OCL D&T: Long Term Plan

Brief overview
Year 7: ***Investigate, iterate, ignite.***
It is highly likely that students will transition into Year 7 with a vast range of D&T experiences, skills and knowledge, and some with none. It is therefore vital that teachers work closely with students to affirm and acknowledge all prior D&T learning (formal – through Primary school experiences, and informal – outside of school e.g., Cubs, clubs, online Minecraft) and to ensure that those who have previously developed skills and understanding can use them in lesson and are signposted to extracurricular activities, as appropriate.
D&T in Year 7 initially aims to ignite students' curiosity, foster their critical thinking abilities, and nurture their designing and technological skills. We aim to build creative confidence by working both independently and collaboratively through a design process and across a range of contexts. We also look to begin to foster student decision making, starting with highly constrained problems to address, and moving towards more open-ended design opportunities.
A core theme of product analysis will underpin each ½ term, moving from single material product to complex multi-material products. Year 7 will include a balance of the following areas: designing, making, designing + making, considering wider consequences, developing technical knowledge, and experiencing materials.
Students are introduced to CAD technology through focused tutorials, through to short projects.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
This framework recognises the many unique issues that D&T departments face – rooming, equipment, staffing, carousels, budgets etc therefore this is a long-term plan.						
Food : 1 x ½ term module is defined as being for "Cooking & Nutrition" but other modules can be contextualised for delivering in a specialist Food room e.g. Year 7 Spring 2						
Unit title	**Make > test > iterate**	**Intro to CAD (Design)**	**Food & Nutrition**	**Make > test > iterate**	**Designing + Wider consequences**	**Design and prototype (> test > iterate)**
Relevant core concepts	Making Considering consequences of D&T	Designing Technical knowledge	Considering consequences of D&T Making	Making Considering consequences of D&T	Designing Considering consequences of D&T	Designing + making

	Materials			Materials		
Indicative knowledge (subject to confirmation)	General D&T vocabulary (tier 2) Working within and meeting constraints Using part of an iterative design process (make > test > iterate) Understanding and using materials and manipulating them using simple hand tools Product analysis – single material product	CAD D&T vocabulary (tier 3) Using, moving, and manipulating shapes in 3D Combining, arranging, and modifying shapes Exploring the relationship between 2D and 3D Simulating in CAD Presenting & explaining a CAD design	Food D&T vocabulary (tier 2) Food hygiene and safety Explore food provenance. Acquire and demonstrate simple food preparation and cooking techniques Product analysis – single material product, ergonomics and material focus	General D&T vocabulary (tier 2) Working within constraints – with one or two decision making options Use part of an iterative design process (make > test > iterate) Understanding and using materials and manipulating them using tools Product analysis (case study) – single material product	General D&T vocabulary (tier 2) Designing for self or peers Learning and using a range of design techniques Learning and using a range of Design Thinking strategies Giving and receiving critique Judging and justifying potential consequences of design decisions	General D&T vocabulary (tier 2) Designing for others, meeting design constraints Prototyping tools and techniques Reflecting on design process and outcomes
Relevant end points	M1, Mat1, WC1, WC2	D3, M3, WC3	Mat1, WC1, M1	M1, Mat1, WC1, WC2	D1, D2, WC2	DM3, D2, D3
Core declarative knowledge *facts or information stored in the memory*	Gaining knowledge of: - Design process vs outcome - Design constraints - Benefits and drawbacks of an iterative approach What something is made from (availability, properties etc)	Gaining knowledge of: - Using 3D shapes - Manipulating shapes - Arranging shapes - Modifying and joining shapes Advantages and disadvantages of CAD vs alternatives	Gaining knowledge of: - safe and hygienic working practices - where food comes from and how it is used. - The tools and equipment use to prepare and process food.	Gaining knowledge of: - Types of design constraint (subjective vs objective) Specific materials the tools/equipment that are suitable to manipulate them + non-examples.	Gaining knowledge of: - User Centred Design techniques - A wider range of designing and Design Thinking strategies and judging their appropriateness.	Gaining knowledge of: - rapid prototyping principles [to meet design criteria quickly and efficiently]

