Meden School Curriculum Planning							
Subject	GCSE D&T	**Year Group**	10	**Sequence No.**	Single Lessons	**Topic**	Core & specialist technical principles

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
☐ Retrieve knowledge from science, especially in relation to density and electrical/thermal conductivity. ☐ Use materials and applications students are familiar with to illustrate material properties and the use of materials because of these properties, (e.g.: why is stainless steel used for saucepans – thermal conductivity, hardness(not scratch from stirring), resistance to corrosion etc). ☐ Link with understanding of similar words in other contexts, (eg to compress something, garden 'shears' etc).	☐ Know and understand physical properties of absorbency (resistance to moisture), density, fusibility, electrical and thermal conductivity. ☐ Know and understand working properties such as strength, hardness, toughness, malleability, ductility and elasticity. ☐ Know and understand the physical and mechanical properties relevant to commercial products in their chosen area as follows. For 'resistant materials' focus students know for timber-based materials (e.g.: traditional timber children's toys and flat pack furniture), for metal-based materials (e.g.: cooking utensils and hand tools), for polymers (e.g.: polymer seating and electrical fittings). For 'textiles' focus students know for textile-based materials (e.g.: sportswear and furnishings). ☐ Know, with examples, that the properties of these materials can be modified, e.g. Seasoning to reduce moisture content of timbers (timber-based materials), annealing to soften material to improve malleability (metal-based materials), stabilisers to resist UV degradation (polymers), flame retardants reduce combustion and fire hazards (textile-based materials). ☐ Know the meaning of tension, compression, bending, torsion and shear in relation to forces and stresses upon materials. ☐ Know in relation to the area of material specialism that/how materials can be enhanced to resist and work with forces and stresses to improve functionality. Specifically, how materials can be reinforced, stiffened or made more flexible: e.g. by lamination, bending, folding, webbing, fabric interfacing.	☐ Often the materials with the most desirable qualities are the most expensive. As a result, lower cost products often perform less well causing the least affluent consumers to suffer the most. Discuss potential strategies to address this issue.

☐ Use physical examples students are familiar with and ask … why like this? ☐ Retrieve knowledge from KS3 and the timbers/manufactured boards used there. ☐ Retrieve knowledge in relation to flat pack(Ikea) furniture to raise existing understanding of types of KD fittings. ☐ Retrieve knowledge from Science and the periodic table. Those 'metals' that are on the periodic table are pure metals … those that are not are alloys. ☐ Retrieve knowledge from KS3 and the polymers used there.	☐ Know the main categories and types of papers and boards. Papers knowledge should include bleed proof paper, cartridge paper, grid paper, layout paper and tracing paper. Boards knowledge should include corrugated card, duplex board, foil lined board, foam core board, ink jet card and solid white board. ☐ Knowledge of the main categories and types of natural and manufactured Timbers. Hardwoods covered must include ash, beech, mahogany, oak and balsa. Softwoods covered must include larch, pine and spruce. Manufactured boards covered must include medium density fibreboard (MDF), plywood and chipboard. ☐ (RM focus only) Know the commercially available types and sizes of timber-based materials including planks, boards and standard mouldings. That they are typically sold by length, width, thickness and diameter. Know the standard components e.g. woodscrews, hinges and KD fittings that are used with this material type. ☐ Knowledge of the main categories and types of metals and alloys. Ferrous metals knowledge must include low carbon steel, cast Iron, and high carbon/tool steel. Nonferrous metals knowledge must include aluminium, copper, tin and zinc. Knowledge of alloys must include brass, stainless steel and high-speed steel. ☐ (RM focus only) Know the commercially available types and sizes of metal-based materials including sheet, rod, bar and tube. Know that they are typically sold by length, width, thickness and diameter. Know the standard components e.g. rivets, machine screws, nuts, and bolts that are used with this material type. ☐ Knowledge of the main categories and types of polymers. Thermoforming polymers knowledge must include acrylic (PMMA), high impact polystyrene (HIPS), high density polythene (HDPE), polypropylene (PP), polyvinyl chloride (PVC) and polyethylene terephthalate (PET). Thermosetting polymers knowledge must include epoxy resin (ER), melamine-formaldehyde (MF), phenol formaldehyde (PF), polyester resin (PR) and urea-formaldehyde (UF). ☐ (RM focus only) Know the commercially available types and sizes of polymers including sheet, rod, powder, granules, foam and films. Know that they are typically sold by length, width, gauge and diameter. Know the standard components e.g. screws, nuts and bolts, and hinges that are used with this material type.	☐ Discuss FSC approval of papers, boards and timbers and why as consumers this is something we should look for. ☐ In relation to KD fitting, (relate to Ikea products) discuss the environmental benefits of furniture being shipped in 'flat pack' form. ☐ Discuss the dangers of plastic pollution, particularly in the oceans. Discuss strategies for reducing the use of plastics individually and collectively.

