MESA DAY 2020-21

ENGINEERING LAB REPORT

Instructions: Use template to write the lab report for your MESA Project. Provide as much detail as possible in your report. The report must be typed. All graphs, tables and charts MUST be created Excel or MS Word. No hand table graphs and drawn charts are allowed. Citation must be in MLA Format. The lab reports are due a week before the MESA Day Prelims

Lab Report Due Dates: High School: Saturday Feb. 20, 2021 by 11:59 p.m.

Middle School: Saturday Feb. 27, 2021 by 11:59 p.m.

Lab Report received after the due date will receive a 25% deduction on the lab report score

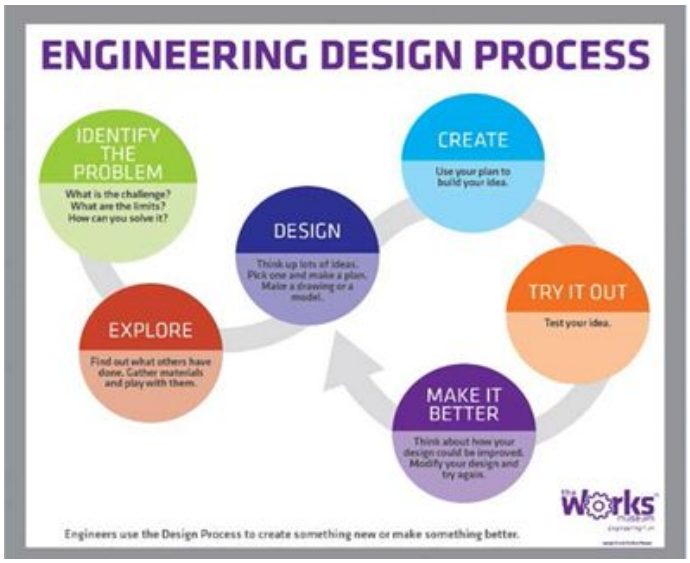
TEAM MEMBERS NAMES: Mya Santana, Saira Moreira

SCHOOL: Woodworth- Monroe TK-8 Academy

CENTER: **UCLA MESA Center**

MESA PROJECT: MESA Machine

GRADE: LEVEL (circle one): 6th 7/8th 9/10th 11/12th



1. IDENTIFY THE PROBLEM

What is the challenge being worked on?

Students will design and construct a complex machine that utilizes five to ten different sequential and dependent actions from designated categories of simple machines/energy that will ultimately in the least amount of time propel a vehicle with wind the farthest distance.

What are the limits/constraints?

Machine Rules:

- Most utilizes five to ten different sequential and dependent actions
- The complex machine must be initiated by a single operation of pulling a string.
- Each of the five to ten actions MUST only use one of the following listed categories of simple machines/energy:
  Categories of simple machines/energy are LIMITED to the following seven:
  - i. Inclined plane (simple machine)
  - ii. Lever (simple machine)
  - iii. Wedge (simple machine)
  - iv. Wheel and axle (simple machine)
  - v. Pulley (simple machine)
  - vi. Screw (simple machine)
  - vii. Electronics
- The complex machine must propel the wind-powered vehicle within

90 seconds of the initiation
- All parts of the complex machine must fit into a 75 cm by 75 cm by 75 cm cube

Wind-powered vehicle rules:

- All parts of the wind-powered vehicle must fit into the 35 cm by 35 cm
- The vehicle must be solely powered by the wind energy provided by the complex machine; no other energy source may be added to the vehicle.
- The vehicle may NOT have contact with the complex machine
- The vehicle must have two or more axles
- All wheels of the vehicle must stay in contact with the ground

How do you think you can solve it?

We think we can solve this by making everything compact, so it fits inside the machine zone. We can also solve another problem by utilizing five to ten different sequential and dependent actions. We can make sure the complex machine is initiated by a single operation of pulling a string. We can make sure all parts of the wind-powered vehicle fit into the 35 cm by 35 cm

2. **EXPLORE-** Find out what others have done (research). Clearly list at least 5 sources using MLA citation format (web pages, articles, books, etc.). Identify (cite) and describe each source with one or more sentences.

Source #1
Citation:
Ostr, Yuri, "How to Make a Car - Wind Car - Very Simple Toy", Youtube. Com, April 19, 2018
https://www.youtube.com/watch?v=5aCzHGiH4rQ
Description:
This video showed us how to make a wind-powered car. This video showed us step by step on how to build a wind-powered car.

Source #2:
Citation:
Nguyen, Bao “Simple Machine - Rube Goldberg Project” Youtube.Com Feb 22, 2013
https://www.youtube.com/watch?v=uhqWvfVqYUo
Description:
This video showed us some different sequential and dependent actions. This gave us an idea how it’s supposed to work.

