ANDRETTI FASTTRACK XPERIENCE

Official Partner

VIDEO 2:
Power Up!
EDUCATOR GUIDE

OVERVIEW

This unit will use the sport of race car driving to help students gain a deeper understanding of energy transformations that take place in the sport and in the world around us. The introductory video discusses some of these energy transformations and hopefully gets the students excited about learning more.

In this unit, students will learn more about kinetic energy, potential energy, thermal energy, chemical energy and how they can be transferred in a system. After a brief introduction, students will use a computer simulation to learn more about energy and energy transfer. They will develop a tool for representing energy in a graphical way and apply it to a variety of situations. Students will also learn about power and how it relates to energy and auto racing.

Lastly, the students will complete the challenge given in the video. They will build a car which will transfer energy to produce a car with the highest power possible.

Video 2: Power Up!

In this video of ***ANDRETTI FASTTRACK XPERIENCE****, we explore energy transformations. In both racecars and street cars, the engine is what powers the car. But the power needed in a racecar is different than the power needed in your family car. Follow our students as they interact with subject matter experts to explore how the energy is transformed in the engine to power the car.*

GETTING STARTED

Time: 50 minutes
Materials: Andretti FX video

Show the students the introductory video to get students excited about this new unit. You may have students answer these questions while they watch the video.

What powers an engine?

What are some energy transformations in the engine?

Where does the lost energy go?

REMOTE LEARNING TIP:

If you are learning remotely, you can direct the students to the video online, have them watch and either have them work independently to answer these questions, put them into online breakout groups (this can be done easily in Zoom) where they can discuss the questions. You can whiteboard the answers by sharing a screen or using another online tool such as Stormboard (they have a free option for teams of 5 or less).

LESSON 1

Timing: 50 minute class period

The purpose of this lesson is to introduce students to energy and energy conservation using an online simulation. They will learn what energy transformation is with an interactive simulation. There are worksheets included for students to use as they go through the simulations.

LESSON 2

Timing: 50-60 minute class period

This lesson will further review the concepts from Lesson 1 with activities that can be done individually or in groups. Students will chart and graph their work either on the worksheets or with a whiteboard to share solutions with the class.

LESSON 3

Timing: 50-60 minute class period

This lesson discus power. What is power? How much useful energy is used in a certain amount of time. There are hands-on activities for the students to use to calculate how much power can be produced individually.

PROFESSIONAL RACE ENGINEER

As an engineer on Indy racecars, Steve Erikson discusses how the racecar engine works, how energy is transferred inside the engine and where energy is lost.

ENGINEERING MANAGER, VEHICLE DEVELOPMENT

Kyle Bentley, the engineering manager of vehicle development for Kia North America discusses the many elements that go into vehicle development and how they relate to power and energy.

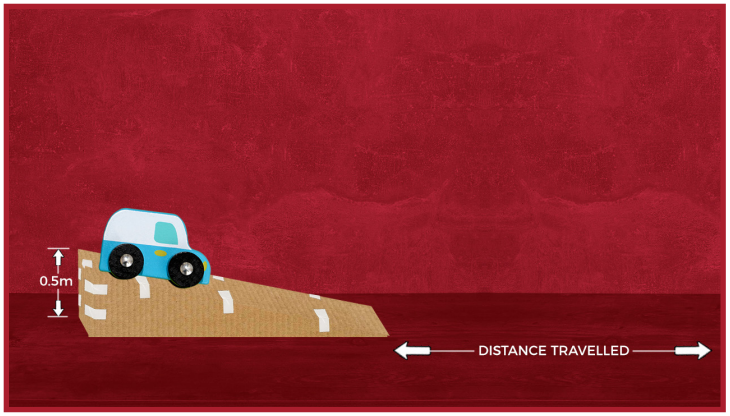
THE CHALLENGE

It's now time for the challenge!!

Your goal is to design and build a car that will produce as much power as possible. You must build the car from common everyday materials and may not use an existing car or the parts from an existing car. You have two options to select from:

Option #1:

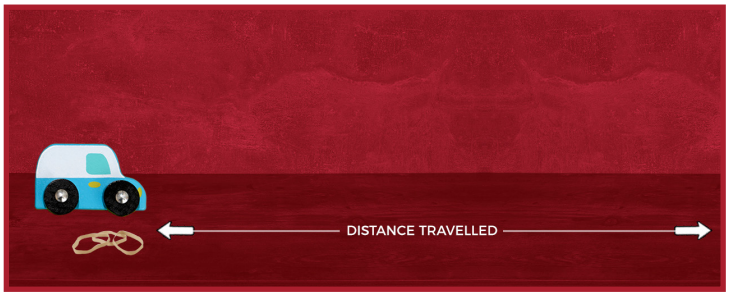
Build a car that will coast down a 0.5 m high ramp and coast across a flat surface. The car must be released from rest and may not have any other forces acting on the car other than the force of gravity. Allow your car to move across the floor until it stops. To calculate the average velocity, measure the distance traveled across the floor and divide by the time it took. Use the average velocity and average power formula to find the average power.



Possible materials that could be used: *CD's for wheels, any round objects for wheels, wooden dowel for axle, water bottle for car frame, fast food containers for car body, hanger, tape, glue, screws, paper cups, paper plates, etc.*

Option #2:

Build a car which is powered by rubber band(s). Your car will start from rest and run across a flat surface. The car must be powered solely by the rubber band(s). (elastic potential energy) To calculate the average velocity, measure the distance traveled across the floor and divide by the time it took. Use your data to find the average power.



Possible materials that could be used: *Those materials listed above and rubber bands.*

THE CHALLENGE

FINAL REPORT:

You will write a short report summarizing your project. The report must include the following:

A) A sketch of your design.

B) An explanation of how your car was supposed to work.

C) The most challenging part of this project.

D) Show all data neatly and your calculation for power.

E) Draw a pie-energy diagram for your car at the beginning, middle and end.

F) Explain what you did to reduce the amount of energy lost to heat as discussed in the video.

Find Report Rubric:	
Sketch of your design	5 pts
Explanation of car design	10 pts
Most challenging part explanation	5 pts
Neat data table of all data	5 pts
Calculation of velocity and power	10 pts.
Energy diagrams drawn correctly	10 pts.
Minimizing heat explanation	5 pts.
Total Points	**50 pts**