☐ Retrieve knowledge from KS3 and the textiles used there. ☐ Link with knowledge od existing products with which students are familiar and ask 'why was that material used there …. why did they not use …'. ☐ Retrieve knowledge from geography in relation to the environmental impact of consumption etc. ☐ Link with the concept of 'food miles' that students may well be familiar with. ☐ Link with the understanding od the word 'infinity' either from maths or from	☐ Knowledge of the main categories and types of textiles. Natural fibres knowledge must include cotton, wool and silk. Synthetic fibres knowledge must include polyester, polyamide (nylon) and elastane (lycra). Blended and mixed fibres knowledge must include cotton/polyester. Woven textiles knowledge must include plain weave. Non-woven textiles knowledge must include bonded fabrics and felted fabrics. Knotted textiles must also be included. ☐ (Textiles focus only) Know the commercially available types and sizes of textile-based materials including yarns and fabrics. Know that they are typically sold by roll size, width, weight and ply. Know the standard components e.g. zips, press studs and Velcro that are used with this material type. ☐ In relation to the material specialism, know how to select materials and components considering the factors of functionality (application of use, ease of working), aesthetics (surface finish, texture and colour), environmental factors (recyclable or reused materials), availability (ease of sourcing and purchase) cost (bulk buying), social factors (social responsibility), cultural factors (sensitive to cultural influences) and ethical factors (purchased from ethical sources such as FSC). ☐ In relation to the material specialism, know and understand the primary sources of materials and the main processes involved in converting into workable forms. For timber-based materials this should include seasoning, conversion and creation of manufactured timbers. For metal-based materials this should include extraction and refining. For polymers this should include refining crude oil, fractional distillation and cracking. For textile based materials this should include obtaining raw material from animal, chemical and vegetable sources, processing and spinning. ☐ Know the ecological issues in the design and manufacture of products including deforestation, mining, drilling and farming. The effect of the mileage travelled moving the materials/components used in the product from raw material source, to manufacture, distribution and user locations and then also at final disposal. Also, an understanding that carbon is produced during the manufacture etc of products. ☐ Understand the impact of resource consumption on the planet, considering the fact that some resources are finite and others non-finite. Also consider the impacts of the disposal of waste.	☐ Discuss the volumes of water used in processing and producing textiles and the environmental drain that this is. Also the moral/ethical implications of 'fast fashion' and the steps we as consumers can take to combat this.

popular culture, ('To infinity and beyond – Buz Lightyear!) ☐ Link with current affairs and items from the news in relation to retailers whose product have been found to be made in sweatshops, and plastics in the ocean etc. ☐ Link with students current understanding of the term 'tolerance' (accepting difference etc). ☐ Retrieve knowledge from KS3 and the concurrent skills board activities, e.g. injection moulding the Y9 lamp feet, pewter casting etc. ☐ Link with products with applied finishes with which students are already familiar. ☐ Link with students current knowledge in relation to driverless cars and technologies such as facetime, teams and zoom that are enabling 'work from home' etc.	☐ Know the meaning, (and examples of the employment of) the six 'R's' of reduce, refuse, re-use, repair, recycle and rethink. ☐ Know the social issues that should be considered in the design and manufacture of products including safe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others. ☐ Know about 'Scales of production' and how products are produced in different volumes. Know the reasons why different manufacturing methods are used for different production volumes including prototype, batch, mass and continuous. ☐ Know, (in relation to the specific material(s) specialism of the class) How materials are cut shaped and formed to a tolerance with the manufacture being to minimum and maximum measurements. ☐ Know commercial processes in relation the classes area of material specialism, (Timber based materials (routing and turning). Metal based materials (milling and casting). Polymers (injection moulding and extrusion). Textile based materials (weaving, dying and printing). ☐ Know (in relation to material specialism) how quality control is applied and used during manufacture, including Timber based materials (dimensional accuracy using go/no go fixture). Metal based materials (dimensional accuracy using a depth stop). Polymers (dimensional accuracy by selecting correct laser settings). Textile based materials (dimensional accuracy checking a repeating print against an original sample). ☐ Know (in relation to material specialism) the preparation and application of treatments and finishes to enhance functional and aesthetic properties. Specifically, for timber-based materials (painting, varnishing and tanalising). For metal-based materials (dip coating, powder coating and galvanizing). For polymers (polishing, printing and vinyl decals). For textile-based materials (printing, dyes and stain protection). ☐ Know the impact of new and emerging technologies on the design and organisation of the workplace including automation and the use of robotics, on buildings and the place of work, and on tools and equipment. ☐ Know the meaning of various enterprise methods that can be used the development of an effective business innovation including crowd funding, virtual marketing and retail, co-operatives and fair trade.	☐ Discuss examples from the media of retailers being found selling products produced in unsafe working conditions. Discuss what we as designers and consumers can do to combat such practices. ☐ Link with food waste and the fact that huge amounts of perfectly good food goes to waste because it is visually 'out of tolerance' (slightly not straight etc. ☐ Consider in a positive way how automation, computer-controlled manufacture etc has caused changes to the workforce and the types of jobs/working conditions people now do/work in. - What has/is changing?

