Electricity and Magnetism: Extreme Car Race Teacher's Guide

Subject: Integrated Science (Life; Earth-Space; Physical)

Topic: Car design using series or parallel circuits with the ability to travel over 1 meter of grass.

Summary: This lab requires the students to take a car that they have designed and built at home (and which contains either a series or parallel circuit) outside. The car must be able to travel a minimum of 1 meter over grass. This will be in the form of a competition with the top 3 car designs winning certificates.

Objective(s): After completing the field lab, students will be able to:

1. Understand the use of technological design in an outdoor setting
2. Understand the power differences between parallel and series circuits
3. Understand the effects of environmental factors on a toy cars ability to travel
4. Calculate the average speed of their car

Ecosystem(s): Hammocks, Pinelands, Scrub

Equipment:

- Car previously designed
- Digital Camera (optional)
- Meter stick
- white board or posterboard
- marker or dry erase marker
- GPS
- stopwatches
- certificates or ribbons for winners.

Background:

- **Vocabulary**: series circuit, parallel circuit, technology, environmental factors, average speed, average speed formula, resistance, electrical potential energy, circuit, open and closed circuit
- **Reference Material**: Mcdougal-Littell Science 7th grade chapter 10:3 (Electric current is a flow of charge) and chapter 11 (Circuits and Electronics); Car design take home assignment
- **Equipment Training:** Sper Mini-Environmental Meter

Procedure (Engage; Explore; Explain)

Welcome to the annual 7th grade extreme car race. Each car will undergo an elimination round where any car not able to travel one meter on grass will immediately be eliminated. Those that survive this round will proceed to the race. You will race in pairs with the slower car being eliminated. This will continue until one car is chosen as the winner of the race!!! Your problem: does your car have what it takes to reach the top???

1. Take the class outside and have each student bring their car they designed.
2. Have the students describe the area they observe and all environmental factors that will affect their car on their data sheet
3. Take measurements including temperature, soil temperature, and wind speed.

4 Begin the race by having each student's car travel the meter. Have each student calculate the average speed of their car. Eliminate all students whose car is unable to travel 1 meter. Group the remaining students into pairs. Have each pair race their car. Eliminate the loosing car. Continue this until 1 car is the winner.

Sunshine State Standards:

Science: SC.H.3.3.6; SC.H.3.3.4; SC.H.1.3.5; SC.B.1.3.4; SC.C.1.3.1; SC.C.2.3.1
Language Arts: LA.A.2.3.5; LA.A.2.3.7
Mathematics: MA.A.1.3.1; MA.A.1.3.3; M.A.A3.3.3; M.A.B.1.3.2; M.A.E1.3.1
Social Studies: SS.B.2.3.6; SS.B.2.3.9

Electricity and Magnetism: Extreme Car Race Student Data Sheet

General Information

Full Name:		Date:	
School (teacher):		Time:	
Latitude:		Longitude:	

Student Hypothesis and Rational I hypothesize that the winning cars (choose one: will/ will not) have observable differences that increase the car's ability to race because… _____ _____.

Field Observations/Measurements/Data

Environmental Variable	Location 1
Temperature at ground level (C)	
Wind at ground level (mph)	
Relative humidity at ground level (%)	
Soil Temperature (C)	
Plant types present	

Car facts:

Car was able to travel one meter?	YES NO
Time (in seconds) for car to travel 1 meter	
Number of races your car participated in. List placement of your car if applicable (for example: first, second…)	1 2 3 4 5
Observations of winning cars: What did they have that helped them win???	

Extreme Car Race Assessment

1. When you observed the winning cars, what one factor did you seem to note most frequently?

2. Calculate the average speed of your car. Average speed = distance divided by time.

3. What design factor affected YOUR cars ability to race the most? The least?

4. If you were to design a real car to race, what would your top design priorities be (for example: speed, control, adaptability, etc) and why???

5. We are experiencing a fuel crisis currently. Gas prices go up frequently as does the cost of electricity. How could you change your car design currently run on batteries so that it is run on an alternative fuel source?

Portfolio Journal Prompt

Imagine that some seniors have told you that they are going "mudding" near Ichetucknee Springs. You need to give them some real facts to let them know the danger they place themselves, their cars, and the environment in. List the facts and explain how you would use those facts to stop your high school friends from making a mistake.