Source #3:
Citation:
By Science Buddies, Finio, Ben “Build a Wind-Powered Car” Scientificamerican.com SCIENTIFIC AMERICAN October 24, 2019
https://www.scientificamerican.com/article/build-a-wind-powered-car/
Description:
This website showed me some ways to make a wind powered vehicle go further. It also showed me how to make the wind power vehicle that I made.

Source #4:
Citation:
Louie, Ben “The MESA Machine 2020-21” rise.articulate.com
https://rise.articulate.com/share/f_5xaEkVsQQL3BI0I5z5AIUckJ75vDGJ#/lessons/dtkVl6u_IZcTMC5gou2kCYzfZivFV40R
Description:
This website showed me the six basic simple machines and descriptions for each simple machine. Also, It give my further rules about the MESA Machine.

Source #5:
Citation:
Werrell, Beth, “Build Your Own Rube Goldberg Machine”, Connectionsacademy.com, Connections Education, FEBRUARY 4, 2020
https://www.connectionsacademy.com/support/resources/article/build-your-own-rube-goldberg-machine
Description:
This website showed me some different sequential and dependent actions. It showed me step-by-step on how I can build a machine with different actions. This website helped me get some ideas for my machine.

3. **DESIGN -** Brainstorm ideas (at least 3) and record them. Write 2-3 sentences describing your idea. Make sure to Include a sketch or drawing for each.

Idea #1

Our first idea is to use a fan to move the vehicle. We want a fan that is movable to be able to angle it perfectly to hit the vehicle with air. Fans produce plenty of air and I know this will definitely be one of our best options. We like that fans arrange from sizes and prices.

Idea #2

Our second idea was to use a wind turbine. We wanted to make our own wind turbine and attach a DC motor. This will make a good amount of air, but we don't know if it will be enough.

Idea #3

Our last idea was to use a leaf blower. Although a leaf blower will produce more than a fan that we want and wind turbine we want to make, they can be extremely expensive. We also need the leaf blower that is battery operated and they can be less efficient than electric powered leaf blowers. This is an amazing idea, but there are many drawbacks and I don't think this might be our final decision.

Select one of the 3 ideas above and describe a plan for building it (at least 5 sentences).

In terms of items that could produce air we were somewhat limited. With that being said our final decision is to use a fan to move our vehicle. This is our best option because the fan will be able to produce plenty of air to move the vehicle. Also, we will be able to angle the fan perfectly to hit the vehicle. The Fan we want will be able to produce more air then our other ideas, so our final decision is to use a fan.

Generate a list of materials for the prototype.

- Cardboard
- Popsicle Sticks
- Cardboard cutter
- A fan
- String
- Hot glue gun
- Construction paper
- Bounce ball x4
- Mouse Trap x2
- Duct tape
- Hot glue gun sticks
- Electric tape
- Tennis ball
- Wood sticks
- Straws
- Wooden blocks x3
- Cardboard box
- A fork x2
- Ruler
- Rubber bands
- Pencil
- Scissors

4. **CREATE -** Using your plan, build your prototype. Describe how the prototype was built in at least 5 sentences. Include a picture of the actual project prototype built.

We first made sure our prototype had a string to trigger it to start. The string was keeping a ball from falling down, so once the string is pulled the ball will fall on a ramp causing that ball to hit another bouncy ball. We made the bouncy ball from the ramp hit a mousetrap that was at the bottom of the box. We attached a wooden stick to a string and attached the string onto the mousetrap. We made a pulley by adding a piece of cardboard and added a hole big enough from the wooden stick to have room.The wooden stick was keeping a tennis ball from falling down. Once the mousetrap is activated it will pull on the stick causing the tennis ball to come rolling down from the cardboard. We next made a lever with a pencil and ruler. We want to attach a piece of cardboard on one side of the lever and the other side. We want to attach wooden blocks. We want the tennis ball to hit the cardboard side of the leaver causing the other side to lift up. We want the tennis ball to hit the cardboard side of the leaver causing the other side to lift up. We want to add another ramp next to the pulley, so once the side with wooden blocks lifts the ramp will have a ball and the wooden blocks will hit the ramp causing the ball to roll down the ramp. We want the ball from the ramp to hit another ball. We then made the ball hit a mousetrap that was attached to a string. The string was attached to a piece of cardboard that trapped the air of the fain. Once the mousetrap was active it pulled the string pulling the cardboard and releasing the air of the fan. That's how our MESA Machine was build .

Prototype Image(s) – Paste image (s) below

Side

Top

Front

5. **TRY IT OUT -** Test your idea/prototype. Describe at least 3 trials/attempts. Use tables/charts as needed.

Test #1:
Criteria : The vehicle needs to go over 0.01 cm.

Results: Our furthest distance was 4.3434 meters.

Test #2:
Criteria: The machine needs to produce air within 90 seconds.

Results: The machine produced air within 4 seconds.