☐ Use products such as Toyota Prius (market pull) and touch screen phones (technology push) with which students will be familiar. ☐ Retrieve knowledge from KS3, and the concurrent skills board activity in relation to CAD/CAM. Link automation with knowledge of driverless cars etc. ☐ Retrieve knowledge from science in relation to power generation, nuclear, etc.	☐ Know how people can affect, and be affected by new and emerging technologies including how technology push/market pull affects choice; and how changing job roles due to the emergence of new ways of working are often driven by technological change. ☐ Know how culture can affect, and be affected by new and emerging technologies including changes in fashion and trends in relation to new and emergent technologies; and respecting people of different faiths and beliefs. ☐ Know how society can affect, and be affected by new and emerging technologies including how products are designed and made to avoid having a negative impact on others, specifically by design for disabled, elderly and different religious groups. ☐ Know, with examples the positive and negative impacts new products have on the environment including via continuous improvement, efficient working, pollution and global warming. ☐ Know how production techniques and systems can affect, and be affected by new and emerging technologies including the contemporary and potential future use of automation, computer aided design (CAD), computer aided manufacture (CAM), flexible manufacturing systems (FMS), just in time (JIT) and lean manufacturing. ☐ Know how the critical evaluation of new and emerging technologies informs design decisions and that it is important to consider scenarios from different perspectives considering, planned obsolescence, design for maintenance, ethics, and the environment. ☐ Know and understand how energy is generated and stored and how this is used as the basis for the selection of products and power systems. Specifically, in relation to fossil fuels students should know how power is generated from coal, gas and oil and the arguments for and against the selection/use of fossil fuels. In relation to nuclear power, how nuclear power is generated and the arguments for and against the selection of nuclear power. In relation to renewable energy how power is generated from wind, solar, tidal, hydro-electrical, and biomass, and the arguments for and against the selection of renewable energy. ☐ Know and understand different energy storage systems including kinetic pumped storage systems; and alkaline and re-chargeable batteries.	- Who benefits from these changes? - Could there be a downside - Who may lose out from these changes? - Are there particular elements of society that are most hard hit? Development of a plan/strategy for those at risk of being 'left behind'. ☐ The need for commitment to achievement, and also 'up to date/life-long learning' in order to remain skilled for the future workforce. ☐ How the principles of computer control are being applied more and more widely in our daily lives. Consider/discuss the benefits (and potential pitfalls). - Companies collecting data about us and promoting products to us that we might be interested in. - Are computers always right? Do they always make the best decisions? Does this mean the technology should not be used? How can this technology be improved in the future? - Self-driving cars – how will this technology potentially benefit us in the future? - The moral and legal responsibilities when something goes wrong, (e.g. the Boeing Max8 airplane crashes. Who is responsible? (the pilot flying the aircraft, the airline who own the aircraft, the manufacturer of the aircraft, the passengers who chose to fly …?).

☐ Retrieve knowledge from KS3 in relation to the e-textiles light vessel module. ☐ Retrieve knowledge from KS3 in relation to the electronics nightlight module, and also from related science lessons. ☐ Retrieve knowledge from KS3 in relation to the mechanisms/automata module.	☐ Know about the developments in new materials. Specifically, in relation to modern materials know about the developments made through the invention of new or improved processes e.g. Graphene, Metal foams and Titanium. Also, in relation to alterations made to materials to perform a particular function e.g. Coated metals, Liquid Crystal Displays (LCDs) and Nanomaterials. ☐ Know about the developments in new materials. Specifically, in relation to smart materials and that these materials can have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or PH e.g. shape memory alloys, thermochromic pigments and photochromic pigments. ☐ Know about the developments in new materials. Specifically, in relation to composite materials and that composite materials are produced by combining two or more different materials to create an enhanced material e.g. glass reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP). ☐ Know about the developments in new materials. Specifically, in relation to technical textiles and how fibres can be spun to make enhanced fabrics e.g. conductive fabrics, fire resistant fabrics, Kevlar and microfibres incorporating micro encapsulation. ☐ Know and understand how electronic systems including programmable components are used to provide functionality to products and processes, and enhance and customise their operation. Specifically, in relation to inputs know about the use of light sensors, temperature sensors, pressure sensors and switches. In relation to processes, know of the use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes. In relation to outputs, know about the use of buzzers, speakers and lamps, to provide functionality to products and processes. ☐ Know about the different types of movement and the functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements. ☐ Know the mechanisms used to change the magnitude and direction of movements/force. Specifically, by using levers, (first order, second order and third order), linkages (bell cranks, and push/pull) and rotary systems, (CAMs and followers, simple gear trains, and pulleys and belts).	☐ Discuss the problems and opportunities relating to e-waste. What can we do as designers and consumers to address these.