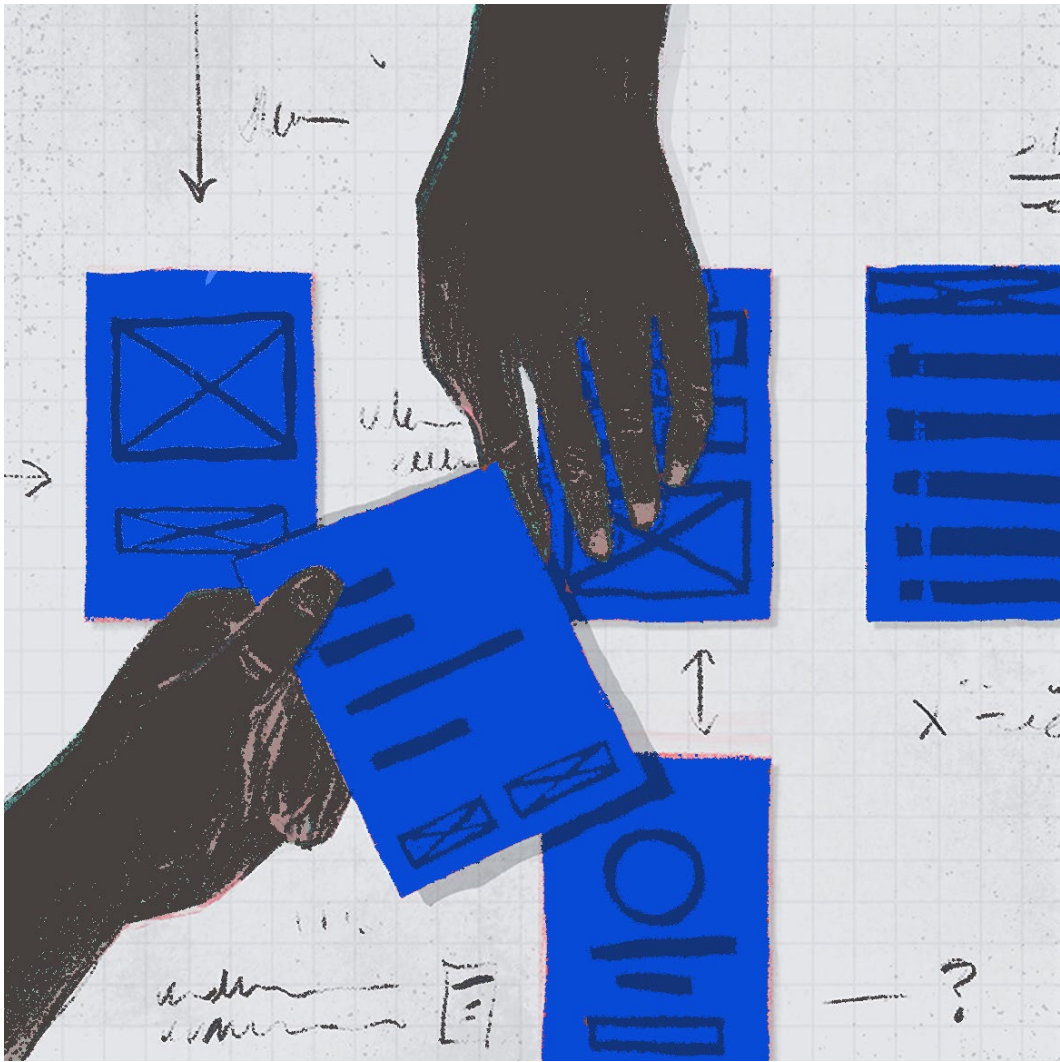


PRIMARY STEM PROJECT

UNIT 4



DESIGN & BUILD

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TEACHERS' NOTES

UNIT 4:

DESIGN & BUILD

In this unit pupils will Build a Chassis and Design & Build a Bodyshell. Students will use their knowledge of forces and aerodynamics to design and make a streamlined bodyshell to cover their chassis.

LEARNING OUTCOMES

Pupils will aim to

- Successfully construct a Primary STEM Project racing car chassis from a cardboard net
- Have an understanding of aerodynamics
- Be aware of the relationship between 2 dimensional and 3 dimensional shapes
- Work constructively as a team and allocate jobs appropriately

Most pupils will

- Have an understanding of **Friction** as a force and where it is applied
- Understand the meaning of aerodynamics
- Understanding that a net is a two-dimensional representation of a three-dimensional shape

Some pupils will be able to

- Explain how friction slows down a moving object and apply their knowledge to other scenarios
- Demonstrate an understanding of aerodynamics and its application in real life
- Construct a net for a three-dimensional shape

Pupil differentiation

Many of the principles taught can be differentiated using additional worksheets.

