Scheme of Work   SUBJECT: **Design & Technology**   YEAR - **7**

	Topic - Mazes	Topic - Vehicle	*Additional theory content*
Key concepts	Measuring, marking out, design, presentation, cutting, workshop safety	Analysis of existing products, design, presentation, scale.	*Systems, electrical power and use,*
Themes	Toys, products for purpose	Design, joints as a means of assembly, fabrication as a means of production.	*Systems (analysis), electrical power, sources of power we use, environmental issues.*
Challenge	Add features in design then in practical tasks. Use additional materials.	High levels of accuracy and inclusion of more than one joint type, combination of materials to enhance product.	*Greater understanding of meta-principles surrounding power use and generation & systems analysis.*
Support	Use pre-prepared marked out bases.	Mitre saws to enable accurate cutting. Templates to facilitate presentation of ideas.	
Literacy focus	Keywords and definitions in IST.	Keywords and definitions in IST.	*Use words associated with 'systems' – analyse systems using appropriate language.*
Numeracy focus	Measuring, counting, converting from mm to cm.	Dividing measurements to mark out accurate joints.	*Volts, cells, batteries (combinations of voltage). Simple calculated concepts such as P=IV.*
Cross-curricular links	Awareness of material sources – in various countries.	Awareness of material sources – in various countries.	*Science – basic electrical circuits and calculations.*
SMSC & MBV	Effects of play on children – types of games.	Environmental considerations of materials, sustainability.	*Environmental impact of power generation and storage.*
ASSESSMENTS	Design work, Safety worksheet/poster, practical outcome.	Research/analysis, design/presentation, practical outcome, evaluation.	
Out of school learning	**IST -** focus on timber, wood products & use.		

NB: Module is split into the following:

- **Theory –** These sessions are linked to the theme/project and skills/knowledge feeds into the project. However, these may be 'stand-alone' lessons with immediate outcomes, feedback and progression.
- **Portfolio** – These sessions are focused on design, development and activities specifically feeding into the practical element of the module.
- **Practical** – These sessions provide pupils with workshop time to build, construct and finish the product(s) they have designed during portfolio lessons.

Sessions are colour coded in the SOW to indicate category.

It is important to note that the sequence of these lessons is highly dependent on the 'pattern' of time allocated in the timetable (e.g. double sessions would be mostly used for practical while end-of-day shorter sessions preclude practical work and would be used to focus on theory or portfolio work).

Other factors such as interruptions to the normal timetable or pressure of completing practical work with a less practically able group mean the sequence in which sessions are delivered may alter. Indicative time is suggested for each activity and may be split over more than one week.

Sequence of activities would ideally be as follows – subject to pace of group, prior knowledge and other external factors. (Assuming 5 weeks X 5 lessons.)

Module 1

Module 2

Lesson	Key concepts	Learning outcomes	Differentiation	Resource

Theory 1 (2 sess)	**Intro to RM and Workshop**
	• Introduce students to the room with emphasis on the need for safe working and sensible behaviour.
	• RD to show students around the workshop and point out safety issues.
	• Task – Complete workshop tour worksheet
	• Task – make a poster to show the safety points needed in the workshop
		The Big Picture
		    TO: Introduce the workshop.
		Learning Objective
		    WE ARE: Learning how to stay safe in a workshop environment.
		Success Criteria
		    Good – Set up workbooks, answer questions.
		    Better – Complete all parts of the workshop tour worksheet.
		    Best – Extend your work by creating a workshop safety poster showing effective graphical communication.
			Support:
			Support spelling of keywords and names of equipment.
			
			Challenge:
			Extent of communication with poster (graphical communication language).
				Tools
				Equipment
				Stationery
				Folders
				Workshop safety worksheet

Theory 2 (2 sess)	**Rendering skills**
	• Pupils draw 6 blocks using single-point prespective.
	• Rendering exercise (PPT) is presented and worked through to demo rendering a range of materials.
	Pupils will apply these skills/techniques to their design work.
		The Big Picture
		    TO: Skills development! Draw accurately with pencil and ruler to communicate our ideas.
		Learning Objective
		    WE ARE: Presenting our ideas using accurate drawing techniques – including rendering.
		Success Criteria
		    Good – Complete the rendering exercise.
		    Better – Apply these skills to portfolio work
			Support:
			Basic layout provided to short-cut drawing process
			
			Challenge:
			Show precision with application of taught colour theory
				Stationery
				Try Squares
				Rulers
				Partial layouts for support
				Colouring pencils

