

STONY POINT HS -- ROUND ROCK ISD

Design Problem – Marble Sorter

Project 3.3.1 – VEX and RobotC

Adam Frankovic, Bianca Diaz, Fabian Perea, & Kevin Calderon

April 12, 2017

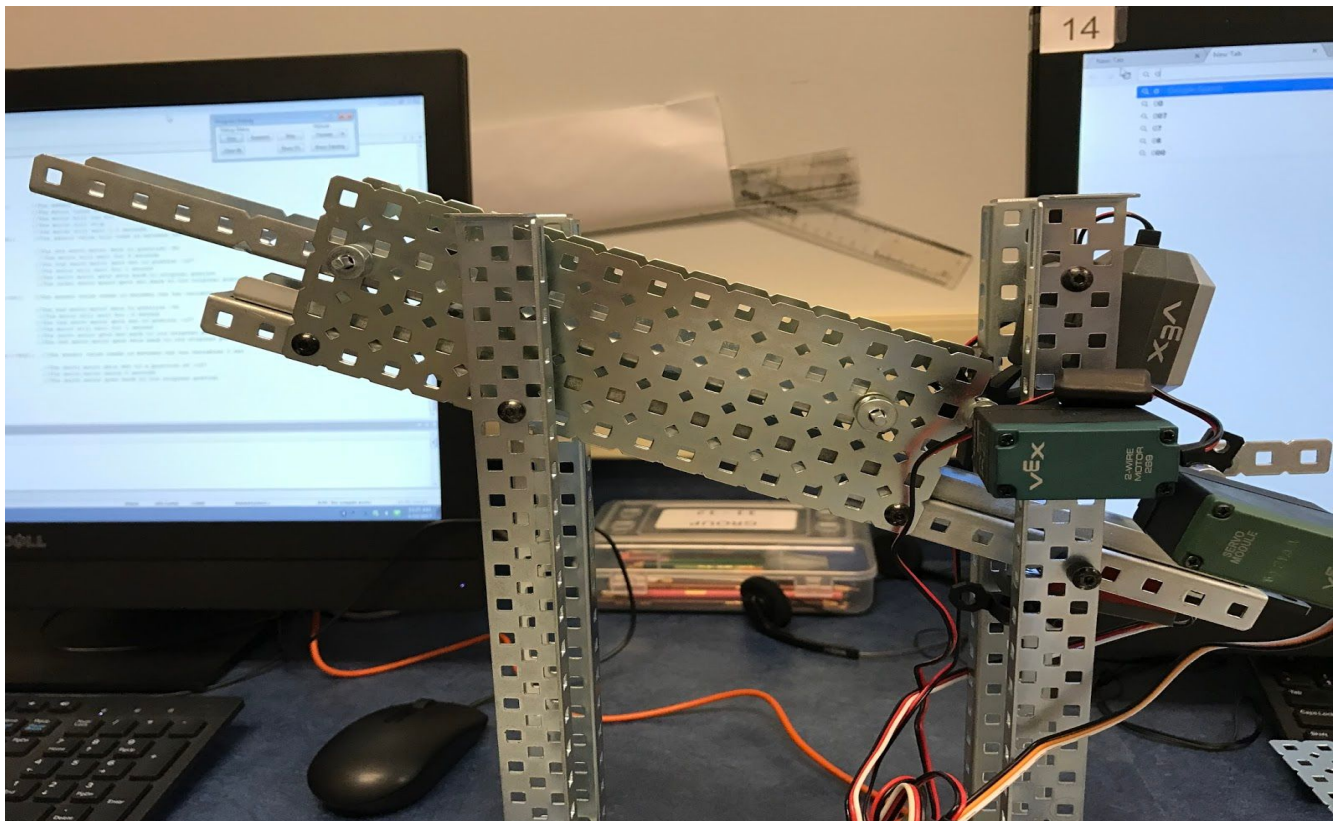


TABLE OF CONTENTS

[Design Brief](#)

[Final Design Pictures](#)

[RobotC Code](#)

[Reflections](#)

[References](#)

[Appendices](#)

[Dispenser Brainstorming](#)

[Sorter Brainstorming](#)

[Bins Brainstorming](#)

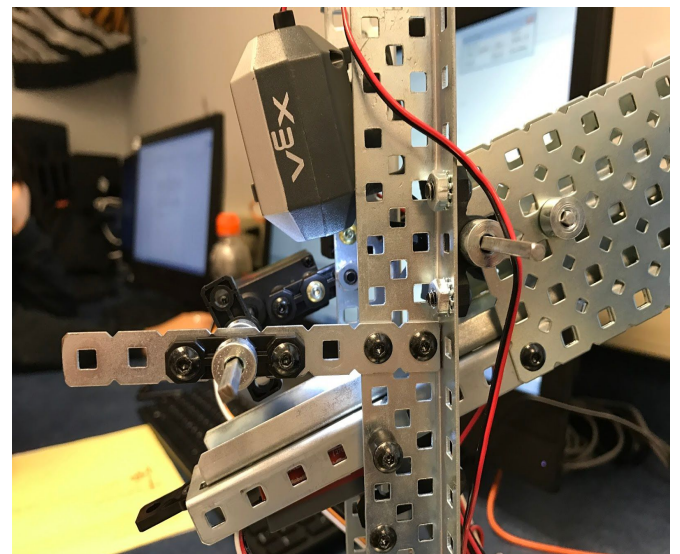
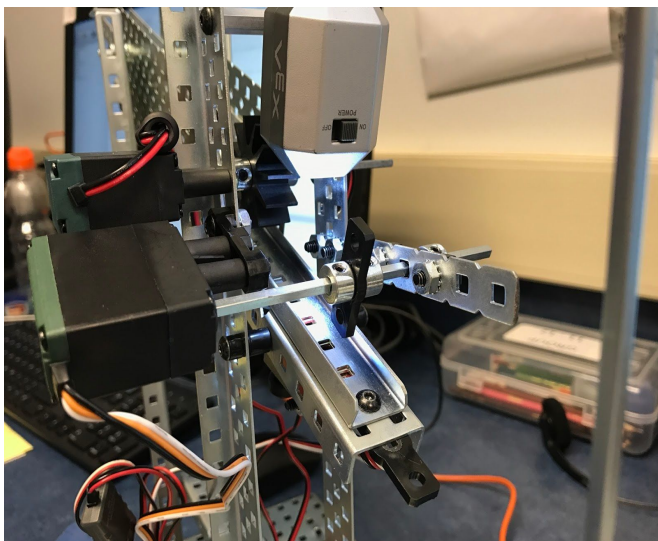
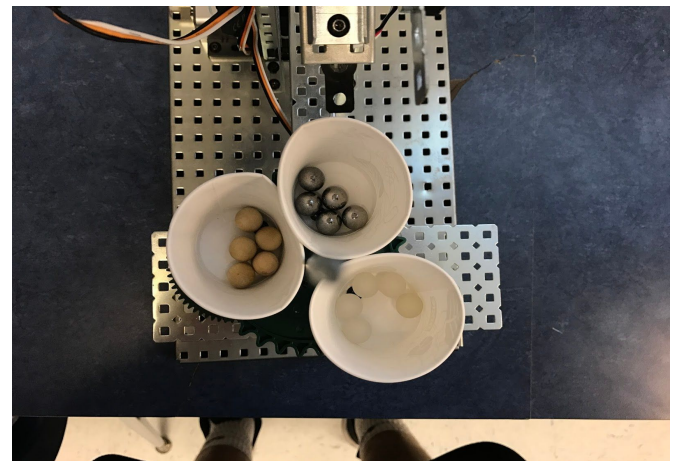
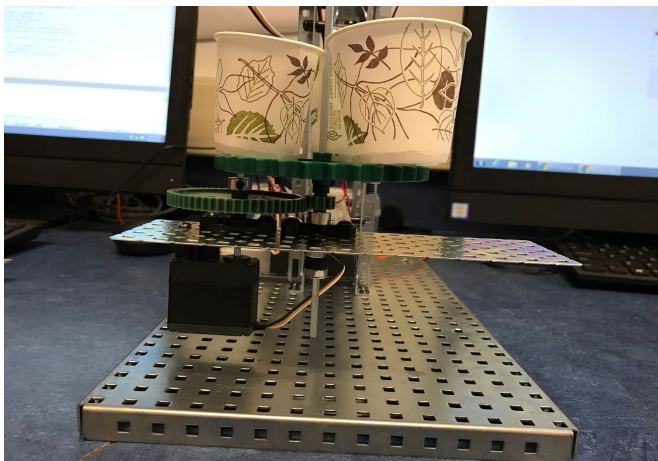
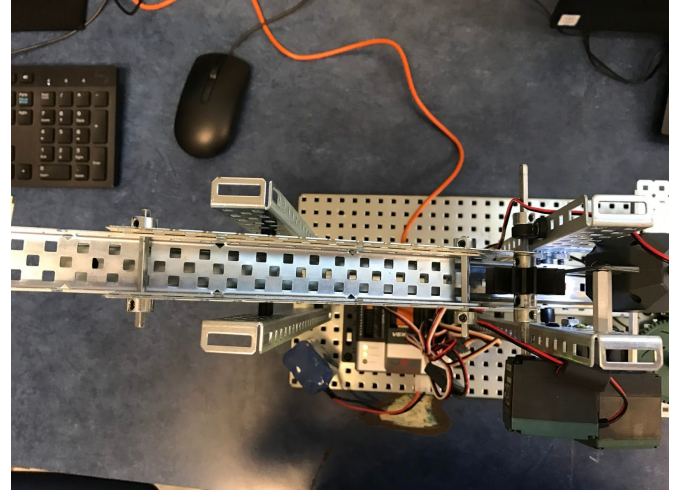
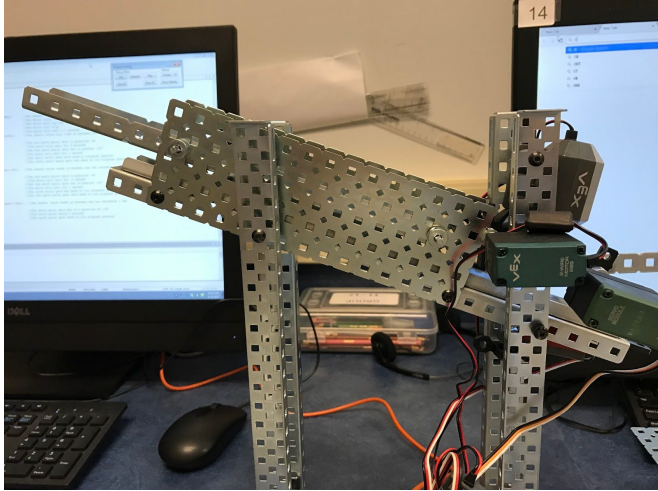
[Design Modifications](#)