LESSON 1

BUILD THE CHASSIS

LEARNING OBJECTIVES Pupils will: <ul style="list-style-type: none"> • Learn use a complex net to assemble the car chassis by carefully and closely follow instructions • Recap on elevation drawings. • Look at shading and rendering techniques. • Learn how to draw 3 dimensional shapes. 		INDIVIDUALS GROUP
RESOURCES WORKSHEETS BUILD THE CAR CHASSIS (2 PAGES) CHASSIS TEMPLATE (double) CHASSIS TEMPLATE (single) VIDEO CONSTRUCT THE CHASSIS DRAWING THE CHASSIS USING IsoSketch®		EQUIPMENT *Writing Tools *Pencils *Rulers *Graph Paper *Isometric paper *IsoSketch Drawing Tools
RELATED WORKSHEETS 2D-3D SHAPES MAKING A CUBE DRAWING A CUBE USING ISOSKETCH 3D SHADING NETS	POWERPOINTS 2D-3D SHAPES QUADRILATERALS TRIANGLES	
IN PREPARATION Pupils could recap on previous learning on 2D and 3D shapes, using RELATED WORKSHEETS and POWERPOINTS		
STEPS <ul style="list-style-type: none"> • CONSTRUCT THE CHASSIS video with clear instructions is available and could be used as an introduction to the lesson. • Each pupil should start by assembling their own chassis. This can be a bit tricky first time. Encourage the pupils to follow the instructions carefully. Because of the need for accuracy and the fine motor skills required, it is advisable to have extra adult help if possible. • ORTHOGRAPHIC DRAWINGS. Refer back to LABEL THE CAR PARTS worksheet (UNIT 3 LESSON 3). Look at plan, front and side elevation labelling. On squared paper, draw a plan, side elevation and front elevation of the completed chassis. This should include careful and accurate measuring to transfer the shape of the chassis to the graph paper. • Use unit blocks to construct simple shapes to draw on isometric paper. • Look closely at simple nets and how to construct nets to form 3D shapes. It may also be an advantage to explore shading of 3D objects to develop a more realistic rendering. This could be practiced by shading the CHASSIS TEMPLATE sheets. 		
PLENARY Put all drawings on the wall during break-time. Invite pupils to attend a SILENT private view. Ask each pupil to spend 5 minutes viewing the work. Can they find one way that they could improve their own work.		
ENRICHMENT More able pupils could make more complicated unit block shapes to draw on isometric paper and use isometric paper or follow the online tutorial 'DRAWING THE CHASSIS USING IsoSketch®' to draw and shade a 3D rendering of the chassis. More able pupils could follow the video link and draw out the chassis using the IsoSketch.		

LESSON 2

FRICTION

<p>LEARNING OBJECTIVES</p> <p>Pupils will:</p> <ul style="list-style-type: none"> • Explore friction in real-world environments. • Investigate how a surface covering can affect momentum. 	<p>INDIVIDUALS PAIRS GROUP</p>
<p>RESOURCES</p> <p>WORKSHEETS</p> <p>FRICTION EXPERIMENT WITH FRICTION INVESTIGATING TEXTURES WRITING UP EXPERIMENTS EXPERIMENT TO....</p> <p>POWERPOINT</p> <p>FRICTION</p>	<p>EQUIPMENT</p> <p>*Large Sheet of Paper *Marker Pens *Flat board or *Strong Piece of Card *Pile of books *Magnifying glass</p> <p>*Various Textured Materials Eg Carpet Corrugated Cardboard Blanket</p>
<p>RELATED WEBLINKS</p> <p>BBC BITESIZE' What is friction?' BBC LIVE LESSONS 'How do forces affect my speed?'</p>	
<p>IN PREPARATION</p> <p>Teachers should watch suggested weblink videos for information and ideas.</p>	
<p>STEPS</p> <ul style="list-style-type: none"> • Use FRICTION PowerPoint to introduce the lesson. Various videos are available online that could be used to support this. Friction is a force that works to slows down a moving object. The larger the surfaces in contact, the higher the friction. This can be demonstrated alternating the pages of two books and then trying to pull them apart. • Discuss how friction affects everyday life. Pupils could work in teams to produce a list of all the examples of friction that they can think, using large sheets of paper and marker pens. Followed by a class-sharing session. • Using the worksheet EXPERIMENT WITH FRICTION complete the classroom activity on friction- to explore how friction may slow down a moving vehicle. • Using worksheets INVESTIGATING TEXTURES, WRITING UP EXPERIMENTS & EXPERIMENT TO...write up the experiment. 	
<p>PLENARY</p> <p>Summarise and recap friction and other related forces. Consider how to reduce friction based upon experiments.</p>	

