

Scheme of work: Year 9

This resource is an example of a scheme of work for GCSE Design Technology (8552) aimed at Year 9. This scheme of work is intended as a suggestion only and not as a prescriptive approach. You may wish to amend and adapt the material contained in this resource in the way that best suits the needs of your students.

Term 1: Moving toy

Week 1

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| Key idea | Specification content | Learning activity and resources |
| Material categories  Key names of materials and their properties  Students to record core technical principles for the External assessment – Section A | 3.1.6 Materials and their working properties | Timbers.  A range of products and material samples can be used to assess prior knowledge from Key Stage 3. What names and categories are already understood?  Build theory knowledge through note taking activities – research packs on hardwoods, softwoods, manufactured boards – used to collect and record information.  Discussion of properties and demonstration with the material samples of some of these properties.  Students look at moving toys made of a variety of timbers and identify which timber has been used and why.  Links made to sources and origins, finite/non-finite resources (3.1.1, 3.2.4). |
| Material categories  Key names of materials and their properties  Students to record core technical principles for the External assessment – Section A | 3.1.6 Materials and their working properties | Metals.  Discussion of the three main categories – their characteristics.  Metal samples and magnets on desks – student to categorise the samples in front of them into ferrous and non-ferrous.  Build theory knowledge through note taking activities – research packs on ferrous, non-ferrous and alloys – used to collect and record information.  Students look at moving toys and identify where metals have been used in their manufacture and why.  Links made to sources and origins, finite/non-finite resources (3.1.1, 3.2.4). |

Week 2

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| Key idea | Specification content | Learning activity and resources |
| Material categories  Key names of materials and their properties  Students to record core technical principles for the External assessment – Section A | 3.1.6 Materials and their working properties | Polymers.  Discussion of when polymers replace other materials and why? This should link into the properties that these materials have.  Analysing common products that we use every day and discussing the specific type of polymers, names, types and properties.  Demonstration of heating and processing thermoforming polymers to understand plastic memory.  Note taking used to record information.  Students look at moving toys made of a variety of polymers and identify which polymer has been used and why.  Links made to sources and origins, finite/non-finite resources (3.1.1, 3.2.4). |
| Material categories  Key names of materials and their properties  Students to record core technical principles for the External assessment – Section A | 3.1.6 Materials and their working properties | Textiles.  Categorisation of textiles, examples shown and discussion of findings.  Information and samples of various textile types and categories spread out in classroom. Students work in pairs to collect information. Resource and revision material collated.  Garments shown and identification of textiles discussed based on their findings.  Students look at moving toys made of a variety of textiles and identify which textiles have been used and why.  Links made to sources and origins, finite/non-finite resources (3.1.1, 3.2.4) |

Week 3

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| Key idea | Specification content | Learning activity and resources |
| Sketching  Modelling | 3.3.4 Design strategies | Design brief given (3.3.1) and analysed.  Use of mixed materials is discussed according to facilities and teacher direction.  Students produce design solutions for a moving toy (autometer, pull along toy etc.) A more guided approach taken with this outcome as it is the first project.  Annotation used to justify all design decisions – theory of materials and mechanical devices used to assist.  Sketching techniques discussed and practiced.  Peer assess. |
| Sketching  Modelling | 3.3.4 Design strategies | Discussion of different ways designers develop ideas. Examples shown of methods of modelling and sketching to communicate ideas.  Techniques explored and practiced to encourage students to work quickly and without worrying about making sketches and models perfect. |

Week 4

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| Key idea | Specification content | Learning activity and resources |
| Types of motion  Names of common mechanisms  Students to record core technical principles for the External assessment – Section A | 3.1.5 Mechanical devices | Whiteboard activity – think of the main types of motion. Visual aids could be used as prompts (sewing machine, see saw, pendulum, wheel).  Record key information.  Discuss the use of mechanisms within products and machines, identify key mechanisms by name. Examples of products shown and analysed to understand the use of mechanisms.  Record key information. |
| Names of common mechanisms and changing direction of force. | 3.1.5 Mechanical devices | Re-visiting names and types of mechanism and motion.  Using card (templates) and split pins model classes of levers, linkages and gear trains.  Working examples of mechanisms produced to embed understanding.  Links to maths for the external assessment possible. Looking at gear ratios, calculating angles in degrees, action of forces. |

Week 5

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| Key idea | Specification content | Learning activity and resources |
| Sketching  Modelling | 3.3.4 Design strategies | Students continue to produce design solutions for a moving toy (autometer, pull along toy etc.) A more guided approach taken with this outcome as it is the first project.  Annotation used to justify all design decisions – theory of materials and mechanical devices used to assist.  Peer assess. |
| Selecting the correct tools and equipment for a range of materials. | 3.3.9 Use appropriate marking out methods, data points and coordinates  3.3.10 Specialist tools and equipment | Use of whiteboards to name tools linked to the 4 material areas being looked at in this project.  Stations set up with instructions at each and sample materials. In pairs students use the machines/tools to mark out, cut and shape materials. All material areas included.  Samples could be photographed for revision booklets. |