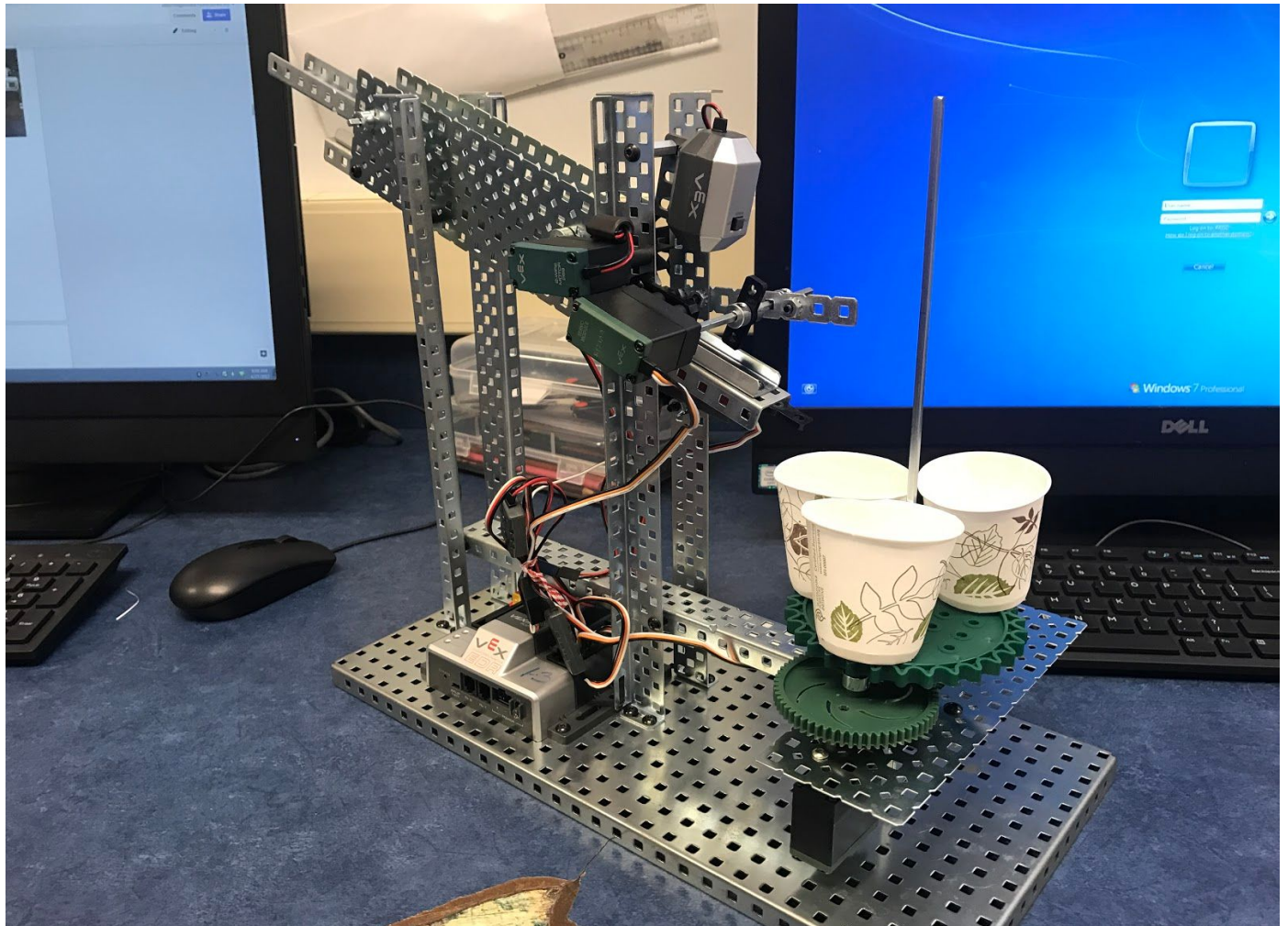
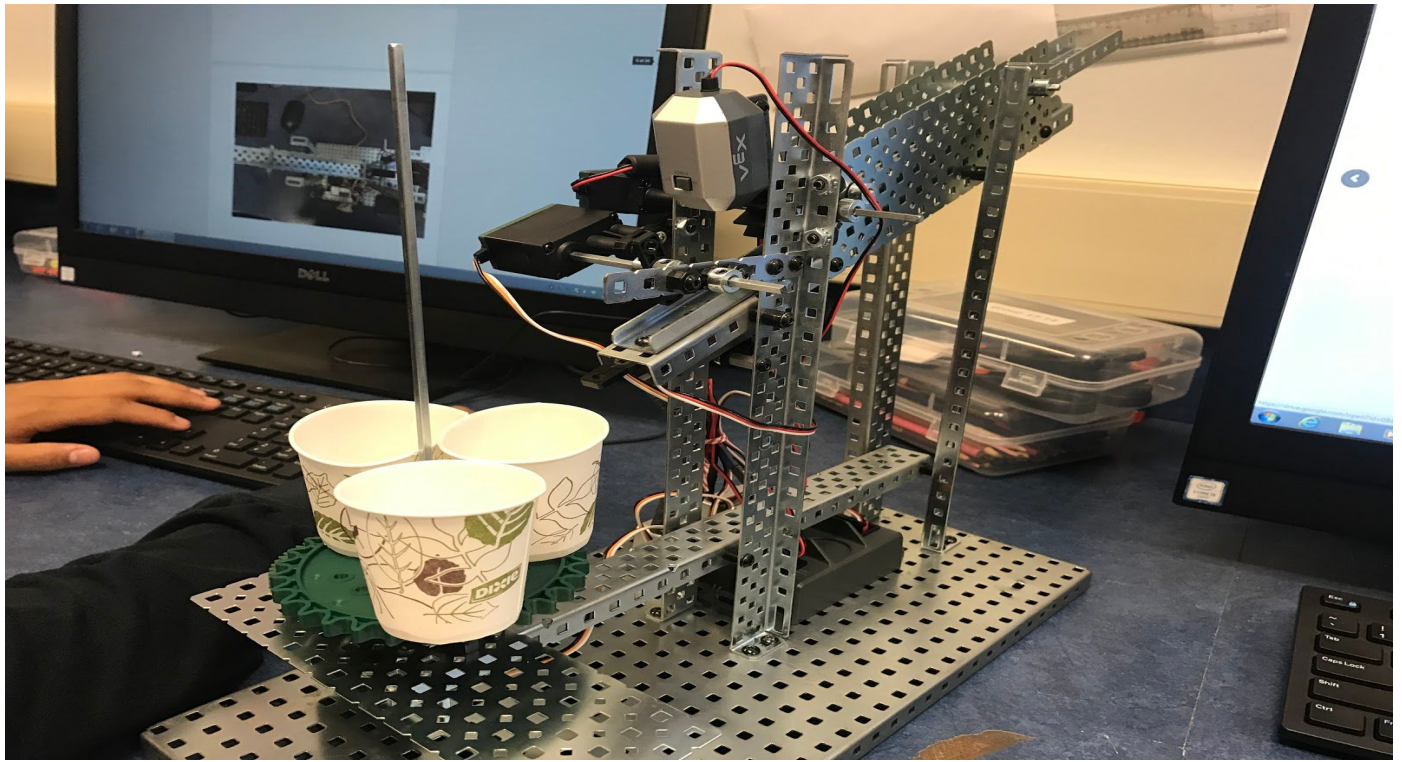
DESIGN BRIEF

