

Essential Knowledge. Year 9 Graphics. Sustainable design and architecture project.

The environmental impact of:

Transportation	Waste	Energy	Raw Materials	Pollution	Socioeconomic
<p>Diesel ships and trucks emit large amounts of CO2. This can be reduced by sourcing locally. Using less packaging can also mean more items can be moved at once, however if an item gets damaged it is counter productive.</p>	<p>Large amounts of waste go to landfill. This scars the landscape. 'Leachate' or landfill run off is toxic and can contaminate water and food supplies. Recycling waste reduces landfill usage and energy consumption.</p>	<p>Wind, solar, hydroelectric, tidal and biomass power sources are all 'renewable' energy sources.</p> <p>They do not rely on burning fossil fuels which releases large amounts of CO2 into the atmosphere.</p>	<p>Mining scars the landscape and uses lots of CO2. It can lead to subsidence (land collapsing). Deforestation. Large areas of forest and rain forest are destroyed to harvest wood. This kills animal habitats.</p>	<p>Atmospheric Pollution. The quality of air is affected by pollution. Emissions are given off by raw material extraction, manufacturing, transportation and incinerating waste.</p> <p>Oceanic pollution is caused by pollutants entering the water system. An example of this is micro plastics and plastic fibers from clothing and product packaging.</p>	<p>Noise Pollution. Noise from construction, material extraction and manufacture can be a real issue with local residents.</p> <p>Fairtrade. This is an organisation that ensures workers get better prices, decent working conditions, local sustainability, and fair terms of trade for farmers and workers in the developing world.</p>

Existing Designers: Zaha Hadid - Born in Iraq and lived between 1950- 2016. Hadid was known as the queen of the curve much of her work is seen as futuristic, combining curved edges with sharp angles using concrete and steel. Notable works include: Heydar Aliyev Centre.



Fossil Fuels:
 Pros: Produces large amounts of high power energy.
 Cons: Burning fossil fuels releases lots of CO2 emissions.

Wind:
 Pros: Does not burn fossil fuels so is considered non polluting.
 Cons: Weather dependent. If there is no wind, or too much wind, then the wind turbines cannot operate.

Nuclear Power (fission):
 Pros: Generates large amounts of power with very little fuel.
 Cons: Waste is radioactive and safe disposal is very difficult and expensive.

Tidal:
 Pros: Long lifespans, once built they will provide power for a long time.
 Cons: Negative impact on marine life and habitats.

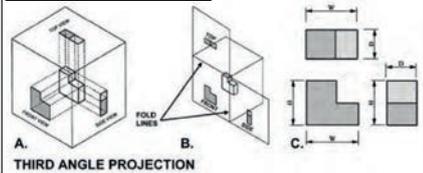
Solar energy:
 Pros: Does not burn fossil fuels so is considered non polluting.
 Cons: Weather dependent. If there is no sun the panels cannot convert sun light into energy.

Hydropower
 Pros: Hydropower is fuelled by water, so it's a clean fuel source, meaning it won't pollute the air like power plants that burn fossil fuels, such as coal or natural gas.
 Cons: In some cases, hydroelectricity can disrupt wildlife habitat.

Using tape: Advantages	Using tape: Disadvantages
Will not damage paper / card or cause it to warp as there are no liquids involved.	Difficult to remove if placed in the wrong position.
Tape can be applied prior to cutting out allowing adhesive to be positioned exactly to the edge of the paper / card.	Can have a low aesthetic appeal if visible on a product.

Existing Designers: Heatherwick Studio. Founded by Thomas Heatherwick in 1994. Heatherwick Studios employs over 250 people including architects, engineers, landscape architects and product designers who work collaboratively. Notable works include: The Vessel (Image above left)

Orthographic Drawing:



Scale: A drawing or model that is half the size of the original is of the scale 1:2. A model that is of the scale 1:50 would be 50 times smaller than the original, so for every 1mm on the model, it is 50 times bigger in reality.

Corrugated Board	Advantages	Disadvantages
Made from layers of fluted board sandwiched between paper outer layers.	Made from recycled pulp. It is also easily recycled. Lightweight and stiff.	Brown finish doesn't convey quality.

Foam Board	Advantages	Disadvantages
Foam is sandwiched between two layers of paper or card.	Rigidity means it is ideal for the walls in architectural models.	Not recyclable or biodegradable.