		Best – Develop this work using CAD.		
Theory 3 (1 sess)	**Drawing skills** • Pupils explore Isometric projection using grid paper and simple shapes • Pupils progress to additive or subtractive drawing Pupils will apply these skills/techniques to their design work.	**The Big Picture** TO: Skills development! Visualising objects in 3D and using formal drawing methods to present these. **Learning Objective** WE ARE: Using Isometric projection as a formal drawing method to present work. **Success Criteria** **Good** – Draw simple cubes accurately in isometric projection **Better** – Use isometric technique to draw various shapes and sizes based on cuboids **Best** – Produce more complex shapes including angles or curves from basic isometric blocks.	**Support:** Driven by tutor intervention – sketching basic forms for pupils to copy or develop. **Challenge:** Move on to using 'crates' as a method for production of more complex shapes.	Stationery Rulers Colouring pencils Isometric grid paper
Theory 4 (1 sess)	**Presentation skills** • Pupils are shown 6 simple techniques to enhance presentation. Pupils will apply these skills/techniques to their design work.	**The Big Picture** TO: Skills development! Communicate effectively and with impact. **Learning Objective** WE ARE: Using simple graphical techniques to give impact to our work. **Success Criteria** **Good** – Complete the 6 techniques as instructed. **Better** – Show flair in using these techniques. **Best** – Apply these techniques to prior work.	**Support:** Pre-prepared blocks may be provided for pupils to apply techniques. **Challenge:** Explore ways of combining more than one technique. Which ones work together? Which do not?	Stationery Rulers Partial layouts for support Colouring pencils

Theory 5 (1 sess)	**Plastics theory** • Pupils are taught about thermo-plastic and thermosetting plastic • Pupils identify a range of products made using each type of plastic and give simple reasons why • Sources of plastic are discussed and implications for disposal at end of product life. Pupils may use plastic as part of the maze product but need to know about the basic properties of this material	**The Big Picture** TO: Understand more about the origins and uses of plastic as a material **Learning Objective** WE ARE: Finding out about the origins, uses and disposal of 2 categories of plastic **Success Criteria** **Good** – Complete notes and questions about plastic **Better** – Be able to identify which category of plastic is used to manufacture various products **Best** – Appreciate some of the issues with disposal of plastics and why alternatives must be found.	**Support:** All pupils should be able to develop a basic understanding of this topic. **Challenge:** Explore various options for alternate plastics or other materials which could be substituted based on their properties.	Plastics presentation Workbooks Plastic products laminated sheets
Portfolio 1 (2 sess)	**Introduction to theme – Maze project.** • Look at existing projects – what works well, looks good, etc. • Students to create 2 maze designs on graph paper – spec. 12cm by 12cm square box – maze walls 1cm thick. Peer evaluation of Maze designs – suggestions and improvements.	**The Big Picture - 1** TO: Analyse existing maze game designs. **Learning Objective** WE ARE: Looking at existing designs to find out more about them. **Success Criteria** **Good** – Give answers to the 5 basic questions for each design. **Better** – Write detailed answers which refer to the design. **Best** – Justify / explain the answers you give. **The Big Picture - 2**	**Support:** Analysis support.pub – structured with keywords. **Challenge:** Open question analysis of good/bad and points for development or improvement.	Maze games Maze examples Graph paper Stationery

		TO: Skills development! Draw accurately with pencil and ruler to communicate our ideas. **Learning Objective** WE ARE: Presenting our ideas using accurate drawing techniques – including shading. **Success Criteria** **Good** – Complete more than one idea for a maze. **Better** – Use line accurately and shade raised areas of maze. **Best** – Annotate your work to describe how your design will work and be made. **Extension** – Add a 'feature' to your maze design.		
Portfolio 2 (1 sess)	**Transferring Design** • Producing a cutting list – students to work out how many lengths of pine they will need for walls and list them by measurement along with their design (i.e. 3 x 1cm length/ 4 x 3cm length) • Students to draw out grid on to 12cm by 12cm MDF block – emphasis on accuracy.	**The Big Picture** TO: Skills development! Draw accurately with pencil and ruler to communicate our ideas. **Learning Objective** WE ARE: Creating a CUTTING LIST of all our maze parts. **Success Criteria** **Good** – List basic 'wall' parts needed for the maze. **Better** – List 3 dimensions for all parts needed.	**Support:** Part-drawn cutting list. Tutor support with marking out base. **Challenge:** 3D presentation of maze design to aid visualisation	Stationery Try Squares Rulers MDF blocks