Client Company:	National Recreation and Park Association (NRPA)
Target Consumer:	Society
Designer(s):	Adam Frankovic, Bianca Diaz, Fabian Perea, & Kevin Calderon
Problem Statement:	The National Recreation Park Association (NRPA) has asked your team to develop a solution to a growing problem in their parks. The association has placed dumpsters for recyclable material throughout the parks. They have a sorting facility; however, they need a device that will sort the recyclable material.
Design Statement:	Design, model, and test a device that will separate recyclable materials.
Problem Statement:	<ol style="list-style-type: none">1. Separation process must be fully automated.2. Must successfully separate commingled recyclable materials into individual holding bins.3. Recyclable materials include 3 different ½-in. material spheres totaling 15. Examples could include steel, aluminum, wood, opaque plastic, and clear plastic.4. Must be efficient—2 minute max for completion of sorting process.5. Must not be larger than 24”L x 12”W x 18”H6. Must make efficient use of materials.

FINAL DESIGN PICTURES

<Include pictures of your final robot. You must have a minimum of 2 pictures of each part of your project
Dispenser, Sorter, and Bins, as well as at least 2 over all pictures of your robot.>





ROBOTC CODE

```
task main()
{
  turnFlashlightOn(flashLight, 127);
  while(1==1)
  {
    if(SensorValue(lineFollower)<=2700 && (SensorValue(lineFollower)>=2400))
    {
      startMotor(rightMotor,-23.5);
      wait(.10);
      stopMotor(rightMotor);
      wait(1.5);
      if(SensorValue(lineFollower)<= 2300 && (SensorValue(lineFollower)>=2000))
      {
        setServo(servoMotor2, -40);
        wait(.5);
        setServo(servoMotor,-127);
        wait(1);
        setServo(servoMotor,0);
        setServo(servoMotor2, 5);
      }
    }
    else if(SensorValue(lineFollower)<=350 && (SensorValue(lineFollower)>=50))
    {
      setServo(servoMotor2, 50);
      wait(.5);
      setServo(servoMotor,-127);
      wait(1);
      setServo(servoMotor,0);
      setServo(servoMotor2, 5);
    }
    else if(SensorValue(lineFollower)<=1300 && (SensorValue(lineFollower)>=400))
    {
      setServo(servoMotor,-127);
      wait(.3);
      setServo(servoMotor,0);
    }
  }
}
```

//Turns flashlight on
//Sets condition to be true
//The sensor value reads in between the two variables I set
//The motor turns on at the set speed
//The motor will run for .10 seconds
//The motor will stop
//The motor will wait 1.5 seconds
//The sensor value will read in between two variable I set
//The 2nd servo motor sets to position -40
//The motor will wait for 5 seconds
//The 2nd servo motor gets set to postion -127
//The motor will wait for 1 second
//The servo motor gets sets back to original postion
//The other servo motor gets set back to its original position
//The sensor value reads in between the two variables I set
//The 2nd servo motor sets to position -40
//The motor will wait for .5 second
//The 2nd servo motor gets set to postion -127
//The motor will wait for 1 second
//The servo motor gets set back to its original position
//The 2nd servo motor gets sets back to its original position
//The sensor value reads in between the two variables I set
//The servo motor gets set to a position of -127
//The servo motor waits 3 seconds
//The servo motor goes back to its original postion

REFLECTIONS

A) How well did you accomplish your objectives, discuss your success for EACH of the 6 constraints?

-Our marble sorter was successful and simple. The marbles that we chose were; metal, wood, and opaque plastic. Our intake roller would release 1 marble at a time and would stop for the marble to be read by the light sensor. Then the servo motor would adjust itself into the right position for the marble to fall in for its specific material. It also sorted every marble out in under a minute! Our design met the correct measurements and didn't go over it, it also did not use many materials because that would make the sorter more expensive but we did make great use out of the materials that we chose to work with.

B) What would your team do differently with your design solution (min 3 things) and why?

- 1.) Made it smaller, to be more cost efficient.*
- 2.) Made a better design to where we wouldn't need something to keep the marbles in place from jumping out of place.*
- 3.) Made a smaller code, there could've been less code.*

C) Do the results fulfill the problem statement, if not what was missing?

-Our results meet all the requirements and it wouldn't cost them much to build it.

D) If you had more time, what would you do differently or what would you add. *(Give a minimum of one thing for each PART: Dispenser, Sorter, Bins)*

-One thing that we would change about our dispenser is make it dispense the marble sorter faster and smoother. For the sorter we would place the line follower in a different position to get better results. Lastly for our bins we would chose better bins because the bins we were using started to bend a little.

REFERENCES

<https://www.youtube.com/watch?v=rpqIDKP5bBc>
<https://www.youtube.com/watch?v=pbOEmqHfaqo>
<https://www.youtube.com/watch?v=GnluqACRATs>
<https://www.youtube.com/watch?v=bmbXOAaNtqg>
https://www.youtube.com/watch?v=D1_95iwIjyw

<https://www.youtube.com/watch?v=rpqIDKP5bBc>
<https://www.youtube.com/watch?v=pbOEmqHfaqo&t=1s>
<https://www.youtube.com/watch?v=GnluqACRATs>
https://www.youtube.com/watch?v=0uQV_fqHV8M
<https://www.youtube.com/watch?v=F1-Ga0WmfXQ>

https://www.youtube.com/watch?v=EV92YD1_Sd4
<https://www.youtube.com/watch?v=JreLXx4o8UI>
<https://www.youtube.com/watch?v=7hkcfO7Bh44>
<https://www.youtube.com/watch?v=P87aMXONZi0>
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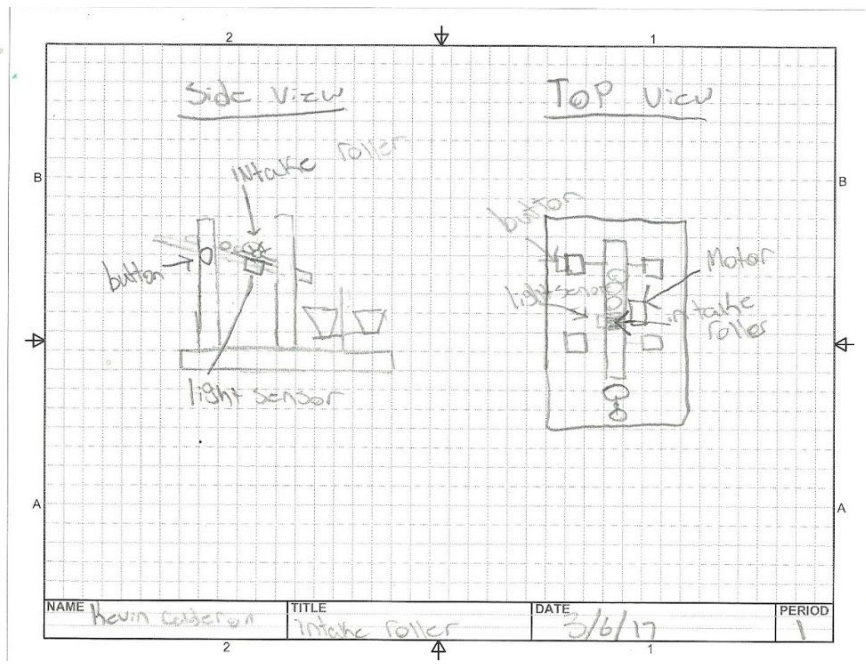
APPENDICES

