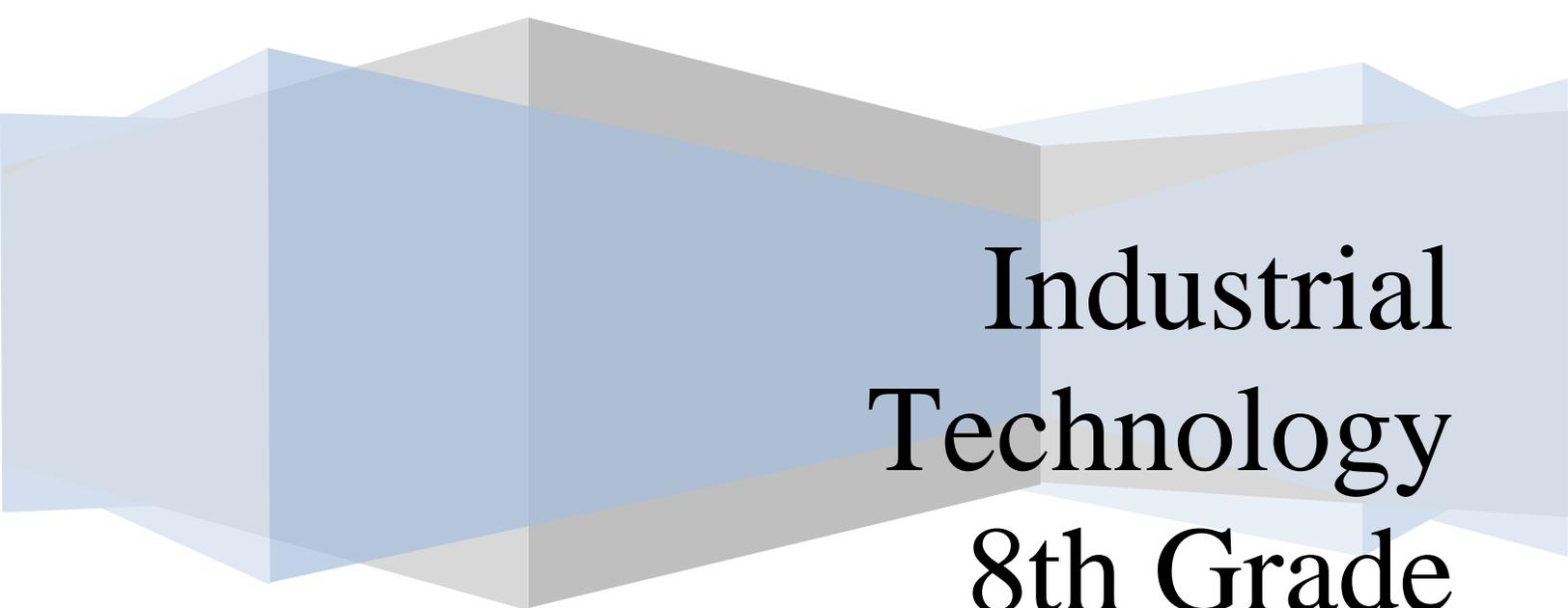


Solon Board of Education

Research & Design:
Aerodynamics through car building
By: Mrs. Aughinbaugh



**Industrial
Technology
8th Grade**

Research & Design: AP dragster

Interdisciplinary Skills

The Research & Design lesson reinforces various skills about which students are learning in other classes.

The Curriculum is an activity-based, hands-on learning system; Therefore, students gain a practical understanding of many interdisciplinary skills. Some of the interdisciplinary skills implemented in this lesson are:

Language Arts

- Read daily instructions for comprehension
- Read excerpts for comprehension
- Gather and record information
- Expand language communication skills by learning new terms
- Summarize daily activities

Math

- Measure millimeters and centimeters with a metric ruler
- Draw to scale
- Read and use numerical dimensions

Problem Solving

- Conceptualize the solutions to a problem
- Design, draw, and construct a scale model structure based on a design brief
- Identify research and design principles while creating and assembling a completed product
- Explore the design process
- Develop a scale model wood dragster to given limitations and specifications
- Test a completed model dragster

Science

- Identify research and design processes used in manufacturing (understanding the scientific process of observing and collecting data observed)
- Recognize how aerodynamics, weight, and friction affect automotive design and performance
- Discover how the motion of objects are affected by friction
- Describe Sir Isaac Newton's equation
(Force = Mass x Acceleration)

Social Studies

- Develop knowledge of and practice safe habits and attitudes while working with tools and machines
- Implement engineering and design principles

Visual Arts

- Apply sketching and drawing techniques
- Prepare and read a technical drawing
- Learn and use basic layout techniques

Day 1

Today's learning target

To determine what you already know about Research, Design, and automobiles and what you will or would like to learn.

To begin to understand the requirements for this projects

- Fill out the pre knowledge worksheet (K-W-L) to determine prior knowledge. Consider the following points as you fill in the worksheet.

Pre knowledge

- What do you already know about this subject?
 - What have you heard about this subject?
 - What do you want to know about this subject?
- Read the introduction page for brief description of the lesson
 - Read "The Race Car Design Basic Fact" sheet located in your module
 - Answer questions 1 - 9 on the correlating work sheet.

Clean up your work space and anything you used

Day closure:

In your technology journal write down one thing that you discovered today

Day 2

Today's learning target

The student will gain a working knowledge of the metric system and/or review how the metric system works.

- In order to create this car you must work in Metric measurement.
- To better understand metric measurement find the video called: **"The Metric System"**

and view the video with your group for a quick review.
If you are confident with your metric skills you **DO NOT** have to watch the video

- Each group member must complete their own sheet.
- You can also answer #10 in your questions worksheet by the time you complete this activity.