Core procedural knowledge *the knowledge exercised in the performance of a task*	Getting better at: - Measuring - Cutting - Refining, Assembling - Finishing - Testing to inform iterative design	Getting better at: - Navigating a 3D workspace - Identifying opportunities to use CAD - Meeting design constraints	Getting better at: - Using Food Technology tools and equipment - Using a Food Technology vocabulary - Following recipe procedures and judging taste, favour, temperature etc	Getting better at: - using Design Thinking methodologies to analyse products e.g. ACCESSFM - - developing techniques to use tools and equipment effectively	- The process and value of Design Critique - How to identify and quantify some aspects of the consequence(s) of design decisions.	- prototyping materials, tools, processes, and techniques
Hinterland knowledge *the extra contextual knowledge needed to be able to understand key concepts or vocabulary*	Developing an understanding of: - the complex nature of materials selections - the compromises designers must make - - the consequences of design decisions, including on the environment	Developing an understanding of: - the fundamentals of CAD systems and their applications - the opportunities and limitation of using CAD as a design tool - - the links from CAD to other subjects e.g. geometry, Physics	Developing an understanding of: - the lifecycle of foods and ingredients - the consequences of unsafe of unclean food preparation - the skills and precision used in food preparation using specific equipment	Developing an understanding of: - the vast complexity of even seemingly simple products lifecycles - the “black box” nature of the systems behind manufactured products - how we make judgements of cost v value (and perceived quality)	Developing an understanding of: - the need to design for others, not self. - - the interrelation between design decisions and the downstream environmental and social consequences.	Developing an understanding of: - creative prototyping examples occurring post criteria definition / within narrow constraints - - how to ask for, and get, useful feedback

Brief overview
Year 8: *Create, collaborate, critique.* The Year 8 curriculum build upon the foundations laid in Year 7 and aims to develop increased mastery in the following areas: designing, making, designing + making, considering wider consequences, developing technical knowledge, and experiencing materials. They will also start to use a specific D&T vocabulary with confidence and accuracy. Students will continue to develop mastery of CAD technology by interleaving its use across all terms. Year 8 is also a great time to start to develop students' decision-making agency, so tasks will start to include an element of ambiguity that students will need to grapple with and make decisions based on their experience of D&T in Year 7 and their work in other subject areas e.g. Maths and Physics. In Year 8 we will start to move toward designing for "others" (as opposed to for "self") which will mean collaborating with others and using "soft-skills" such as asking for and receiving critique and feedback. This will be framed within the framework of an iterative design process to facilitate quick cycles of designing + making. Product analysis will continue to be a core stand and we will start to explore more complex products, and their impact on both the environment and the economy.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Unit title	**Food & Nutrition**	**Making + materials**	**CAD + Wider consequences**	**Designing + making**	**Designing**	**Materials + Wider consequences**
Relevant core concepts	Considering consequences of D&T Making Materials Technical Knowledge	Making Materials	Designing Considering consequences of D&T	Designing + making	Designing	Materials Considering consequences of D&T
Indicative knowledge	LCA – ingredient e.g. sugar Food D&T vocabulary (tier 2 & 3)	Structures + mechanisms materials + testing Bridges, towers etc…	CAD + CAM Simulation Design optimisation	Pre-defined design criteria > design and make to meet criteria. Systems approach + electronics (robotics?)	Defining some design criteria Designing for others	Product analysis LCA "Miracle" materials e.g. Secrets of the Super