LESSON 3

DESIGN & BUILD A BODYSHELL

<p>LEARNING OBJECTIVES</p> <p>Pupils will</p> <ul style="list-style-type: none"> Use their acquired knowledge of forces to identify areas of their chassis that could be modified to improve the aerodynamic properties. 	<p>INDIVIDUALS PAIRS GROUP</p>
<p>RESOURCES</p> <p>WORKSHEETS</p> <p>DESIGN A BODYSHELL CHASSIS TEMPLATES (2 PAGES) BUILD A CAR BODYSHELL SAMPLE CAR BODYSHELL</p>	<p>EQUIPMENT</p> <p>Writing Tools Drawing Tools IsoSketch Drawing Tools</p>
<p>RELATED WORKSHEETS</p> <p>REALISTIC F1 BODY SHELL</p> <p>VIDEOS</p> <p>WIND TUNNEL TESTING STREAMLINING OF MOTOR VEHICLES SKETCHING THE BODYSHELL USING IsoSketch®</p> <p>More information is available at: THE DRAWING TOOL COMPANY Drawing a bodyshell video</p>	
<p>IN PREPARATION</p> <p>Check out RELATED VIDEOS in preparation for the lesson. If pupils wish to use the IsoSketch drawing tool to help them to professionally produce isometric drawings of their ideas, it is advisable that they have completed DRAWING A CUBE USING ISOSKETCH activity in UNIT 4 LESSON 1.</p>	
<p>STEPS</p> <p>This lesson may be split into two sessions</p> <p>DESIGN BODYSHELL</p> <ul style="list-style-type: none"> If appropriate, use one of the above videos as an introduction to streamlining. Looking closely at body chassis, flag areas where forces would have a negative effect on efficiency of the vehicle. Use the chassis templates to help pupils to develop designs for a more aerodynamic bodyshell. Less able pupils could use the SAMPLE CAR BODYSHELL template. This could be decorated using team livery and logos. Pupils should be able to explain why their design would make the chassis more aerodynamic Draw designs and elevation drawings. Pupils could use the chassis template to draw round or sketch out designs on isometric paper. The IsoSketch drawing tool could be used. An online video is available to guide pupils through the task. 	

MAKE BODYSHELL

- Either using a template, making an original net for a bodyshell or sticking shapes directly onto the chassis, pupils should modify the shape in order to make it more aerodynamic. This could be an individual task with each pupil using their own chassis.
- Pupils should annotate designs to explain key features and demonstrate understanding. A simple template is included. This could be decorated using team livery and logos. Pupils should be able to explain why this would make the chassis more aerodynamic. Ideally pupils should be encouraged to design their own bodyshell. Experimenting using cut out shapes and sticking them to the chassis.
- Allow pupils to come together in their team and evaluate each design before deciding on a final team design.
- Each consumables pack contains enough materials to make 50 car chassis, allowing individual pupils to make their own chassis to experiment with. There will be the enough spare materials for each team to make 2 further chassis allowing for modifications to be made after testing.
- The final team car could either use the simple template provided, a design that the team has developed develop, or pupils could stick shapes directly onto the chassis.
- A rendering of the final team car should be drawn by the Graphic Designer, to be included in the team's end of project portfolio of work.

PLENARY

Look at everybody's cars. Discuss additions and how these might help the car go faster, recap on learning about aerodynamics and streamlining.

ENRICHMENT

Use IsoSketch Drawing Tool to sketch a car chassis and body shell.

LESSON 4 EVALUATION

<p>LEARNING OBJECTIVES</p> <p>Pupils will:</p> <ul style="list-style-type: none"> • Have a chance to reflect upon what they have learned during this UNIT and evaluate where improvements could be made in the future. 	<p>INDIVIDUALS PAIRS</p>
<p>RESOURCES</p> <p>WORKSHEETS SUMMARY & EVALUATION ABOUT FORCES(2 PAGES)</p>	<p>EQUIPMENT *Writing Tools</p>
<p>IN PREPARATION</p> <p>Prepare all work that has been produced during this UNIT for evaluation.</p>	
<p>STEPS</p> <ul style="list-style-type: none"> • Hand out SUMMARY & EVALUATION worksheets. • Complete either individually or peer on peer assessment. • Hand out both ABOUT FORCES worksheets and complete either individually, in pairs or as a team. 	
<p>PLENARY</p> <p>Review ABOUT FORCES worksheet, go through the correct answers. Are any of the statements true of more than one of the forces mentioned?</p>	
<p>ENRICHMENT</p> <p>More able pupils could be asked to think of their own examples to fill in on the ABOUT FORCES worksheet.</p>	