DISPENSER BRAINSTORMING

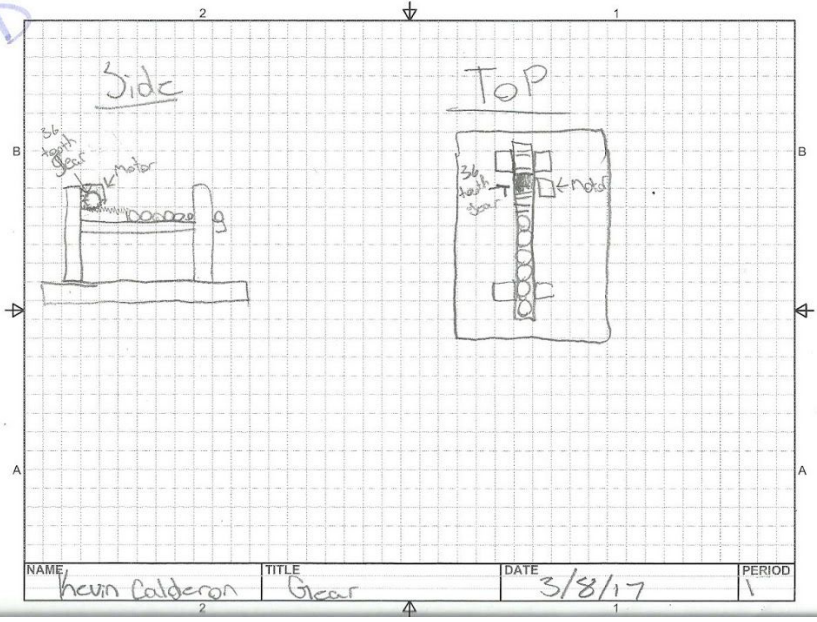
Decision Matrix Template

Ideas	Criteria					Totals
	Accuracy	Simplicity-Building	Simplicity-Coding	Time Spent Building		
1	2	2	4	3		11
2	3	3	3	4		13
3	3	4	4	4		15
4	3	2	2	2		9

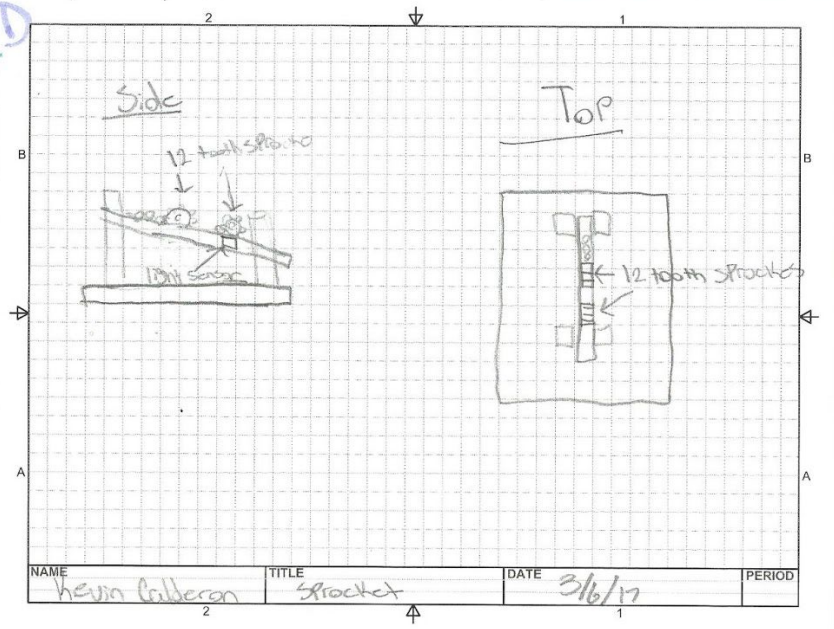
Key: 4 best -- 1 worst
Must include a minimum of 4 criteria.



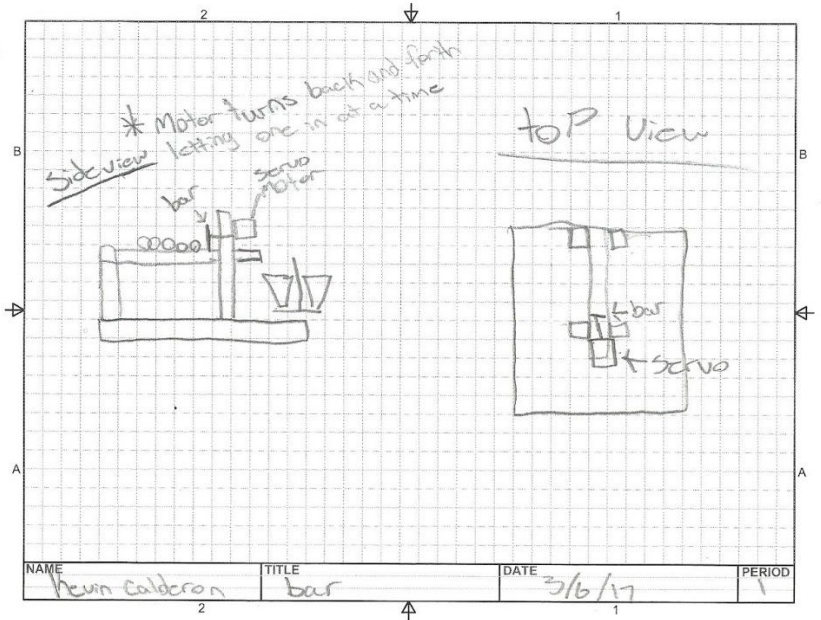
3-D



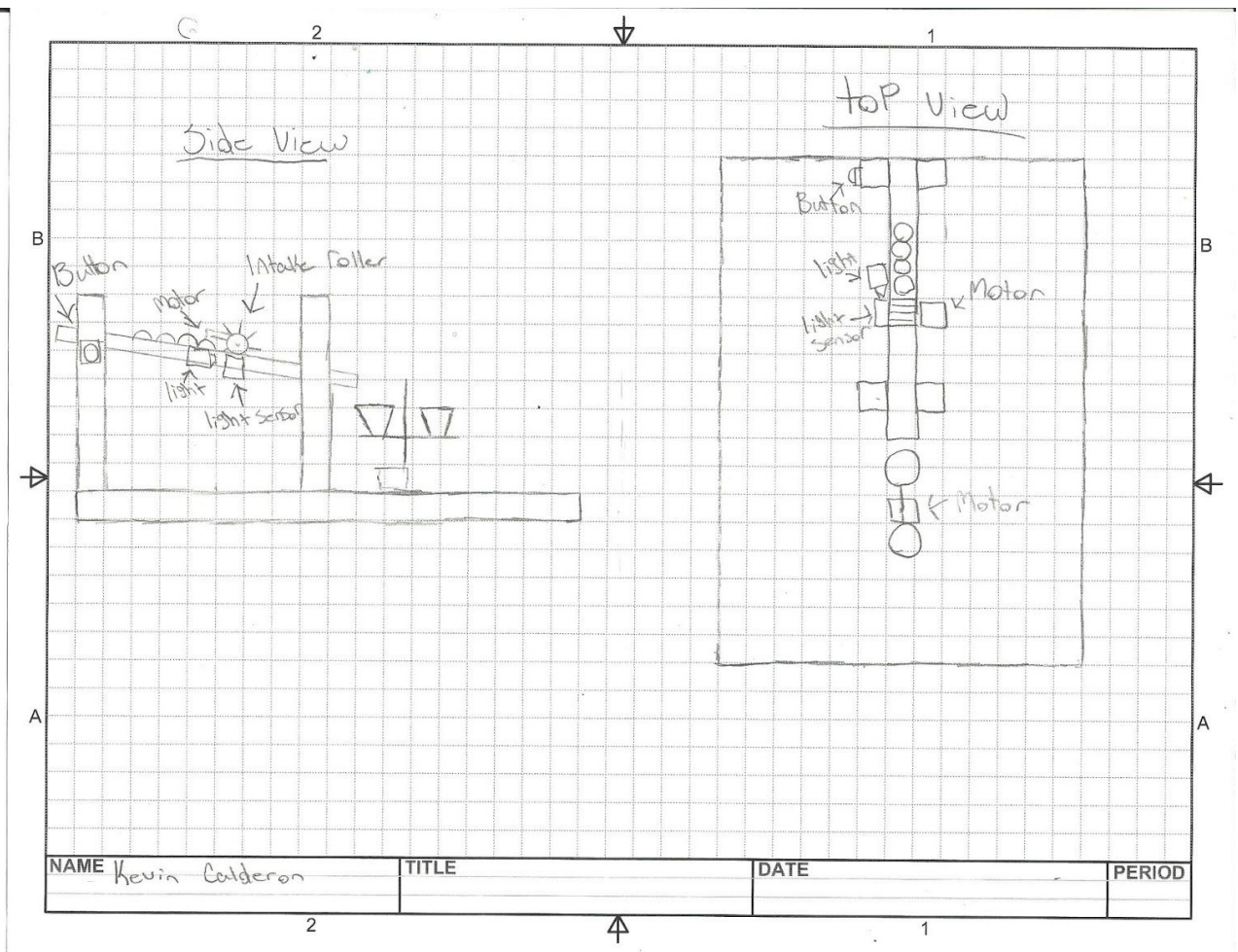
3-D



4.



