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# The Gravity Design Brief and Student Names

Do not change the font size or color.

Student Name

Student Name

Student Name

Student Name

Student Name

# The Context:

To stay competitive, manufacturers must change products to meet changing demands.

The Scenario

As gasoline prices continue to rise, alternative energy sources for vehicles are becoming more popular. The Gravity Automobile Company Inc. is looking to capitalize on this trend and establish itself as a front-runner in the hybrid car business that is future proof.

The Challenge

The Gravity Automobile Company Inc. is seeking new engineering teams to design and construct gravity-powered test vehicles(with two axles) that are capable of traveling in a straight line for a distance of six meters. The winning design team with the furthest distance will compete against other 6th grade teams in school for a grade champion of the school. They are gathering data of the effects of 3D Printed tires versus a traditional tire (the ones provided) . The research will include the information learned in class concerning forces, gravity, friction, and Newton’s three laws.

The Limitations

* Team members must collaborate on the vehicle design.
* Each team must submit vehicle illustrations before gathering construction materials.
* Illustrations must be both top view and side view projections.
* Design teams may only use the K'NEX Education materials provided
* Vehicle will have a license plate to describe or name the car.

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# The Rules

* Teams have time to research, design, sketch, construct, and test their vehicle.
* All test data must be recorded in the data chart.
* Teams are expected to make and test two different modifications to their vehicles.
* All changes and test data **must** be recorded.
* 3D Printing Components:
  + Each team will design 1 tire (teacher will duplicate a max of 4 tires)
  + The Large Rim Design will require an inside diameter of 51mm.
  + The Smaller Rim Design will require an inside diameter of 48mm.

# [Types of Hybrid - Research Document](https://docs.google.com/document/d/1jjiHLyeiztz99H1BrM85whMeh0FWujEWqGsQxpygUI4/edit)

# Original Vehicle Design:

Design and Plan

You will draw your design of the car with a Top View & a Side View.

Your Team will attach their vehicle drawing pictures on this page.

To attach a picture from your Chromebook

1. Insert
2. “Image”
3. “Take a snapshot”
4. “Take your picture”
5. “Select” your picture
6. Select “break text” to move your picture
7. You may right click on the picture to “crop” your picture.

Place your pictures (Top and Side) below.

# Creating and Building a Prototype

* Meet as a team and decide which qualities of everyone’s cars should be included in your groups design.
* Build a vehicle to match your design thoughts. What are your thoughts?

Place your pictures of your vehicle (Top and Side) below.

* Let your vehicle roll down a ramp (WITHOUT PUSHING IT).
* Measure the distance it travels from the bottom of the ramp.

**Testing:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Car at 10 books high | Trial #1 | Trial #2 | Trial #3 | Average |
| Original Design | ??? | ??? | ??? | ??? |
| 1st Iteration | ??? | ??? | ??? | ??? |
| 2nd Iteration | ??? | ??? | ??? | ??? |

**Improve & Discuss Redesign**

* Make some modification (change) to your original design in order to make your vehicle travel further. Test the vehicle again and be sure to record your data.
* What change did you make and what were the results?

Type answer here.

# Vehicle Design 1st Modification Picture

You will take a picture of your vehicle's 1st Modification design of the car with a Top View & a Side View.

* + Your Team will attach their vehicle drawing pictures on this page.
  + See directions above to attach pictures.

Place your pictures of your vehicle modification (Top and Side) below.

# 

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# Vehicle design 1st modification data table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Height of Ramp | Trial #1 | Trial #2 | Trial #3 | Average |
| 10 books | ??? | ??? | ??? | ??? |

# 

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# Vehicle Design 2nd Modification & Picture

* Make a 2nd modification to make the vehicle go even further. Test the vehicle, record the data, and in the space below, or over the page, describe the change you made and what happened.
* What changes did you make and why?

Type answer here.

Place your pictures of your vehicle (Top and Side) below.

# 

# 

# Vehicle design 2nd modification data Table.

Test your vehicle and record your data below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Height of Ramp | Trial #1 | Trial #2 | Trial #3 | Average |
| 10 books | ??? | ??? | ??? | ??? |

# 

# 

# Testing the effects of ramp height:

* Make 3 trials with your vehicle and record your data on the chart below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Height of Ramp | Trial #1 | Trial #2 | Trial #3 | Average |
| 5 books | ??? | ??? | ??? | ??? |
| 10 books | ??? | ??? | ??? | ??? |
| 15 books | ??? | ??? | ??? | ??? |

1.Does the height of the ramp make a difference to the distance the vehicle travels?

Type answer here.

2. Please describe what you found:

Type answer here.

3. What ramp height would you recommend to others if they wanted their vehicles to travel the greatest distance? Use data to support you answer.

Type answer here.

4. What other things do you think you could do to make your vehicle go further?

Type answer here.

# 

# Team Reflection:

What recommendations would you make to The Gravity Automobile Company Inc. to increase the distance their vehicles will travel? Please support your answer using the data you collected.

Type answer here.

# License Plate Requirements

* Each license plate should describe or name your vehicle.
* License plates cannot be more than 10 characters including spaces.
* The license plates should be colorful and neat.
* Use the directions in “Original Vehicle Design” to take a picture and insert it below.
* Be creative!!



# Eggstra Enrichment: Egg-citing design restraint system

What is the name of your egg? \_\_\_\_\_\_\_\_\_\_\_\_\_

The Context:

It’s not going fast that will injure the passengers in a car...it’s the sudden stop.

The Scenario:

The vehicle in which we travel contain many safety features that have saved lives. In an effort to be more proactive, the National Highway Traffic and Safety Administration has recently decided to increase the safety standards that automobile manufacturers must meet.

The Challenge:

As a member of an automobile engineering team you have been assigned the responsibility of improving the overall safety of the company’s cars. You and your team believe that the current restraint system of the vehicle needs to be revised, especially since the testing procedures have been upgraded and more sensitive raw eggs will be used instead of the standard electronic dummy.

The Limitations:

Each team must submit a detailed action plan before modifying their vehicle.

Each team will have access to the general supply of K’Nex materials.

Additional materials are the responsibility of the team.

During the research and development phase teams will use imitation eggs.

Raw eggs, in plastic bags, will be used for the final.

The Rules:

what materials will you need to bring in from home for you vehicle restraint system.

\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Modify your vehicle to allow a space for your egg person.

# Individual - Reflection - Wrap-up

Now that you have done your design and redesign, as individuals complete each of this reflections questions.

STUDENT NAME

What did you learn from this process?

Type answer here

What was your/team's thinking behind the improvements you made to your vehicle?

Type answer here

What was the outcome of the improvements you/your team made?

Type answer here

What different modifications would your team make and why?

Type answer here

What was the most challenging part of this task?

Type answer here

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Type answer here

# Resources

1. <https://www.youtube.com/watch?v=Tyc4Apyk2Rc>

2. <https://www.youtube.com/watch?v=oJySiRH8lno&t=83s>

3. [Project Rubric](https://docs.google.com/spreadsheets/d/1nl2viII2tWsEpft-KuXoGWOqJSD_qmXId6NV9lBudME/edit#gid=0)