	Food hygiene and safety Acquire and demonstrate food preparation and cooking techniques + nutrition Product analysis – laminated packaging (tetra Pak) materials focus / or mechanical product e.g. rotary whisk -material focus	Tier 2 vocabulary			Iterative design based on feedback Redesign considering materials	Elements - Indium, Lithium etc
Relevant end points	M1 WC1 Mat 1 TK1	Mat 2 TK1 M1	D1 DM2	DM1 Mat 1 TK2	D2 M3	Mat 1 Mat 2 WC2
Core declarative knowledge *facts or information stored in the memory*	Gaining knowledge of: - the lifecycle of specific ingredients and food related products e.g. packaging - safe and hygienic working practices - The tools and equipment use to prepare and process food, including mechanical devices.	Gaining knowledge of: - specific material properties (hardness, toughness, ductility, malleability) - techniques, materials and joining methods designers and engineers use to create strength and structural integrity - types of structures e.g. mass, frame, shell	Gaining knowledge of: - benefits and limitations of CAD in a design process - ways in which CAD can be used to optimise designs - the relationship between CAD and CAM including requirements of designs for CAM, e.g. laser cut, or 3D print - how to use simulations features in CAD to test and iterate	Gaining knowledge of: - interpreting pre-designed criteria - using design criteria as creative" guiderails" - the systems approach (input > process > output + feedback) as a framework for understanding and creating complex systems	Gaining knowledge of: - ideation frameworks and specific techniques - defining design criteria using research - principles of User Centred Design - how material properties effect (affect?) design decisions	Gaining knowledge of: - the lifecycle and impact of specific materials - specific notable properties humans exploit to gain functionality

Core procedural knowledge *the knowledge exercised in the performance of a task*	Getting better at: - Measuring - Cutting - Refining - Assembling - Finishing - Testing to inform iterative design	Getting better at: - Measuring with precision - Cutting with repetitive accuracy - Refining - Assembling - Testing to inform iterative design	Getting better at: - Creating in 3D workspace - Manipulating shapes to create forms that solve design problems - How to meet (and test) design constraints - Preparing and exporting files for CAM	Getting better at: -Ideating using Design Thinking techniques and methods -Using electronics and programmable microprocessors to add functionality and meet design criteria - applying procedural knowledge from other subjects in service of a design problem e.g. Computing	Getting better at: - applying techniques to ask for and give effective design critique - how to make reasoned and balanced design decisions - selecting appropriate communication techniques for different uses	Getting better at: - analysing products using analysis frameworks [e.g. ACCESS FM] - identifying and justifying materials, components, ingredients, joining methods etc - making links to wider impacts of design decisions (positive and negative)
Hinterland knowledge *the extra contextual knowledge needed to be able to understand key concepts or vocabulary*	Developing an understanding of: - the friction between food packaging increasing usage times and environmental impacts of material usage - the compromises of selecting and using ingredients depending on a hierarchy of criteria e.g. cost vs calories or availability vs scalability	Developing an understanding of: - the ways in which humans design, make and use structures - how and why structures fail, and the consequences - the compromises of material selections e.g. cost vs longevity or availability vs environmental impact	Developing an understanding of: - the opportunities e.g. economic of CAD and CAM on micro-manufacture and prototyping - the potential future applications of CAD and CAM - the ways in which CAD and CAM underpin the modern manufacturing and related industries	Developing an understanding of: - the vast complexity of electronic systems, but the underpinning of those with 'systems principles' - the embedded functionality that programmable microprocessors provide - the relationship between discreet components, coding, electro and electro-mechanical products	Developing an understanding of: - real life, relatable examples of design constraints in action e.g. aeroplane seats, sports equipment, phone chargers - products that leverage unique properties of materials -	Developing an understanding of: - the assumptions that it is necessary to make to analyse the lifecycle of products due to their myriad complexity e.g. supply chains - examples of the unique functionality that specific materials can offer, but the issues of areas like availability of ethical sourcing

Year 9: ***Engage, extend, embed.***

Year 9 for some will be the last time they formally study D&T, while for others it will be the springboard towards KS4, 5 and further study of D&T related subjects. For the former group Year 9 is designed to foster an understanding and appreciation of the myriad ways in which humans affect each other and the planet through their

actions and choices. For the latter group we will continue to grow confidence and agency in using a design process and develop a mastery approach to using D&T specific tools.

Throughout we will oscillate our perspective from micro-decisions to macro-systems.