FINAL:



SORTER BRAINSTORMING

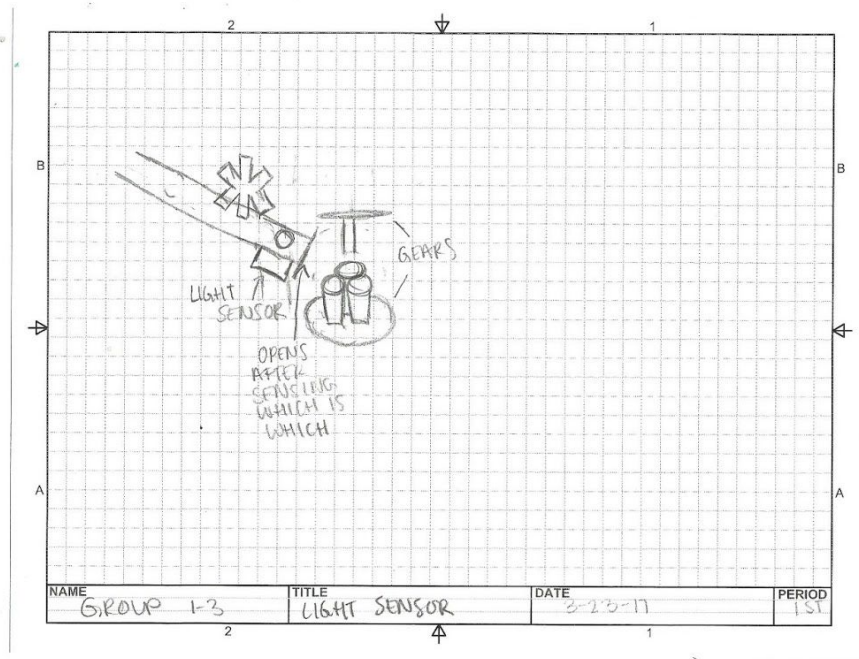
PLTW | Engineering

Decision Matrix Template

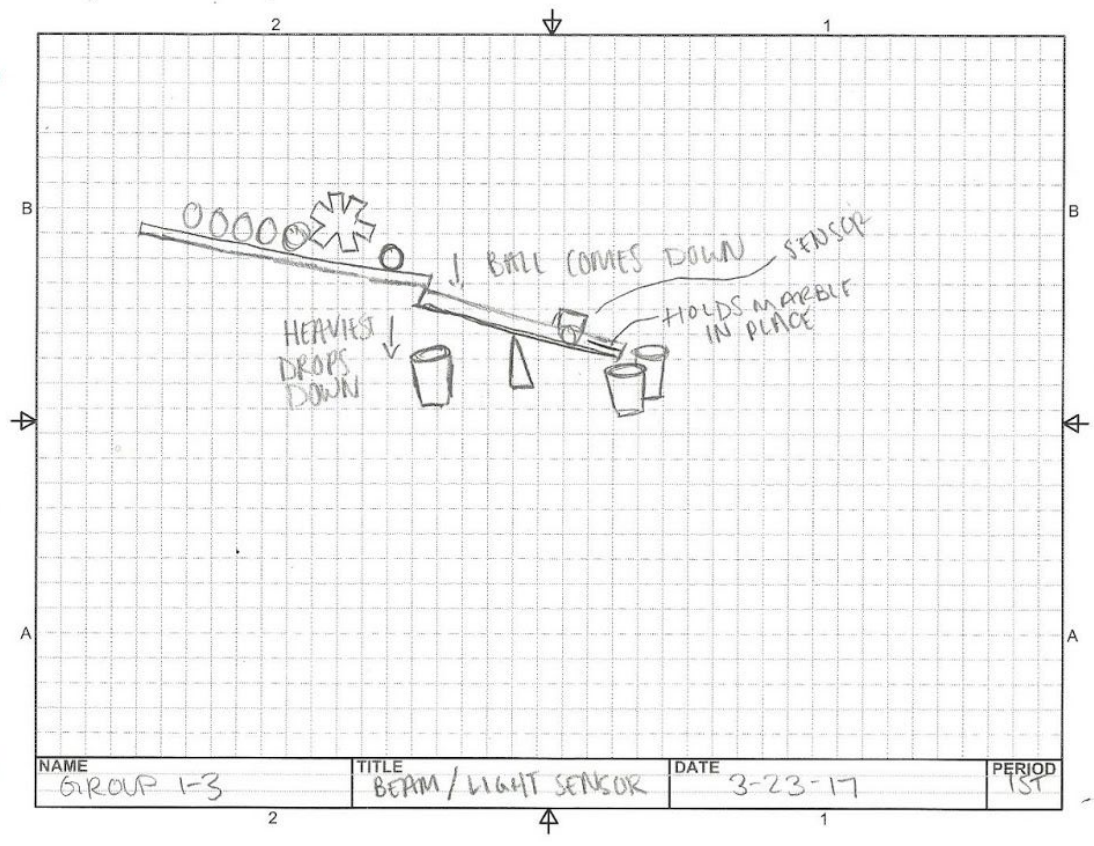
Ideas	Criteria					Totals
	Accuracy	Simplicity	Speed	Time Spent On Building		
Light Sensor	2	3	3	4		12
Light Sensor + Seesaw	3	4	4	2		13
Flashlight + Line Tracker	2	2	2	3		9
Limit Switch	2	3	3	4		12p

Key: 4 best -- 1 worst
Must include a minimum of 4 criteria.

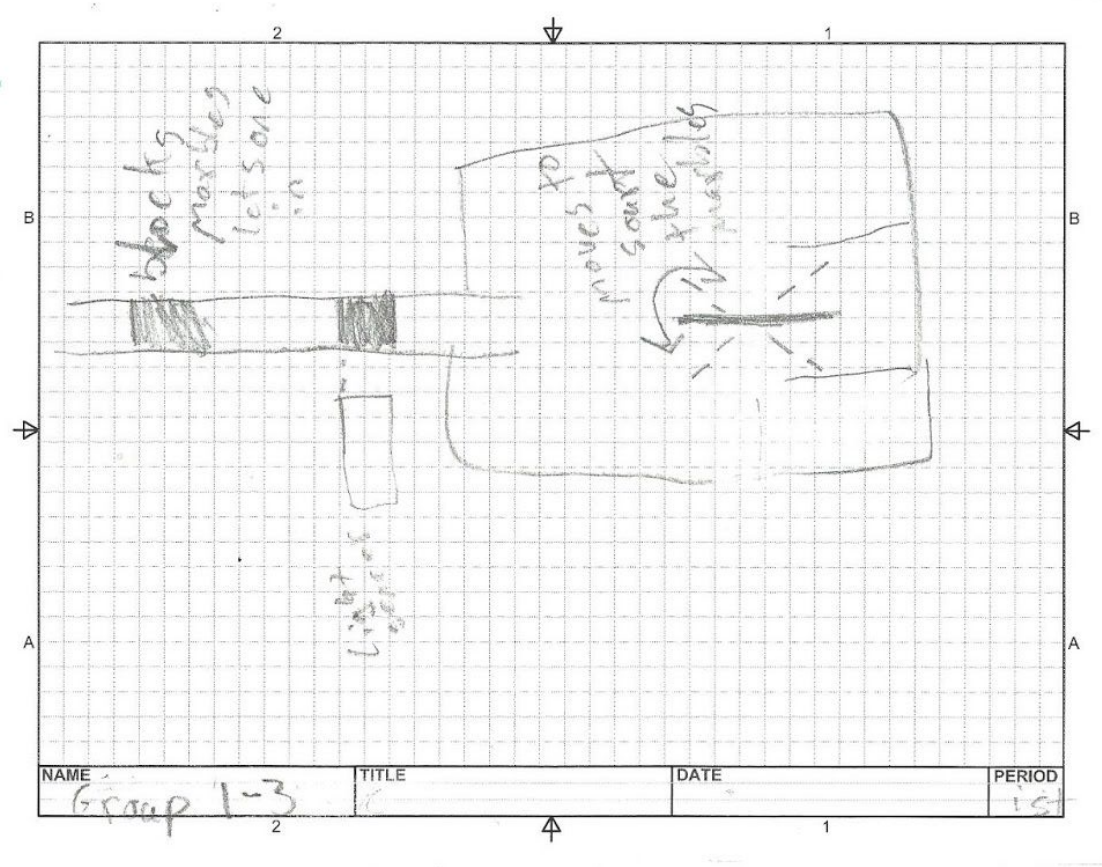
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Principles Of Engineering Decision Matrix Template – Page 1