CAD: Computer Aided Design 

CAM: Computer Aided Manufacture 

Wood

Hardwoods	Softwoods
<ul style="list-style-type: none"> • Come from deciduous (leaf losing) trees. • Generally slower growing, making them denser (harder). • Some trees take up to 100 years to reach full maturity, this makes them expensive to buy. • Colours vary. 	<ul style="list-style-type: none"> • Coniferous (cone-bearing) trees. • Generally grow faster than hardwoods (reach maturity in 30 years). • Softer to work. • Cheaper than hardwoods.

Wood and Type	Grain Pattern	Properties	Uses	Aesthetics	Advantages	Disadvantages
Oak Hardwood		Hard Tough Durable High density	High-quality furniture Garden benches Boat building Veneers	Light-brown Distinctive growth rings Open grained	Finishes well Very hard but quite easy to work with	Contains an acid which corrodes steel
Mahogany Hardwood		Durable Medium density	Indoor furniture Interior woodwork Window frames Veneers	Reddish-brown colour	Finishes well Relatively easy to work	Prone to warping Some tropical types can be soft and fibrous
Ash Hardwood		Tough Flexible Good elasticity	Sports equipment Ladders Furniture Tool handles Veneers	Creamy white colour (often stained black) Open grained	Flexible Can be laminated (sliced into veneers which are then glued together and cramped around a former until dry)	Can become a bit splintered
Pine Softwood		Lightweight	Constructional woodwork (joists, roof trusses) Floorboards Children's toys Garden decking	Straight-grained but knotty Light in colour (cream/pale brown)	Appealing colour and grain pattern Grows relatively quickly in comparison to hardwoods Fairly strong but easy to work with Inexpensive	Prone to warping Knots can fall out and cause holes

Metals

Ferrous	Non-ferrous
<ul style="list-style-type: none"> • Consist of iron, carbon and other elements. • Most are prone to rusting. • Most can be picked up with a magnet (except stainless steel – designed not to rust and some grades are non-magnetic). 	<ul style="list-style-type: none"> • Don't contain any iron. • Aren't attracted to a magnet. • Don't rust when exposed to moisture (but they do tarnish and oxidise).

Metal and Type	Properties	Uses	Advantages	Disadvantages
Mild steel Ferrous 	Tough Malleable Magnetic	Structural steel girders Car body panels Nuts Bolts Furniture frames Gates	Easily worked and joined (even in a school workshop) Relatively cheap Widely available in numerous forms and sections Can be recycled	Will oxidise (rust) if left unprotected/ exposed to moisture Can only be case-hardened
Stainless steel Ferrous 	Hard Tough Excellent corrosion resistance	Cutlery Kitchen sinks Pots and pans Surgical instruments	Easily cleaned Does not need any surface finishing Can be recycled High-lustre finish	Difficult to use and join in a school workshop Specialist welding equipment needed for joining
Aluminium Non-ferrous 	Lightweight Soft Ductile Malleable Good conductor of heat and electricity Corrosion-resistant Light grey in colour	Window frames Kitchen foil	Easily drawn into thin wires and sheets Can be recycled	Expensive Difficult to weld (specialist equipment needed)
Copper Non-ferrous 	Malleable Ductile Good conductor of heat and electricity Corrosion-resistant Reddish-brown, but can turn green after exposure to oxygen	Electric cables Plumbing fittings and wires Hot water cylinders	Easily drawn into thin wires Can be recycled Can be easily soldered	Expensive Will tarnish (change colour) over time
Brass (alloy) 	Good resistance to corrosion Good fluidity, casts well Good conductor of heat and electricity Hard, yellow metal	Plumbing fittings Marine fittings	Can be polished to achieve a high-lustre finish Tougher than copper Can be recycled Easily cast and turned	Relatively expensive

Plastics

Thermoplastics	Thermosetting
<ul style="list-style-type: none"> Softened when heated and can be shaped when hot. The plastic hardens when cooled, but can be reshaped if heated up again. 	<ul style="list-style-type: none"> Heated and moulded into shape. Can't soften if reheated

