the uneven weight distribution, as one side of the cup rises with the pulley, the other side will be held down by the weight of the water and will tip it into the cup with the plant.

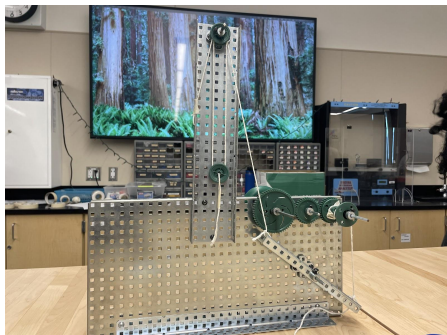
Modifications

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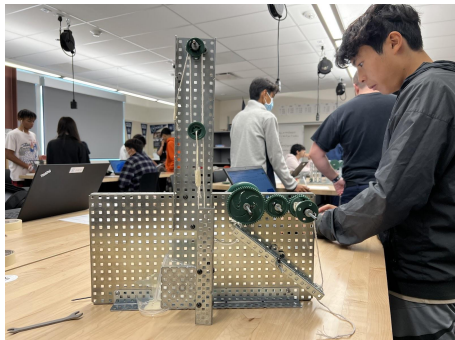
We changed the driven gear from a small to a medium gear. We also moved the lever to have the fulcrum located under the idler gear instead of the driven gear. We did this because the small gear would have to properly fit on the board, nor would it have allowed us to attach the mechanism that holds the string. We also added an axle driving wheel in order to wrap the string around it which adds another machine. We needed that in order to control the string.

9/30



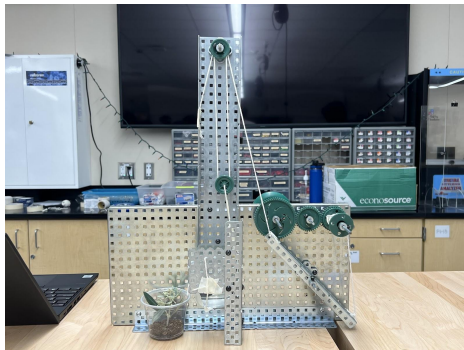
We added another piece of vex metal and also moved the pulley onto it instead of having it on the base board, because our pulley was not going to fit on the original baseboard where it could lift the cup high enough to tip and dispense all the liquid in it.

10/4



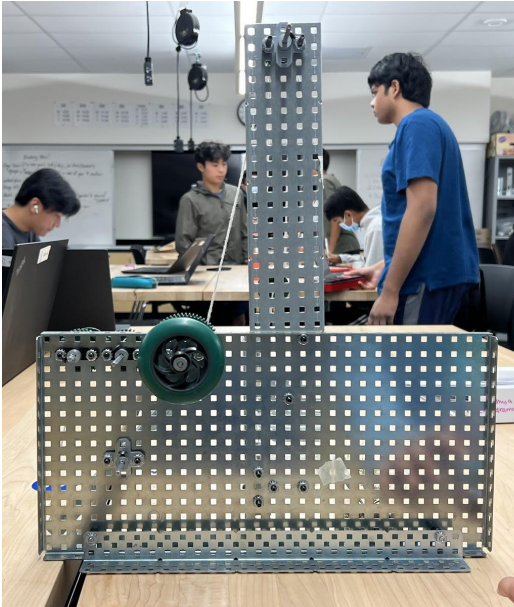
We added more support for the cup than we originally had planned. We changed the barrier from being a single vertical extension to a set of plates covering a larger area, almost covering the cup itself.

10/5



We raised the support for the cup and added a bar for it to sit on. We also put the plant into a cup instead of having it be in a larger container. We did this to better ensure the tipping and full dispensing of the contents of the cup.

Final Design Images



Prototype Information

Our prototype is a compound machine that lifts a cup of water and pours it into another container, in order to water a plant. Our machine includes a wheel driving axle, a simple gear train consisting of 3 gears, and an axle driving wheel, a first class lever, and a block and tackle pulley in that order. The effort force is at the wheel driving axle with an IMA of 21.667. One begins by turning the wheel which will instigate the driver gear, causing the gear train to begin to rotate. The gear ratio of the gears is 0.644. The output gear of the gear train has an axle driving gear attached to the same axle which has an IMA of 0.1429. On the wheel and axle, there is a string attached that connect it to the end of a first class lever which has an IMA of 0.9348. When the lever is rotated and pulled towards the wheel and axle, the other end of the lever is forced down, which is the effort force for the block and tackle pulley that has an IMA of 2. As that string is pulled down, the string around the block and tackle pulley will pull up the cup with the water in it. The cup is attached by string through the center of the movable pulley in the block and tackle system. The string is only attached to one side of the cup which will cause it to tilt due to the uneven distribution of weight. In order to guide the cup, there is an extension surrounding the cup and restricting its movement so that it only tips towards the left, where the plant is. The total IMA for our compound machine is 3.736.

[Compound Machine Final Design Video](#)