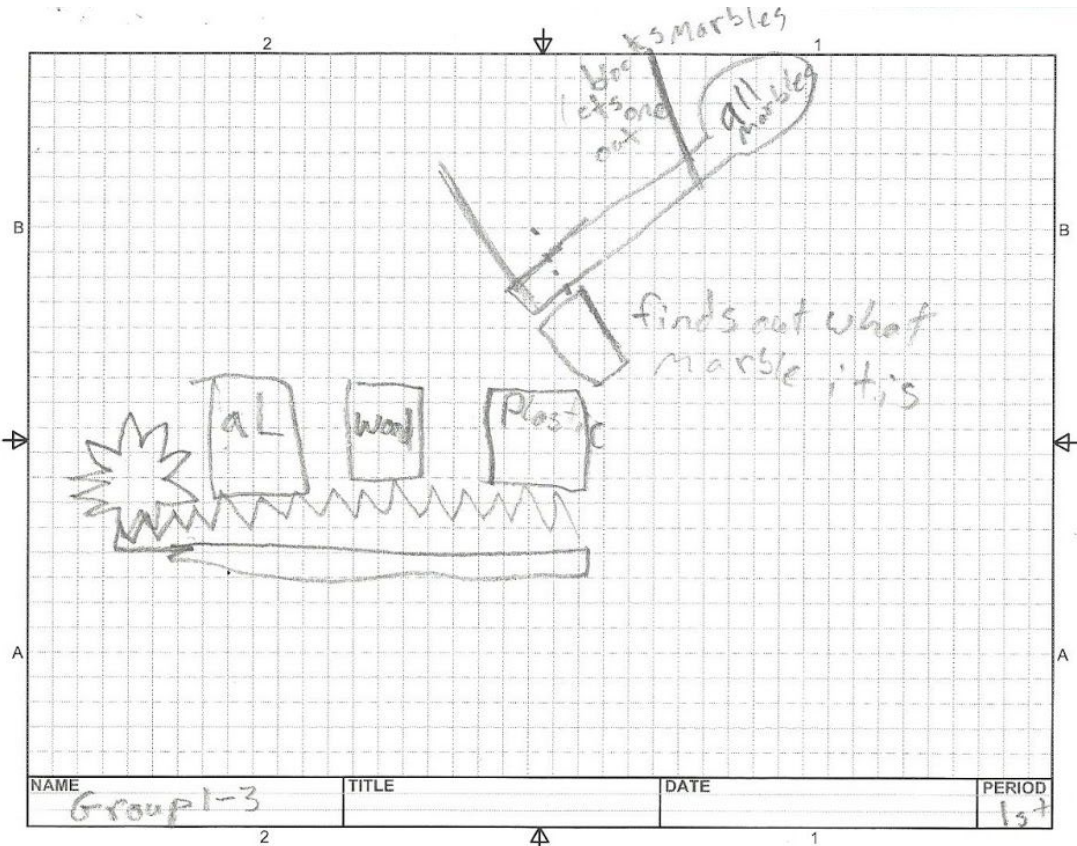
2.



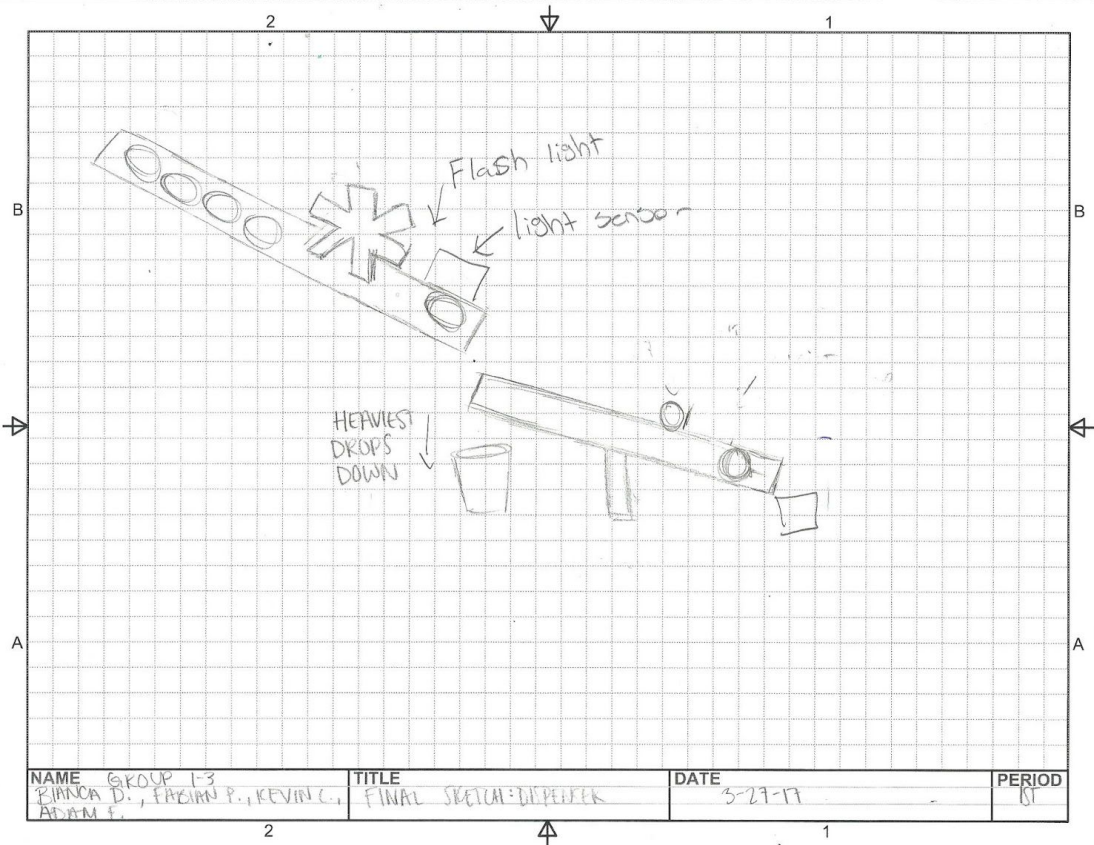
NAME GROUP 1-3	TITLE BEAM / LIGHT SENSOR	DATE 3-23-17	PERIOD 1ST
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NAME Group 1-3	TITLE	DATE	PERIOD 1ST
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FINAL



BINS BRAINSTORMING

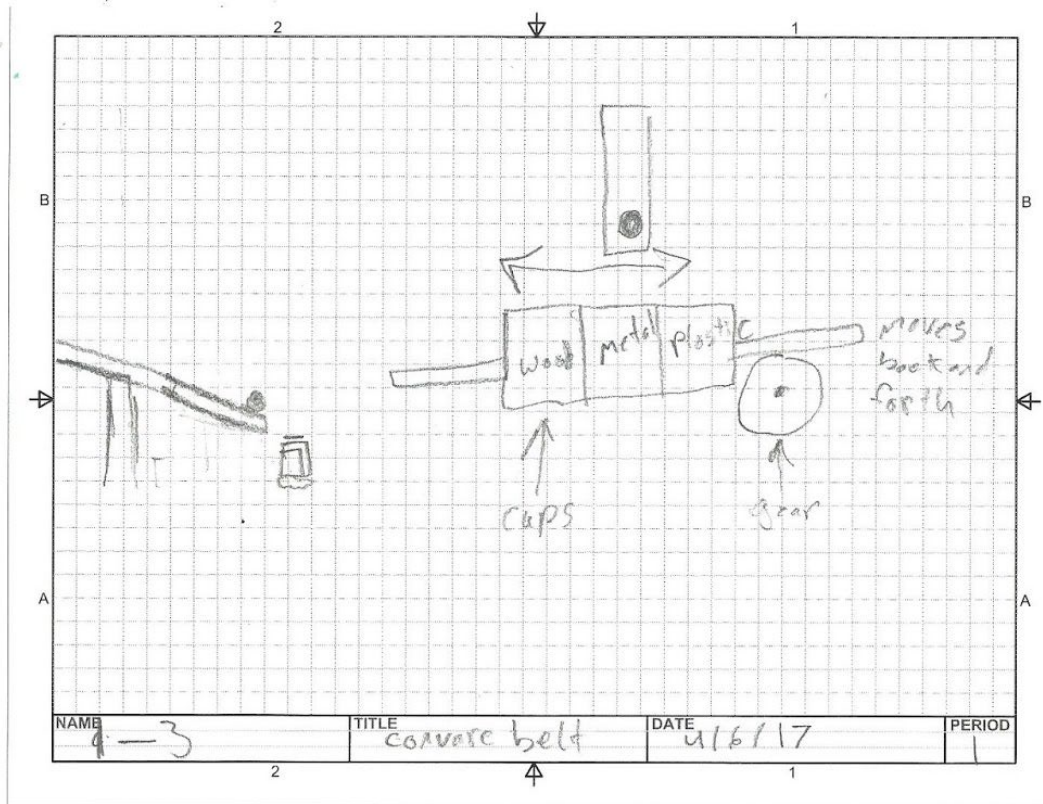
PLTW | Engineering

Decision Matrix Template

Ideas	Criteria					Totals
	Simplicity	Speed	Accuracy	Reliability		
1	4	3	3	3		13
2	2	1	3	2		8
3	2	2	3	3		10
4	3	3	2	3		11

Key: 4 best -- 1 worst
Must include a minimum of 4 criteria.

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Principles Of Engineering Decision Matrix Template – Page 1



2.