	Demo on using Try Square/H pencils/rulers.	**Best** – Include external plastic wall (circumference) and any additional features.		
<mark>Portfolio 3</mark> <mark>(1 sess)</mark>	**Maze Evaluation** • Peer Evaluation of completed Maze Students to complete personal evaluation sheet for work	**The Big Picture** TO: Evaluate our work. **Learning Objective** WE ARE: Evaluating our work and noting good points and areas for development. **Success Criteria** **Good** – Respond to all questions on the grid. **Better** – Extend your answers with further detail. **Best** – Ensure comments show some depth of thought about your work.	**Support:** Keywords and sentence starters provided. Writing frame used for all pupils. **Challenge:** Free text with in-depth analysis of own work, strengths etc. Reasons given for statements.	Evaluation Sheets and Photos of work can allow teacher to mark practical after the lesson.
<mark>Practical 1</mark> <mark>(4 sess)</mark>	**Cutting wood** • Demo in measuring and marking out lengths of wood and cutting using Bench Hook and Tenon (Back) saw - appropriate H/S warnings • Students to work through cutting, cutting appropriate lengths – laying out over original design helpful. • Demo in filing or using disc sander to neaten edges - appropriate H/S warnings	**The Big Picture** TO: Creating our maze. **Learning Objective** WE ARE: Using workshop tools and equipment to realise our design. **Success Criteria** **Good** – Work safely and effectively. **Better** – Work quickly and with precision. **Best** – Support other pupils with their work and share skills.	**Support:** Use of mitre saws to aid dexterity. **Challenge:** Cut on waste side, use square set up on sander to trim.	Stationery Try Squares Rulers MDF blocks Pine strips Tenon Saw Bench hook Metal Files Disc Sander

Practical 1 (4 sess)	**Glue and Paint**
	• Demo in gluing pine walls on to MDF and painting maze.
	• While work is drying students can do work sheets on Pillar Drill and Metal Files
	* Students should choose coloured strips of acrylic for next lesson
		The Big Picture
		    TO: Creating our maze.
		Learning Objective
		    WE ARE: Using workshop tools and equipment to realise our design.
		Success Criteria
		    Good – Work safely and effectively.
		    Better – Work quickly and with precision.
		    Best – Support other pupils with their work and share skills
			Support:
			Tutor support with assembly and painting.
			
			Challenge:
			Independent work including support (paired work) of less able.
				Stationery
				Glue
				Black paint
				Brushes
				W/Sheets

Practical 1 (4 sess)	**Preparing Acrylic**
	• Demo in Filing (Cross and Draw) using Metal files and Swiss Files and in using Wet/Dry paper.
	• Students to spend lesson refining edges of their acrylic strips.
		The Big Picture
		    TO: Creating our maze.
		Learning Objective
		    WE ARE: Using workshop tools and equipment to realise our design.
		Success Criteria
		    Good – Work safely and effectively.
		    Better – Work quickly and with precision.
		    Best – Support other pupils with their work and share skills.
			Support:
			Tutor support or paired work – encourage reference to 'technique champions'.
			
			Challenge:
			Be a 'technique champion'
				Acrylic
				Metal Files
				Swiss Files
				Wet/Dry paper
				Wood protectors
				Vices

Practical 1 (1 sess)	**Strip Heater**
	• Demo in using Strip Heater and Jig to bend acrylic strips around maze - appropriate H/S warnings
	• Students to continue preparing acrylic whilst
		The Big Picture
		    TO: Creating our maze.
		Learning Objective
		    WE ARE: Using workshop tools and equipment to realise our design.
		Success Criteria
		    Good – Work safely and effectively.
		    Better – Work quickly and with precision.
			Support:
			Tutor support or paired work – encourage reference to 'technique champions'.
			