Plastic and Type	Image	Properties	Uses	Advantages	Disadvantages
Acrylic Thermoplastic		<ul style="list-style-type: none"> Good impact strength (tends not to shatter but to break into big pieces) Lightweight Good electrical insulator Durable 	<ul style="list-style-type: none"> Ornamental fish tanks Baths and bathroom furniture Car indicator covers/ reflectors Machine guards 	<ul style="list-style-type: none"> Can be recycled Excellent environmental stability Polishes and finishes well Available in a wide variety of colours 	<ul style="list-style-type: none"> Relatively soft Scratches easily Poor chemical resistance Hard wearing, but will shatter if treated roughly (into big pieces)
High Impact Polystyrene (HIPS) Thermoplastic		<ul style="list-style-type: none"> Light but strong Tough/rigid Good electrical insulator 	<ul style="list-style-type: none"> Vacuum forming Outer casings on electronic products and packaging Food appliances Toys DVD and CD cases 	<ul style="list-style-type: none"> Light but strong Widely available in lots of colours/sheets Can be machined and painted Can be recycled 	<ul style="list-style-type: none"> Expensive Limited flexibility Will not biodegrade

Standard Components - Screws

Woodscrews are used to temporarily join two pieces of wood together. They are available in different lengths and diameters and are usually made from brass or steel. They also have different shaped heads for different applications.



When joining two pieces of wood together using wood screws...



- 1 Drill a pilot hole through both pieces of wood. This hole should be slightly narrower than the thread of the screw.
- 2 Drill a clearance hole through the top piece of wood. This hole should be slightly larger than the shank or thread of the screw.
- 3 If using a countersunk screw, a countersunk hole should be drilled to the depth of the screw.

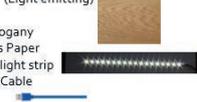


Tools and Equipment:

- Steel ruler
- Try square
- Marking out gauge
- Tenon Saw
- Router
- Pillar Drill
- Battery powered drill
- Scroll saw
- Hammer
- Bradawl
- Laser cutter
- Paint brush
- Sanding block
- Band Sander / Disc Sander
- Bench hook

Materials:

- Soft pine wood
- Vinyl (3 layers/ 3 colours)
 - Opaque, Transparent, Translucent (Light emitting)
- Oak
- Mahogany
- Glass Paper
- LED light strip
- USB Cable



Construction Methods:

- Wood screws (2 sizes)
- Wing nut
- Washers
- Coach bolts



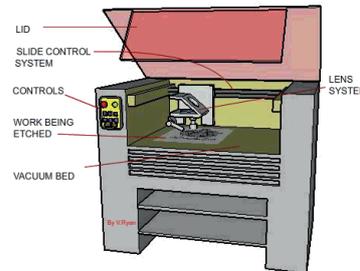
Finishing Methods/Techniques:

- Sanding (Stages are M2, F2, 00)
- Sanding sealtant
- Wax polish
- Staining
- Spray paint
- Laser cutter for engraving



Laser Cutting

Laser cutting / etching machines are quite simple in the way they work. The lens system that controls the position of the laser is itself moved by a motorised slide control system. This allows movement in any direction. The control system moves according to the programme being used by the machine. The diagram shows the LID open - however, the laser will not operate unless the lid is closed. This is a safety feature. The work/material being engraved or cut by the laser is held firmly in position on the bed.



The work/material is normally positioned in the top left corner as shown on the diagram below. The machine operates with three axes, X, Y and Z. The top left corner is regarded as coordinates (0,0,0), this is sometimes called zero point



