ANDRETTI FASTTRACK XPERIENCE | Official Partner

VIDEO 1:
A Force to Be Reckoned With
EDUCATOR GUIDE

OVERVIEW

Andretti FASTTRACK Xperience offers turn-key learning modules which feature streaming videos and accompanying hands-on lesson plans supplementing and enhancing your STEAM curriculum. Utilizing Motorsports as a backdrop, AFX will introduce STEAM concepts as they relate to the real-world problems and experiences of racecar drivers. Through activities, students will be able to apply what they learn to their own experiences outside of motorsports.

Video 1: A Force to Be Reckoned With

*In this video of **ANDRETTI FASTTRACK XPERIENCE**, we explore Newton's Laws of Motion.*

Former Racecar Driver, Jeff Andretti had a terrible accident over 20 years ago in the Indy 500. This episode takes you through what happened that day and how safety has improved since then.

Follow our students as they interact with subject matter experts to learn what happened to Jeff and improvements that have been made to keep drivers safer.

After hearing from experts, your students will be challenged to come up with their own solutions to keep racecar drivers and their families safer on the road.

The lessons that follow are activity based and allow students to experiment for themselves and behave as a real scientist in performing investigations and finding relationships. Minimal equipment is required.

The three lessons for this video focus on Newton's Three Laws of Motion the culminating activity will find the students applying their newfound knowledge to find a solution to the challenge presented.

REMOTE LEARNING:
With the COVID-19 pandemic, in many areas of the country school buildings are either closed or schools are operating on a hybrid schedule (partially in school and partially remotely) and educators are navigating new ways of teaching remotely. This guide will give you some suggestions to assist you with implementation for remote learning.

TIP:
Having students keep a journal throughout the module will help them to organize their thoughts and to start forming connections. We hope that you and your students enjoy this module and the opportunity to learn more about STEAM with the exciting world of motorsports as the backdrop.

GETTING STARTED

Time: 50 minutes
Materials: Andretti FX video

Please show the AFX Video to the students. After the video, put the students into groups of 3-4 and have them discuss the video and answer the following questions. This would be a great time to have students begin their lab book entries.

It might be helpful for the students to whiteboard their results and to share with each other. Please let the students know that the challenge given can be applied to all cars and not to just fast race cars.

Here are some tips for whiteboarding.
http://modeling.asu.edu/modeling/Whiteboarding_DonYost03.pdf

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).

TOP FUEL DRAGSTER DRIVER

Momentum is explained from the perspective of a top fuel dragster driver, Ashley Sanford. Our Team Steam members learn about acceleration and momentum from inside a dragster!

RESEARCH ENGINEER, TRACK SAFETY

Our expert, Bob Bielenberg, discusses ***Inertia and Kinetic Energy*** with the introduction to the construction of new safety walls at the track that assist in reducing impact and resulting injuries.

Questions

1) What was the cause of the crash?

2) What observations did you notice about the collision?

3) What types of safety devices protected Jeff during the collision?

4) What is the challenge that was given in the video?

5) What information from the video will be helpful in finding a solution?

6) Discuss some possible solutions to the challenge as a group and write down a few ideas.

LESSONS & LABS: Newton's Laws of Motion

After watching the video and discussing the questions, we have provided 3 Lessons covering Newton's Three Laws of Motion. These lessons and classroom labs will help the students learn and understand not only what happened to Jeff but the concepts in these laws.

LESSON 1

Timing: 2-3 50 minute class periods

The purpose of this lesson is to help students to better understand Newton's First Law of Motion, a.k.a. The Law of Inertia. Newton's First Law is often defined as

An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force.

There are two Labs to this lesson: Lab 1 using online interactive activities and Lab 2 using hands-on activities to illustrate the Newton's First Law.

REMOTE LEARNING TIP:

The activities in lab 2 can be done at home for remote learning. They utilize materials that are easily found around the house and there are several options so you can choose from rather than doing all of them for remote learning. You might consider assigning 1-2 activities to each student, have them complete them and the worksheet and then come back into an online group to share the results.

LESSON 2

Timing: 1-2 50 minute class periods

The purpose of this lesson is to help students to better understand Newton's Second Law of Motion. Newton's Second Law is often defined as

The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.

There are two Labs to this lesson: Lab 1 using online interactive activities and Lab 2 using hands-on and online activities to illustrate the Newton's Second Law.

REMOTE LEARNING TIP:

Your school district may have specific tools that you are encouraged (or required) to use for remote learning. These tools may include interactive/collaborative work environments like Google Classroom and Google Docs along with video chat environments like Zoom. There are many wonderful tools to encourage group learning and team collaboration which will assist with the implementation of these labs.

LESSON 3

Timing: 50 minute class period

This purpose of this lesson is to introduce/review Newton's Third of Motion:

For every action, there is an equal and opposite reaction.

There are a series of hands-on activities and associated questions for this lesson that will allow students to practice Newton's Third Law.

We have also provided some problems for students to practice Newton's Three Laws at the end.

EXTENSION ACTIVITY

Timing: 2-3 50 minute class periods

The Egg Drop Experiment is added as an extension activity

if you have the time. It is a fun way for students to apply Newton's Three Laws to solve an engineering problem. This requires some materials that are listed in the lesson plan.

REMOTE LEARNING TIP:

Although this is a great activity to do in teams, it can also be done by students at home. You might suggest that they involve their family in the experiment and have someone video the result.

THE CHALLENGE...It's time!!

Find a way to reduce the force on a driver.

NEXT GENERATION SCIENCE STANDARDS

MS-PS2-1 Motion and Stability: Forces and Interactions

Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

Time: 2-3 50 minute class periods

At this point, it might be helpful to replay certain parts of the video from Lesson 1 to help the students remember the original challenge. Remind them also that this challenge is not for just race cars but all cars. Encourage students to use the science concepts they learned in this module to help with their design. You might give the students a few class periods to discuss, design and possibly construct their devices. You could also provide a variety of common materials to build with.

Have students write their solutions to the challenge directly to the racecar driver, car manufacturer or racetrack engineer. The solution should have the following components.:

- Introductory paragraph.
- Sketch and/or model of their design.
- An explanation of their design and the science behind it.
- Why the person they are writing to should consider their design.

Here is a rubric you could use to evaluate the final project. (100 points total)

Criteria	***Points Possible***
Introductory paragraph	10
Neat sketch or model	20
Correct explanation of the science.	30
Persuasive paragraph	10
Functionality of project	10
Creativity.	20