2 1

B B

A A

Side View

Top View

rotates to the cups

scrub

NAME Kevin Calderon TITLE Water TITLE DATE 4/6/17 PERIOD 1

2 1

2 1

B B

A A

metal plate that sorts the marbles in the correct cups.

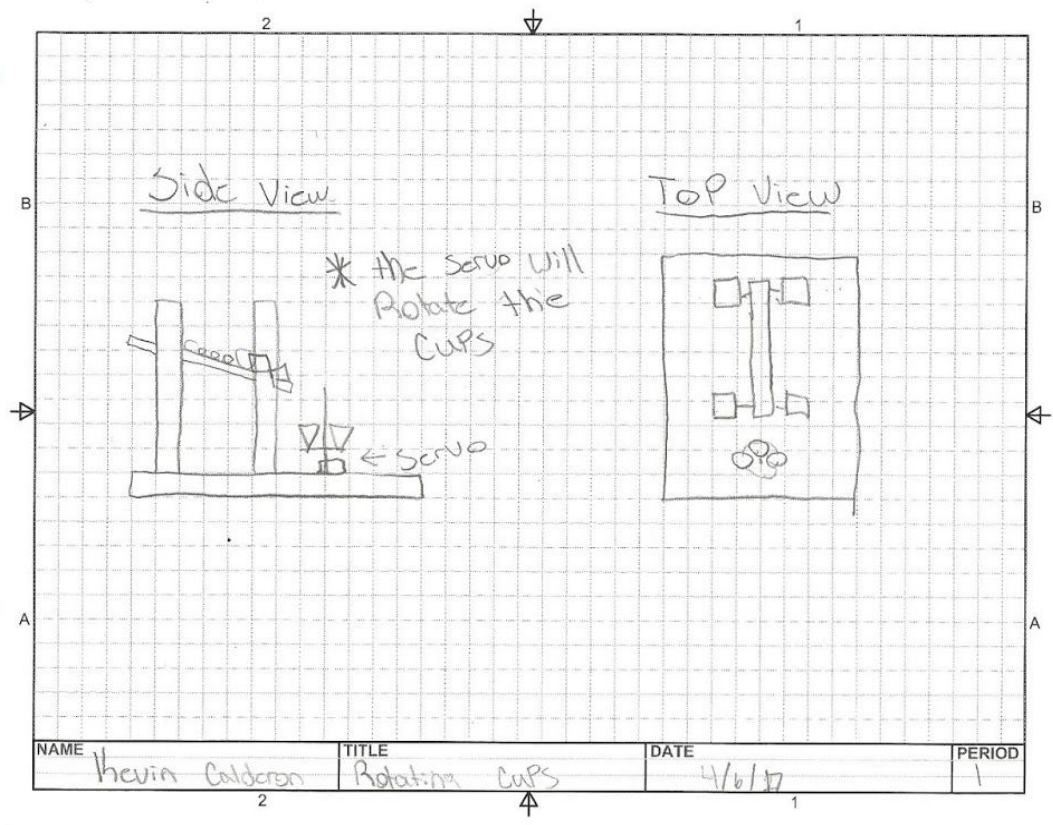
plastic metal wood

NAME 1-3 TITLE Ball TITLE DATE 4/16/17 PERIOD 1

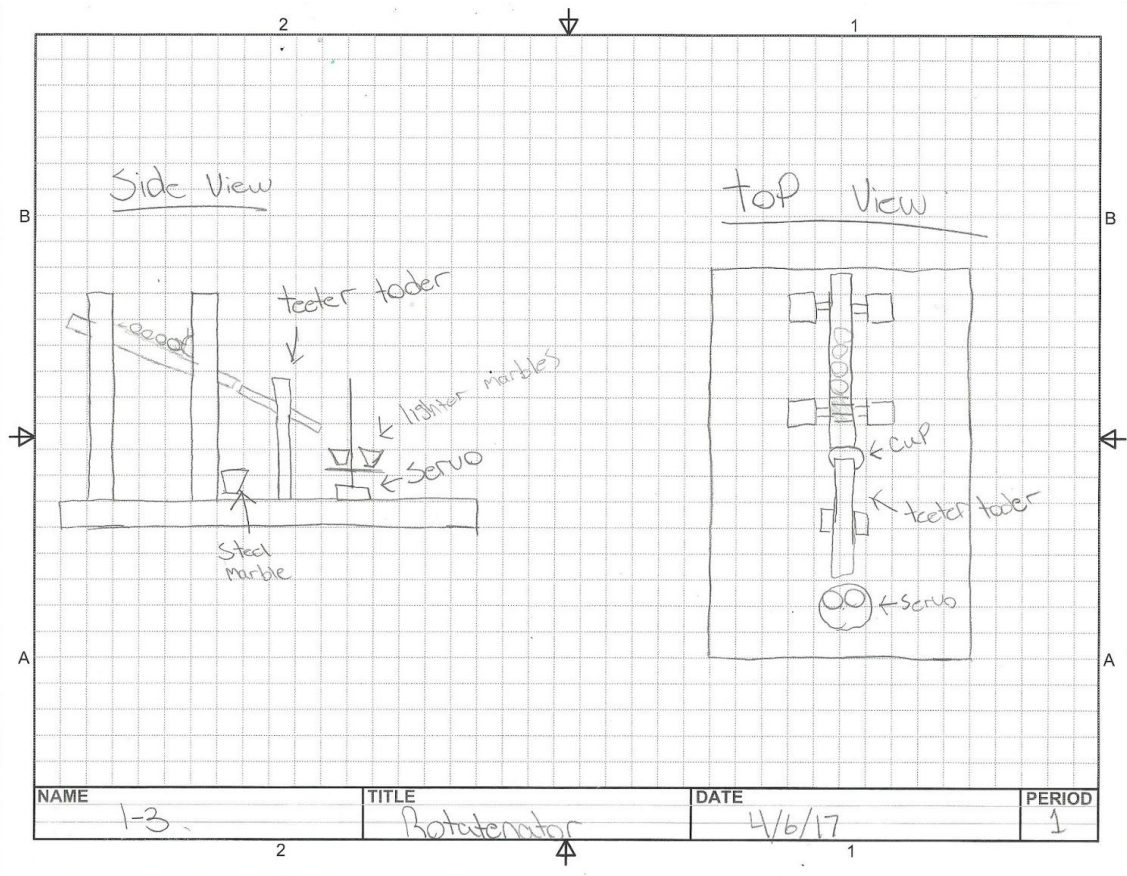
2 1

3

4



FINAL



PARTS LIST

Quantity	Description	Quantity	Description
	Metal Parts		Motion Parts
1	Vex Base Plates	1	Intake Roller
1	12" Long Linear Slide Track	0	6-tooth Sprocket
0	17.5" Long Linear Slide Track	0	12-tooth Sprocket
0	Chassis - Bumper	0	18-tooth Sprocket
4	Chassis - Rails	0	24-tooth Sprocket
0	Plate 5x5 holes	0	30-tooth Sprocket
3	Plate 15x5 holes	1	12-tooth gears
0	Plate 5x25 holes	0	36-tooth gears
0	Bar 1x25 holes	1	60-tooth gears
0	Angles	0	84-tooth gears
1	C-Channel	0	19-tooth rack gear
0	Gussets - any type	0	Worm gears
	Input/Output/Motors		
1	Line Tracker	0	24-tooth bevel gear
0	Bumper Switch	0	Worm wheel
0	Limit Switch	0	Differential frame
1	Flashlight	0	Delrin Slide Track (pair)
0	Potentiometer	0	Claw kit assembly
0	Optical Shaft Encoder	0	Winch and pulley Parts
0	Ultrasonic Range Finder	0	Conveyor-belt Parts (10 inch)
0	Light Sensor	0	Tank Tread Parts
1	3-Wire Servo (maximum 2)	0	Chain Links 10 inch
1	2-Wire Motor (maximum 2)	0	2.75" Wheel
		0	4" or 5" Wheel
			Misc. Fasteners that do not need to ir

DESIGN MODIFICATIONS

Design Modifications Chart

Group: 1-3

Use this chart to document all modifications to your final design solution. Describe the design problem requiring modification and your proposed solution. Then sketch and annotate each design modification. List changes to vex parts list and pseudocode changes. Sign and date all entries.

Explain the Problem and Proposed Solution
We got 5 C-channels when we only needed 1 and we also need 4 chassis rails
Design Modification Sketch (Annotated)
Changes to Vex Parts List (Include parts added or removed from parts list)
4 C-channels removed ✓
4 chassis rails added ✓
List changes to pseudocode or write new pseudocode and attach.
N/A

Modifications must be approved by teacher prior to work commencing.