Fabric	Advantages	Disadvantages
Plain Weave Cotton 	Breathable, Lightweight, Biodegradable, Easy to care for, Absorbent (good for dyeing)	Takes a long time to dry
Cotton Velvet 	Insulating, Soft, Luxurious sheen.	Difficult to care for, Not very durable.
Twill Weave Polyester (Synthetic) 	Strong, Durable, Drapes Well, Hydrophobic (does not absorb water) so quick drying, Easy to care for, Pleats/shapes can be set with heat-good for adding structure, Diagonal pattern on surface of fabric can be used to create patterns, Cheap to purchase as manmade.	Polyester can melt or misshape with high temperatures. Take care with aftercare.
PVC (Synthetic) 	Synthetic fibre, Plastic texture, Cheap to buy, Strong, Rigid, Lots of colours available including transparent	Difficult to work with due to rigid structure.
Cotton Terry Towelling 	Very absorbent due to the loops (takes a long time to dry), Interesting surface texture, Soft	Loops can snag. Takes a long time to dry.
Acetate Satin (Synthetic) 	Lustrous shine, Drapes well, Strong, Durable, Pleats/shapes can be set with heat-good for adding structure, Hydrophobic (does not absorb water) so quick drying.	Can snag easier than other weaves so not suitable for everyday wear.
Knitted Wool 	Insulating, Soft, Absorbent Natural elasticity, Lots of texture.	Takes a long time to dry, Heavy when wet, Expensive.
Cotton Lace 	Breathable, Absorbent, Lightweight, Easy to clean, Biodegradable, Lots of variations of intricate designs (good to add pattern and texture), Areas of pattern alongside sheer areas.	Delicate to work with. Can snag or pull easily.
Cotton Jersey knit 	Breathable, Stretchy Soft, Lightweight, Absorbent, Biodegradable, Crease Resistant	It doesn't retain its shape well when over stretched. Unravels if cut or snagged as made from one continuous yarn.
Cotton Denim (Twill weave) 	Breathable, Biodegradable, Easy to care for, Absorbent (good for dyeing), durable, diagonal twill surface adds pattern and texture.	Expensive, no stretch, heavy when wet, slow drying.
Cotton Corduroy 	Insulating, Soft, Biodegradable, Absorbent (good for dyeing), different cord thicknesses are available.	Medium durability, the pile cord can wear down with abrasion, takes a long time to dry.

Y9 Design Technology: Textiles Essential Knowledge Sheet



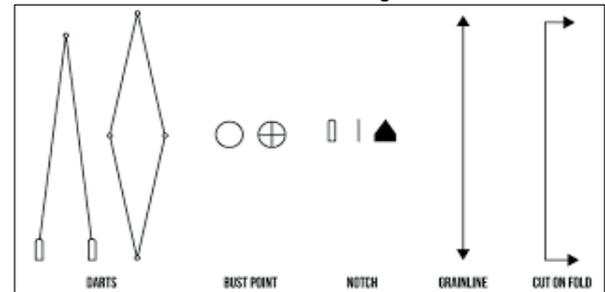
A component is something that is added to a garment to complete it. Below are some examples of components you may be interested in using.

Component	Information
Zip 	Metal or plastic, invisible or open. Easy to use for all ages. Secure. When broken cannot be fixed.
Buttons 	Available in a wide variety of different materials. Functional fastening good for adjustable sizes alongside being decorative. Choking hazard for young children.
Elastic 	Highly stretch and retain shape well. Good to use in waist bands and cuffs for a comfortable fit and to retain body heat.
Velcro 	Easy to use (so good for the young and elderly or for a quick fastening) but not very strong or durable.
Drawstring 	Drawstrings can be added into casing channels and used to tighten and fasten things such as trousers and bags. An easy fastening which can be adjusted to the users requirements. Drawstrings can be purchased in many colours and fibres and can be flat or circular.
Interfacing 	This is a piece of material that is ironed or stitched onto the inside of fabrics to add strength or structure. Used a lot inside collars and waistbands to help them maintain shape.

Decorative Technique	Information
Applique 	When you stitch one fabric to another, this adds colour, texture and decoration. This can be done by hand or machine.
Hand embroidery 	A range of decorative hand stitches to create a pattern/picture. These add colour, texture and uniqueness to a project but can be time consuming.
Sublimation printing 	Adding photos, pictures or text to a fabric. Sublimation printing ensures you achieve a realistic, professional finish and it is quick to do. Synthetic fibres give a better finish as colours are more vibrant.
Decorative Embellishment 	Sewing sequins, beads and buttons to the fabric to add decoration.
Piping 	Aesthetically pleasing trim which adds a pop of colour but also strengthens the seam.
CAD/CAM Embroidery 	Machine embroidery which is programmed by you and sewn by the machine-Quick and durable with a professional finish. Used in year 9 to write letters and numbers only.
Quilting 	Two layers of fabric sandwich a layer of wadding which is stitched in diagonal squares or with a decorative pattern. This traps air which is insulating alongside adding texture and decoration.
Tie dye 	A resist dyeing method which uses elastic bands or string to form a pattern. Tie dye adds colour and originality to a product but if not done correctly can look uneven and unprofessional. Natural fibres such as cotton must be used.
Patch pocket 	Both decorative and functional! A patch pocket is a pocket sewn onto the surface of a garment and can be produced in many shapes.