Clean up your work space and anything you used

Day closure:

In your technology journal write down one thing that you discovered today

Day 3

Today's learning target

The students will learn about the Design process and begin sketching

- Locate the design process fact sheet and read.
- Complete the questions 11 - 18
- To begin the design process you have to have a basic knowledge of the steps in a design process.

- Locate the "Roar of the Race Car" magazine and read carefully pages 2 - 5 about the design process.

- Now view the DVD called: It is in my FIS links as well AP Design Dragster

- You should now be ready to begin the design process.

- Based on what you have read begin making thumbnail sketches.

- Think of at least 8 different body designs.

Clean up your work space and anything you used

Day closure:

In your technology journal write down one thing that you discovered today

Day 4

Today's learning target

The student will learn how to sketch a multi-view drawing

Sketches

- Read page 8 from your reading packet.
- Fill out 3 sketch sheets.
- Draw a Top and side View of each

- When done discuss with your instructor which vehicle will be possible to create within the limitations.
- Use your limitations chart when creating the final drawing

Clean up your work space and anything you used

Day closure:

In your technology journal write down one thing that you discovered today

Day 5

Today's learning target

The student will learn how to use graph paper to create a scale size Final Drawing of the CO2 car.

The student will employ this scaled drawing to create a prototype.

- Pick your best sketch and put it into the Final drawing graph you received from your instructor
- Make sure you meet all limitations or you will not be eligible for race day.**
- Make 2 copies of this drawing one to turn in and one to cut out.

*****NOTE YOU MAY SKIP PROTOTYPE BUT YOU WILL ONLY GET ONE BLOCK OF WOOD TO CUT YOUR CAR OUT OF.*****

- When complete your graphing design you will get a prototype block of Styrofoam from your instructor.
- Cut out the graphing design and tape it to the Styrofoam.
- Cut this design out of the Styrofoam
 - This will help you check if the car fits:
 - all limitations are met
 - If the car looks like what you were expecting

Once you are satisfied move on to the production phase of the design process.

NOTE: All wheel holes must be drilled prior to cutting the wood.

Clean up your work space and anything you used

Day closure:

In your technology journal write down one thing that you discovered today

Day 6 to 8

Today's learning target

The student will learn what the production phase of the design process through hands on experience.

- Observe the prototype
- Make any necessary changes to get the effect you were looking for.
- Using the pattern from the grid paper drill wheel holes in appropriate location
- cut the car out of the wood block
- Sand to a fine finish
- No painting is done until the instructor has given approval.

Clean up your work space and anything you used

Day closure:

In your technology journal write down one thing that you discovered today

Day 9 and 10

Today's learning target

To learn how to alter the physical look of your car with paints and stencils.

- You will complete all sanding and filing
- Project should be smooth to the touch
 - You should be able to close your eyes and not feel any machine cuts or bumps.

- When sanding is complete discuss color with you instructor.
- There are tricks you can learn to paint your vehicle.

The car should be complete with wheels attached and eyelets in place in order to enter it into the race.

All limitations must be within the tolerance to be eligible.

Clean up your work space and anything you used daily

Air Pressure Dragster Design Process

- Each group member must complete their own sheets.

Day 1

Start you KWL (5pts)

K = Tell me what you already think you know about aerodynamics

W= What would you like to know about this module?

Sometimes you cannot answer the "W" until after you have read some background information and that is okay.

Read some background information

- Read "**The Race Car Design Basic Facts**"
- Answer questions 1 - 9 on the correlating work sheet.

Clean up your work space and anything you used

Day 2

- Read The Design Process Fact Sheet
- Complete the questions 11 - 18
- To begin the design process you have to have a basic knowledge of the steps in a design process.
- Read carefully pages 2 - 5 about the design process in the magazine "Roar of the Race Car"
- Determine from this reading what the steps in the design process are.
- List the steps on the back of worksheet and define them in your own words.

Day 3

- Question #10 has to do with Metric systems.
- If you need a refresher on Metric you may watch the VIDEO entitled "**The Metric System**"

- Complete the *Metric Worksheet* in your packet.
- You should now be ready to begin the design process.
- Based on what you have read begin making thumbnail sketches.
- Think of at least 8 different body designs. Look at picture and the video to see what you like as well as what you think is the most aerodynamic based on what you read on Day 1 and 2
- On the back side of one of your worksheets sketch 8 thumbnails (look up the definition of thumbnail to make sure this is the right step.)

Day 4

Sketches - using the 3 thumbnails that you like the best it is time to expand on your ideas.

- Read page 8 from "**Roar of the Race Car**"
- Observe how the sketch on the page is drawn
- Make 3 sketches of your own on the blank paper in the packet.
- Make sure you Draw a Top and a Side View of each car idea.
- Discuss with teacher pros and cons of each car.
- Once a car is approved you will get your kit and directions.

Make sure you have all Materials included in your kit.

Read all directions prior to making any cuts in the body of the car.

Day 5

- Continue reading in your directions and follow the steps on how to make the dragster **Final design**.

What about **prototype**? In the design process this is the step before making the actual product. It allows you to see the product in a 3D form prior to using the expensive materials.

You can mold a prototype out of clay. Cut it out of cardboard, or cut it out of Styrofoam. It is an optional step but remember you only get one piece of dragster material for the project.

Day 6-10

- Follow the directions in your booklet to complete the cutting out, shaping, and sanding of your wood.
- You will have to add the string guides as well and the launch tube.
- You can test the wheels to see how it rolls but you may want to paint your car without the wheels in the way.
- Testing of the car once it is finished with paint will be allowed.

POST TEST

You will need to turn in your packet of worksheets and drawings prior to the test and the car when it is complete.