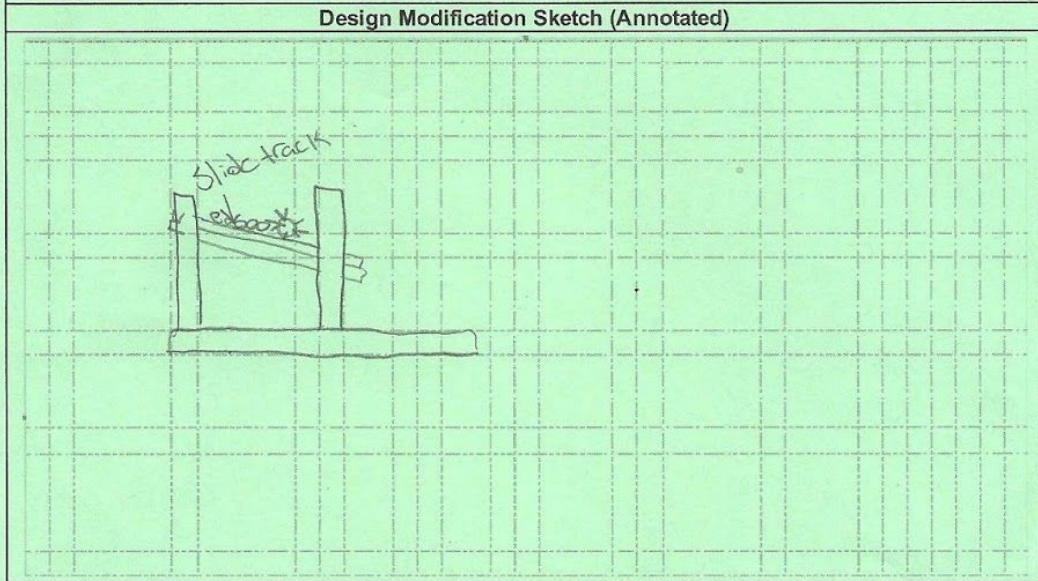
Changes Approved by Teacher: [Signature] Date: 3/21

Design Modifications Chart

Group: 1-3

Use this chart to document all modifications to your final design solution. Describe the design problem requiring modification and your proposed solution. Then sketch and annotate each design modification. List changes to vex parts list and pseudocode changes. Sign and date all entries.

Explain the Problem and Proposed Solution
So our marbles aren't lining up right and the marbles are going everywhere. So we're going to add a 12" long side track on top of the C channel



Changes to Vex Parts List (Include parts added or removed from parts list)
Adding a 12" slide track

List changes to pseudocode or write new pseudocode and attach.
N/A

Modifications must be approved by teacher prior to work commencing.

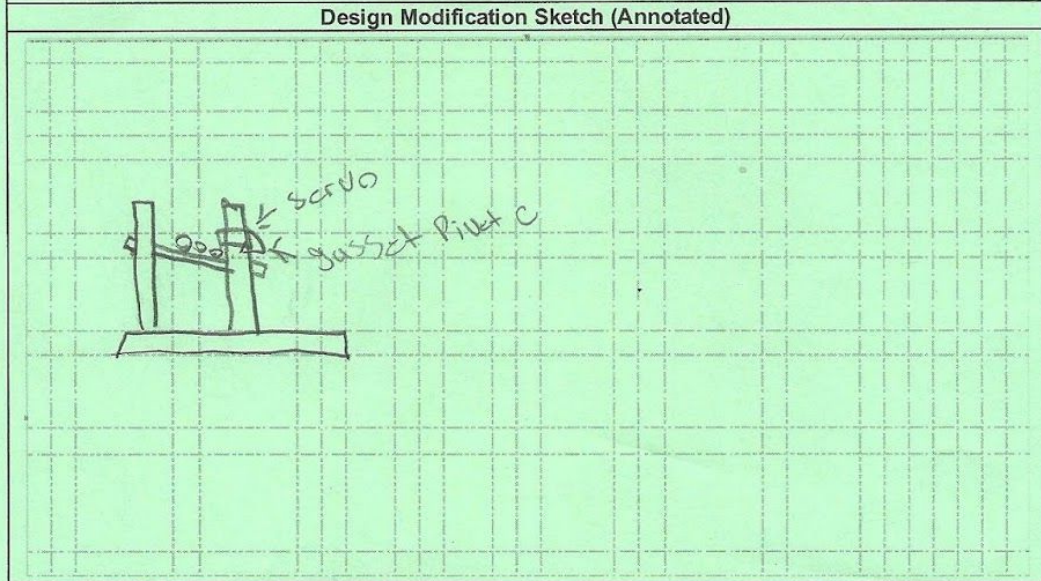
Changes Approved by Teacher: [Signature] Date: 3/23

Design Modifications Chart

Group: 13

Use this chart to document all modifications to your final design solution. Describe the design problem requiring modification and your proposed solution. Then sketch and annotate each design modification. List changes to vex parts list and pseudocode changes. Sign and date all entries.

Explain the Problem and Proposed Solution
Our intake roller wasn't working out because it would shoot two marbles at a time. Our solution is switching the intake roller and replace our 2-wire motor for a gusset, pivot c and a servo motor.



Changes to Vex Parts List (Include parts added or removed from parts list)
removing intake roller
removing 2 wire motor
adding a gusset pivot C
adding a servo motor

List changes to pseudocode or write new pseudocode and attach.
n/a

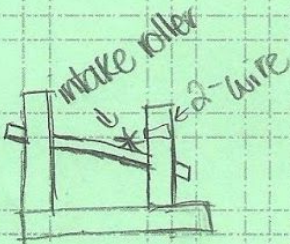
Modifications must be approved by teacher prior to work commencing.

Changes Approved by Teacher: [Signature] Date: 3/27

Design Modifications Chart

Group: 13

Use this chart to document all modifications to your final design solution. Describe the design problem requiring modification and your proposed solution. Then sketch and annotate each design modification. List changes to vex parts list and pseudocode changes. Sign and date all entries.

Explain the Problem and Proposed Solution
The servo motor wasn't working out for us so we're going to change it back to a 2-wire motor and the gusset pivot c wasn't working out for us either so we're going back to an intake roller
Design Modification Sketch (Annotated)

Changes to Vex Parts List (Include parts added or removed from parts list)
removing gusset pivot c
removing servo motor
adding intake roller
adding 2-wire motor → motor controller ✓
List changes to pseudocode or write new pseudocode and attach.

Modifications must be approved by teacher prior to work commencing.

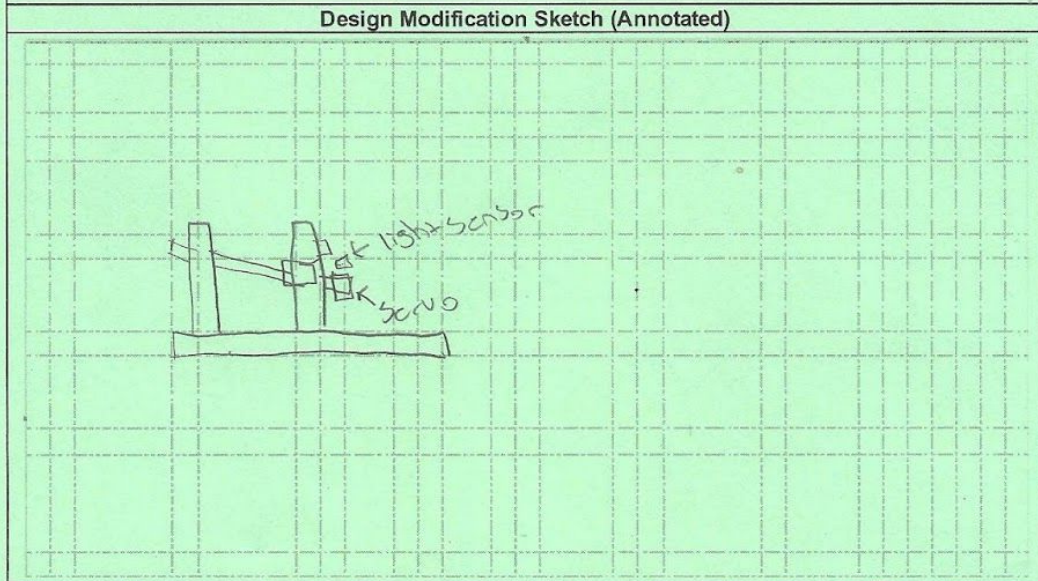
Changes Approved by Teacher: [Signature] Date: 3/29

Design Modifications Chart

Group: 3-1

Use this chart to document all modifications to your final design solution. Describe the design problem requiring modification and your proposed solution. Then sketch and annotate each design modification. List changes to vex parts list and pseudocode changes. Sign and date all entries.

Explain the Problem and Proposed Solution
We need to add a servo to stop the marble so the light sensor can read it. once it reads it, it would let it go.



Changes to Vex Parts List (Include parts added or removed from parts list)
adding servo ✓

List changes to pseudocode or write new pseudocode and attach.
set servo(servo motor, #);
wait(.5)
set servo(servo motor, #);

Modifications must be approved by teacher prior to work commencing.

Changes Approved by Teacher: CS Date: 4/4