Construction Technique	Information
Pleats 	To add interest, texture and volume to a product. Knife, Box and Inverted are all different types of pleats you can add!
Darts 	Add shape to a garment to create the perfect fit! Single point, double point and French darts are different types of darts and positionings on garments.
Seams  	Used to stitch two pieces of a product together. Different seams can be used depending on the fabric and end use. Common seams are the plain seam which is cheap and quick to produce, the double stitched seam (sometimes called double felled) which is used on items that require strength such as jeans and coats and the French seam. Which is used on delicate fabrics
Gathers 	Adds volume and decoration to a product.

Pattern Markings



Sequin	Embroidery	Key Spellings	Synthetic	Sew
Aesthetically	Applique	Waist	Fibre	Seam
Design	Specification	Aesymetric	Hydrophobic	Luxurious
Scalloped	Lycra	Functional	Hydrophillic	Lusterous
Velcro	Durable	Tulle	Thermoplastic	Drape
Pattern	Occasion	Professional	Palette	Inspiration



Year 9 Food Preparation and Nutrition Essential Knowledge Sheet

eatwell 8 TIPS for HEALTHY EATING

- 1 Base your meals on starchy foods
- 2 Eat lots of fruit and veg
- 3 Eat more fish – including a portion of oily fish each week
- 4 Cut down on saturated fat and sugar
- 5 Eat less salt – no more than 6g a day for adults
- 6 Get active and try to be a healthy weight
- 7 Drink plenty of water
- 8 Don't skip breakfast

Healthy Food Swaps change 4 life

Changing just a few eating habits can make a big difference to your diet and is the healthiest way to lose weight. Eat less fat, salt, sugars, processed foods and high calorie foods. Swap them for something healthier, such as more fruit and vegetables (5 a day).

Find out more: www.nhs.uk/change4life/food-facts

Nutrient	Food Examples	Main Function in Body
Macronutrients - We need these in large amounts.		
Starchy Carbohydrates	Cereals, bread, rice, potatoes, pasta etc.	Give us slow release energy. (wholegrain versions are higher in fibre).
Protein	Meat, fish, eggs, nuts, seeds, pulses, lentils.	Growth, repair and maintenance of muscles.
Fat	Butter, lard, margarine, sunflower oil, olive oil etc.	Insulates our vital organs (heart, lungs etc) and keeps us warm.
Micronutrients - We need these in small amounts.		
Vitamins	Fruits and vegetables.	Help our immune system fight off illnesses and help us release energy from other foods.
Minerals		
Other Essential Nutrients		
Dietary Fibre (NSP)	Wholegrain cereals, fruit/vegetables, nuts/seeds etc	Helps our digestive system remove waste and avoid constipation.
Water	Keeps us hydrated, controls body temperature, helps digestion, gets rid of waste.	



All the **foods** on the **Eatwell Guide** give us a range of **different nutrients** which all do **different jobs** in our body.
Remember lots of foods provide more than 1 nutrient.

Health Issues Linked to Poor Diet	
Heart Disease CHD	Arteries become blocked with fatty deposits. Linked to saturated fats and obesity .
Obesity	A condition where the body has accumulated too much fat .
Type 2 Diabetes	A condition linked to too much processed sugar , obesity and lack of exercise.
Tooth Decay	Plaque builds up on teeth causing decay. Made worse by eating too much sugar .

Practical Dishes	Skills and Processes
	Swiss Roll Aeration, creating an egg foam which helps products to rise when baked. Checking for readiness. Filling and shaping.
	Fajitas. Knife skills. Stir frying. Checking for readiness (no pink chicken). Working with high risk foods (chicken). Assembling wraps.
	Pizza Rubbing in, kneading, shaping. Strong flour used for bread dough is high in a protein called gluten . Knife skills.
	Chilli –Con-Carne Dry frying meat. Vegetable preparation, knife skills. Control of hob. Food safety.
	Pasta and Cheese Sauce Boiling, simmering. Sauce making—gelatinisation of starch.
	Cheesecake Crushing, melting, aeration by mechanical whisking . Combining ingredients. Piping cream for decorative finish.
	Milestone Dish of choice Time management, organisation. Demonstration of skills. Use of cooker/oven/safety/hygiene.