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CHARGING A SMARTPHONE

OBJECTIVES

9th grade physical world concepts

"It is the year 2025, it has been a year since **the accident** happen, a year since humanity's way of life changed. All technology stopped working because there is not electricity anymore. Some people say that there is a place on **earth that everything is normal**, but no one knows where.

YOU, one of the few surviving humans, still hold a smartphone that has long lost charge.

One day, you find a note on the door of your house "the **answers** to everything are on the smartphone"

Your objective is to come up with a way to charge your smartphone and find the answer to a better way of life"

The students will summarize their finding and demonstrate mastery of the following:

- Developing a solution to the problem presented
- Describing how they use the engineer design process to design a prototype of their solution
- Explaining the scientific concepts they based their designs on

MATERIALS

- Lab (worksheet)
- Paper
- Pen or pencils
- Calculators
- Any other materials that the student think they might need (with the teacher's discretion)

ESSENTIAL QUESTIONS

- What method would you consider to be the most efficient to charge your smartphone?
- How would you develop this method?
- What scientific concept do you need for this method to work?

PROCEDURES

1. The students will pick a method that produces energy. The idea is for the student to use their experiences to come up with a solution
2. The students will conduct research. They will find information that will help them to better understand the method that they have chosen.
3. They will create a sketch of their idea, a drawing or schematic of the method they have chosen with labels detailing how the method works
4. The student will consult with their peers about ways they can improve about their design.
5. The students will write a conclusion based on the method of choosing and the information that they have gathered

BATTERY-POWERED KARTS

STANDARDS

9th grade Physical World Concepts

- PWC.PS1: Matter and Its Interactions
- PWC.PS2: Motion and Stability: Forces and Interactions
- PWC.PS3: Energy

The students will be given a cart that will be connected to a battery.

Each cart will have a different battery, this mean that the input voltage and the mass of each kart will be different.

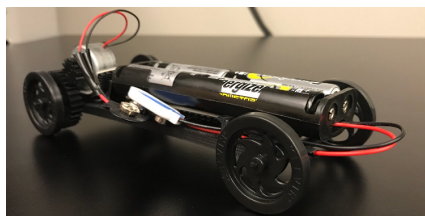
The students' objective is find the relationship between voltage, mass and the angle of elevation in a ramp. The students will need to modify the angle of elevation and take measurements on how far their kart can travel up the ramp and create a model that unifies several concepts in science

The students will summarize their finding and demonstrate mastery of the following:

- Develop a model of the situation presented
- Describe the connections between different science concepts presented in the class
- Calculate the appropriate adjustments to the ramps to achieve the desired results

MATERIALS

- Lab (worksheet)
- Paper
- Pen or pencils
- Calculators
- Rules
- Karts with different batteries
- Ramps



Kart with a configuration of 6-volts

PROCEDURES

1. The students will run the kart through the ramp (one time) to make sure they understand and visualize what is happening in terms on science (forces, energy, electricity).
2. They will do a graphical representations (draw) of the situation
3. The students will conduct the experiment and collect data. They will need to identify the minimum angle of elevation that will allow the kart will clear the ramp.
4. Answer questions that will help them understand their results gathered
5. They will talk to their peers and compare results and methods.
6. The students will write a conclusion based on the results gathered

ESSENTIAL QUESTIONS

- What is the relationship between the voltage of the battery and the mass of the cart?
- How would changing the angle of the ramp affect the performance of the cart?
- What would be the most efficient combinations for a kart?
- What do you think the relationship between the voltage of the battery and the weight of the kart are?
- What alternative source of power would you use to be more efficient in your kart?
- What else would you change on the experiment to make it more efficient?