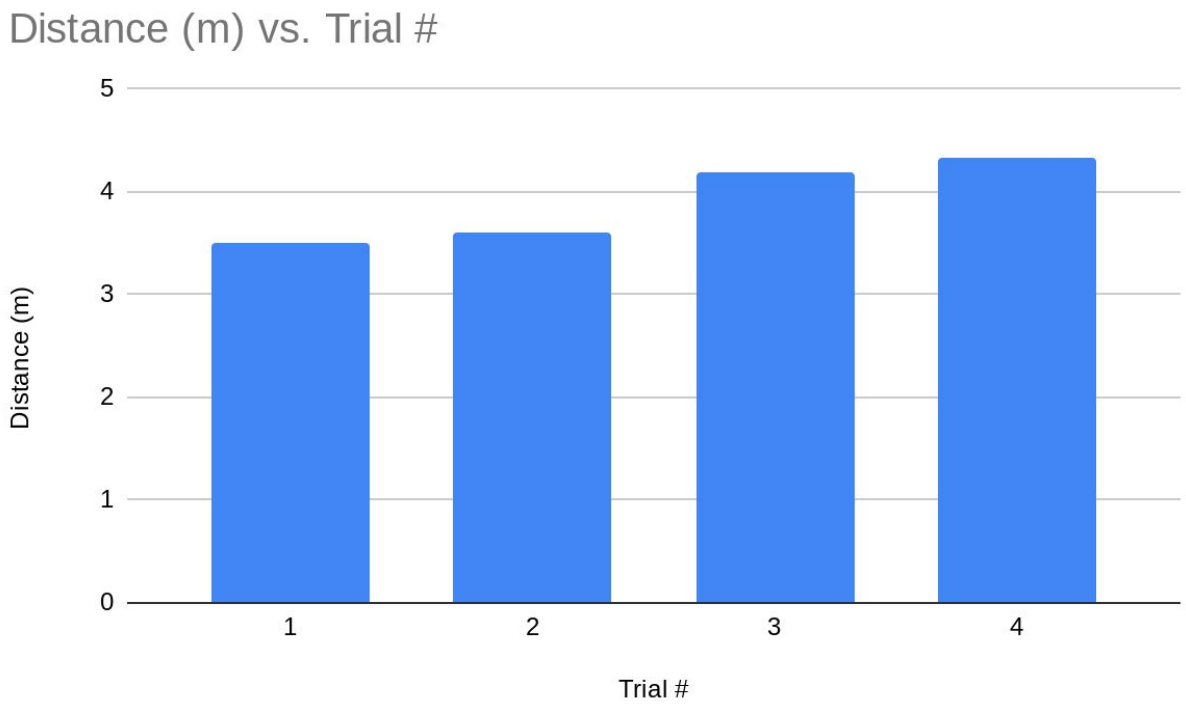
Test #3:
Criteria: We need to make sure everything works.

Results: Every action worked and my vehicle also worked.

Graphs and Tables

Place graphs and tables which provide information in your device. All graphs, charts and tables MUST be created in Microsoft Excel or Microsoft Word.

Trails	Meters
1.	3.50
2.	3.60
3.	4.19
4.	4.34



Use of mathematical concepts/equations:

Applicable math concept/equation (state concept/equation):

Speed= Distance/Time

4.34 distance 4 seconds
Every 1.085 it went 1 second.

How was the concept/equation used?

(Demonstrate use of concept/equation as it pertained to project):
We used the equation provided at the to calculate how fast our wind powered -vehicle went.

Applicable math concept/equation (state concept/equation):

Area= Length x Width x Height

Boxe size in inches:
Converting box size into centimeters: 68.57cmX40.64cmx71.12cm= 198189.022976 cm3

How was the concept/equation used?

(Demonstrate use of concept/equation as it pertained to project):
We used the equation provided at the top to calculate the area of the MESA Machine.

6. **MAKE IT BETTER -** How can you make the project better? What modifications

Do you plan to make ***(state at least 5)?***

Modification/Improvement #1:

The first modification happened when I was building the vehicle sail. I first decided to make the sail out of plastic, but then I tried out construction paper and found out that the construction paper sail made my vehicle go further.

Modification/Improvement #2:

Another modification happened when making my ramp, I placed the ramp to high, so I had to lower it down a little.

Modification/Improvement #3:

Another modification happened when placing my 1st mousetrap. As the ball was falling down it wouldn't always hit the mousetrap to activate , so decided to add pieces of cardboard around the mousetrap, but I made sure that the mousetrap and cardboard have some space in between.

Modification/Improvement #4:

Another modification I did was the lever that I made out of a pencil and a ruler wasn't where I needed it to be. I had to move it slightly down because the tennis ball would hit the cardboard as much as I needed it to.

Modification/Improvement #5:

Another modification I did was my pulley was slightly too long causing the ball from my ramp to land on my pulley, so I needed to make my pulley a slightly smaller and had to angle it slightly more. I also had to make sure my tennis ball from my pulley will be able to hit my cardboard on my lever.

Build and prepare a competition ready project. Include a picture below. Show different views of your project (top view, side view , front view etc)