			Challenge:
			Be a 'technique champion'
				Strip Heater
				Jig
				Drill
				Acrylic
				Metal Files
				Swiss Files
				Wet/Dry paper
				Wood protectors
				Vices

	taking it in turns to bend acrylic. Demo in marking out and drilling holes for start finish points - appropriate H/S warnings for using drill.	**Best** – Support other pupils with their work and share skills.		
<mark>Practical 1</mark> (1 sess)	**Fixing outer casing wall to maze** • Demo in marking out for drilling final holes to fix outer casing wall to MDF block base. Students to finish any outstanding tasks and finish off maze	**The Big Picture** TO: Creating our maze. **Learning Objective** WE ARE: Using workshop tools and equipment to realise our design. **Success Criteria** **Good** – Work safely and effectively. **Better** – Work quickly and with precision. **Best** – Support other pupils with their work and share skills.	**Support:** Tutor support or paired work – encourage reference to 'technique champions'. **Challenge:** Be a 'technique champion'	Drill Acrylic Maze base Wood protectors Vices
		End of module 1 - Maze project – Start of Vehicle project.		
<mark>Portfolio 1</mark> (2 sess)	**Drawing basic vehicle layout** • Accurate measuring and drawing • Tutor to demonstrate	**The Big Picture** TO: Skills development! Draw accurately with pencil and ruler. **Learning Objective** WE ARE: Measuring accurately and using pencil & ruler to draw with precision. **Success Criteria** **Good** – Complete a border, title block and one view. **Better** – Accurately draw two or three views of basic vehicle chassis. **Best** – Add detail to views to better represent vehicle while maintaining Orthographic perspective.	**Support:** Partially drawn layouts can be provided **Challenge:** Add details to drawing above and beyond the basic layout expected	Stationery Try Squares Rulers Partial layouts for support

Portfolio 2 (2 sess)	**Design ideas**
	• Draw 2 ideas based on the layouts creating last lesson.
	• Add detail to designs including features and functions
	• Show joints and assembly methods.
		The Big Picture
		     TO: Skills development! Draw accurately with pencil and ruler to communicate our ideas.
		Learning Objective
		     WE ARE: Presenting our ideas using accurate drawing techniques.
		Success Criteria
		     Good – Complete the basic drawing (2 views) accurately.
		     Better – Construct a design from the basic layout drawing.
		     Best – Add detail to indicate where individual pieces of wood will be cut and joined.
			Support:
			Partially completed drawings enable engagement by all
			
			Challenge:
			Show awareness in the work of assembly and joining methods
				Stationery
				Try Squares
				Rulers
				Partial layouts for support

Portfolio 3 (2 sess)	**Design ideas**
	• Develop one design idea through presentation in 3D
	• Using grid paper or Isometric drawing tools to present using a formal drawing method
	Show joints and assembly methods.
		The Big Picture
		     TO: Skills development! Draw accurately in 3D with pencil and ruler to communicate our ideas.
		Learning Objective
		     WE ARE: Presenting our ideas using accurate drawing techniques.
		Success Criteria
		     Good – Complete the basic drawing in 3D as intended.
		     Better – Show full details of the vehicle including joint and wheels.
		     Best – Add features and/or rendering.
			Support:
			Partially completed drawings enable engagement by all
			
			Challenge:
			Work to a high standard of accuracy. Apply previous knowledge (e.g. rendering) to enhance presentation.
				Stationery
				Try Squares
				Rulers
				Partial layouts for support
				Isometric tools
				Isometric grid paper

Portfolio 4 (1 sess)	**CAD skills** (Optional lesson if IT facilities available) • Using 2D Design to replicate design ideas. • Tutor explains purpose, advantages and possible risks associated with CAD Links are made to industrial application.	**The Big Picture** TO: Skills development! Learn to use a CAD program to create accurate drawings and modify designs. **Learning Objective** WE ARE: Presenting our ideas using accurate drawing techniques and CAD. (Computer aided design.) **Success Criteria** **Good** – Replicate our hand drawn design using CAD. **Better** – Construct more than one design based on the original layout. **Best** – Create a parts list based on our accurate drawings.	**Support:** Partial layouts can be loaded to give various starting points **Challenge:** Apply colour using 'texture' option Extend into 3D presentation using Isometric grid	Computer suite Partial layouts available in shared folder

Practical 1 (10 sess)	**Practical**
	 • Making the design.
	 • Cutting housing joint
	 • Drilling using fixture to secure wheels
	 • Applying suitable finishes
		• **The Big Picture - 1**
		   – TO: Create a simple wooden vehicle using softwood and a housing joint.
		 • **Learning Objective**
		   – WE ARE: Cutting and drilling softwood to assemble a wooden vehicle.
		 • **Success Criteria**
		   – **Good** – Measure and cut pieces accurately.
		   – **Better** – Assemble pieces to create a realistic vehicle.
		   – **Best** – Explore other techniques to extend your skills. Add features or
			Support: Tutor support or paired work – encourage reference to 'technique champions'.
			