Product analysis will continue to be a signature technique as we explore the form, function and lifecycles of highly complex products, and their impact on the environment, culture/society and the economy.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Unit title	**Materials + Wider consequences**	**CAD + making (CAM)**	**Food & Nutrition**	**Design + make**	**CAD Design + Wider consequences**	**Design + make**
Relevant core concepts	Considering consequences of D&T Materials Technical Knowledge	Designing + making Materials Technical Knowledge	Considering consequences of D&T Making Materials	Making Materials Technical Knowledge	Designing Materials + making Technical Knowledge	Designing + making Materials Technical Knowledge
Indicative knowledge	Systems thinking Miracle materials & products e.g. Kevlar, silk, lithium Product analysis: Fairphone LCA	Electronics + electro-mechanical Product analysis: Furby / food processor	QA/QC Designing for demographic groups / extreme needs Embodied water / CO2 / energy Product analysis: food processor / air fryer	Structures	Generating constraints Design > make > optimise > redesign	
Relevant end points	Mat 1 Mat 3 WC1 TK2	D3 M3 DM3 WC2 TK1	WC2 M1 M2 Mat 2	DM2 TK1 Mat1	DM3 TK3 M3 TK2	D3 M3 DM3 TK3 M3
Core declarative knowledge	Gaining knowledge of:	Gaining knowledge of:	Gaining knowledge of:	Gaining knowledge of:	Gaining knowledge of: - how to generate and use objective and	Gaining knowledge of:

facts or information stored in the memory	- the Systems Approach / Systems Thinking - "miraculous" properties of materials - the ways in which technologies impact culture, society and the plant (for good and bad)	- the relationship between CAD and CAM - using CAD to understand and design electronic and electro-mechanical systems - how electro-mechanical systems interact (motors, solenoids, relays etc)	- the needs and wants of demographic groups - design methods to meet the needs of extreme users - principles of Quality Control and Quality Assurance - the hidden (embodied) costs of food - ways to automate or mechanise processes to improve quality	- how designers and engineers create strength - how structures fail - the concept of structural integrity	subjective design constraints - a range of testing strategies to inform iterative designing - design decisions can have significant LCA impacts "downstream" e.g. repairability / use of adhesives / selection of materials	- creative risk taking, including factoring in time. - how to ideate, develop and iterate prototypes - how to select combinations of materials, tools and equipment
Core procedural knowledge *the knowledge exercised in the performance of a task*	Getting better at: - analysing complex systems into their constituent sub-systems and individual parts - analysing products including their systems	Getting better at: - using advanced CAD tools to develop prototype solutions to defined problems - using CAD to virtually test and optimise prototypes - identifying mechanical and electronic parts	Getting better at: - testing using QC and QA procedures - using mechanised or (semi) automated tools and equipment - investigating "hidden" aspects of food, for example embedded CO2	Getting better at: - cutting and joining materials - setting-up and carrying out controlled tests - observing and analysing modes of failure	Getting better at: - selecting and applying CAD tools and techniques to suit design challenges - selecting materials and prototyping / manufacturing techniques	Getting better at: - working in and though a design process - confidently making design decisions based on prior knowledge - using tools, equipment and materials to develop prototypes.

Hinterland knowledge *the extra contextual knowledge needed to be able to understand key concepts or vocabulary*	Developing an understanding of: - the vast complexity of products - compromises of functionality, availability, supply chains etc - ways in which electro-mechanical systems operate and interact (hardware + software) - design strategies like modularity and concepts of obsolescence	Developing an understanding of: - virtual testing & simulation as techniques in the iterative design process - Design Optimisation techniques - scales of manufacture and CNC / CAM in production	Developing an understanding of: - using demographic data sets - extreme examples of embodied costs e.g. water in beef - scales of manufacture in relation to QC and QA	Developing an understanding of: - types of loads and contact forces - famous structural failures and their reasons e.g. Comet, Tacoma Narrows - ways in which structural failure is desirable and intentional	Developing an understanding of: - the role of design constraints in various contexts e.g. F1 rules, budgetary limits (Pound Shop), Fairtrade standards - methods presenting digital designs e.g. storytelling, rendering	Developing an understanding of: - the role of prototypes in a commercial design / engineering process - how designers present ideas using a range of media -