			 Challenge: Be a 'technique champion'
				Tools Benches Drill Back-saws Chisel Mallet Bench-hook Softwood blanks Scrap softwood Dowel MDF Wheels

		function to the basic design, combining materials.		
Portfolio 5 (1 sess)	**Evaluating** • Personal evaluation of completed project identifying strengths, weaknesses and areas for development in product and approach	**The Big Picture** <u>TO</u>: Evaluating our work helps us learn & remember. **Learning Objective** <u>WE ARE</u>: Thinking about what went well and why during the making of our project. **Success Criteria** <u>**Good**</u> – Answer questions about our work. <u>**Better**</u> – Create a process evaluation table. <u>**Best**</u> – Extended writing about the making of our vehicle.	**Support:** Keywords and sentence starters provided. **Challenge:** Free text with in-depth analysis of own work, strengths etc.	Stationery Rulers Printed prompt sheets with differentiated questions and sentence starters
Theory 1 (2 sess)	**Technical knowledge** (Optional lesson) • Building on the IST • Additional taught input on woods, origins and uses • Consideration of recycling • Ethical issues about sources of timber • Sustainability as a concept	**The Big Picture** <u>TO</u>: Knowledge! Finding out more about where wood comes from and how it grows. **Learning Objective** <u>WE ARE:</u> Exploring the trees that grow near us to divide them into 2 main groups. **Success Criteria** <u>**Good**</u> – Simple sketches and suitable objects found. <u>**Better**</u> – Detailed sketches and aesthetically pleasing objects found.	**Support:** Tutor supports pupils with simple questions based on observations **Challenge:** Challenge questions encourage pupils to explore beyond their personal experience into synthesis with wider world	Stationery Rulers Tree-trail sheets Tree-trail support sheets

		Best – Detailed, coloured sketches, suitable objects found and conclusions drawn about tree types.		
Additional Theory Content			

Theory 1 (1 sess)	**Introducing systems**
	• Systems as a way of thinking
	• Systems analysis of common objects
	• Introducing electrical circuits
	• Electrical symbols & meanings
	• Soldering as a technique
		The Big Picture
		    TO: Add the concept of systems to our thinking.
		Learning Objective
		    WE ARE: Examining system thinking and analysing products.
		Success Criteria
		    Good – Systems diagrams drawn and labelled.
		    Better – A systems approach used to analyse existing products.
		    Best – Features of systems described in detail including feedback loops.
			Support:
			All worksheets are graduated in complexity – starting with accessible tasks.
			
			Challenge:
			See Los.
				PPT
				Systems worksheet
				Electrical symbols worksheet

Theory 2 (1 sess)	**Technical knowledge**
	• Electrical generation
	• Power distribution
	• Power storage
	• Batteries / potential storage
	• Environmental issues
	• Future considerations
		The Big Picture
		    TO: Identify sources of power we use
		Learning Objective
		    WE ARE: Learning about electrical generation and storage
		Success Criteria
		    Good – Complete notes/label diagrams
		    Better – Describe sources of power and storage
		    Best – Evaluate impact of power generation choices on the environment
			Support:
			Worksheets provided with basic information as a foundation to build on.
			
			Challenge:
			Opportunity for discussion and/or written evidence of critical thinking.
				PPT
				Worksheets
				Video resources

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<mark>Theory 3 (2 sess)</mark>	**Technical knowledge / Evaluation** • Evaluating and understanding • Assessing success of electrical / electronic products • Understanding how system driven functions may be adapted to other purposes	**The Big Picture** 　　TO: Understand how electronic systems are used to add value to products **Learning Objective** 　　WE ARE: Reverse engineering simple products to consider alternative applications for systems or components. **Success Criteria** 　　**Good** – Basic description of component function 　　**Better** – Suggestions of adaptations to basic function using components 　　**Best** – Imaginative application of electronic circuits to novel situations	**Support:** Tutor guides pupil thinking Writing frames or sentence starters **Challenge:** Tutor challenges pupils to 'think outside the box' in adapting or applying	Worksheets Books Stationary Wallace & Gromit video clips!
<mark>Practical</mark>	**Spare** • Extension or end-of-term activities	**Learning Objective:** To understand how bridges are built and basic structures used for this purpose. • Video input on famous bridges / engineers • Worksheet completed showing understanding of structures • Model bridges built using kits provided or other basic materials.		