Week 6

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| Key idea | Specification content | Learning activity and resources |
| Sketching  Modelling | 3.3.4 Design strategies | Post-it notes – assess the stability of the toy and materials within their design (using the theory work).  Develop design ideas further taking all theory into account: materials, mechanisms, aesthetics etc. |
| Sketching  Modelling | 3.3.4 Design strategies | Post-it notes – assess the stability of the toy and materials within their design (using the theory work).  Develop design ideas further taking all theory into account: materials, mechanisms, aesthetics etc.  Evaluation of their work to improve outcomes.  Justify all modifications made. |

Week 7

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| Key idea | Specification content | Learning activity and resources |
| Testing | 3.3.4 Design strategies | Developing ideas through prototyping (3.3.6).  Model part or the entire toy to scale (maths links – working to and working out the scale). |
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Week 8

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| Key idea | Specification content | Learning activity and resources |
| Appropriate techniques used to communicate design ideas | 3.3.5 Communication of ideas | Demonstration of a specific technique used to communicate in 2D or 3D a chosen design idea. (isometric, perspective)  Students watch and condense the information they are being shown into easy to remember stages – allowing for independent working. |
| Appropriate techniques used to communicate design ideas | 3.3.5 Communication of ideas | Completion of design drawing.  All materials annotated and justified. Choice of mechanism explained and any reinforcement clearly shown. |

Week 9–14

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| Key idea | Specification content | Learning activity and resources |
| Use of appropriate marking out methods to ensure quality | 3.3.9 – Use appropriate marking out methods, data points and coordinates | Re-visit marking out on a variety of materials – quick whiteboard test to assess retention of knowledge.  Students begin to measure and mark out parts of their toys in their chosen material.  Peer assessment used as QC |
| Select and use appropriate hand tools and machinery safely | 3.3.10 Specialist tools and equipment  3.2.5 Using and working with materials – how to shape and form using abrasion, cutting and addition  3.3.11 Specialist techniques and processes – surface treatments and finishes (3.2.9) | Test/re-visit knowledge of tools and techniques.  Students work independently to begin shaping parts of their toys.  Manufacture diaries could be used to plan out each activity and use of tools and equipment.  Demonstration of treatments and finishes used on a range of materials.  Samples carried out to test a range of treatments.  Students recall and apply knowledge as appropriate. |

Week 15

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| Key idea | Specification content | Learning activity and resources |
| Smart materials  New materials | 3.1.3 Development in new materials | Give students the four categories of developing materials (smart, composites, new, technical) and definitions to match up.  Give students a list of materials and ask them categorise them (tests any prior knowledge) under the four headings – leads to a discussion.  Demonstration of smart materials and new materials. In groups analyse the benefits of using smart/new materials in a range of products.  Feedback findings.  Using information on developments in materials, students are to re-design their toy to incorporate one or more of these to enhance the design.  Self or peer assess outcomes. |

Term 2: Furniture modelling (design brief to be given)

Week 16

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| Key idea | Specification content | Learning activity and resources |
| Investigate the work of a designer or company | 3.3.3 The work of others | Group work used to investigate and analyse the work of others.  Design style and philosophies researched and understood.  Investigation work used as a source of inspiration and will allow students to design in the same style.  Key facts and research shared and presented. |
| Papers and boards  Use of Revision booklet to record information | 3.1.6.1 Material categories  3.1.6.2 Material properties  3.2.4 Sources and origins  3.2.6 Stock forms, types and sizes | Card sort the process of making paper – order of key stages to be decided.  Discussion to embed knowledge of the process and sources and origins of paper and board.  Samples used to explain the types of paper and board available and application. Properties of these looked at and applied to products.  Stock sizes to be explained and linked to practical application (used in printers etc). |

Week 17

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| Key idea | Specification content | Learning activity and resources |
| Types of forces  Ways to reinforce materials  Students to record core technical principles for the External assessment – Section A | 3.2.2 Forces and stresses | Discussion of buildings that have failed under stresses and forces.  Information recorded on the types of forces that can act upon materials and structures.  Use art straws to model different structures and students experiment with ways to reinforce these – discussion around best solution under different stresses.  Lead on to understand how materials can be reinforced (lamination, webbing, and interfacing).  Use of reinforced materials to build structures – compare the results. |
| Design a seating solution  Collaboration | 3.3.4 Design strategies | Post-it note/mindmap – key points about the designer/company to include in their work.  Post-it note/mindmap – revisit forces/stresses – how might this need to be considered when designing seating?  Group design work – initial sketches used to generate design ideas.  Feedback time to explain their sketches to others. |

Week 18

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| Key idea | Specification content | Learning activity and resources |
| Freehand sketching  Isometric  2D/3D drawing,  Annotated drawings | 3.3.4 Design strategies  3.3.5 Communication of ideas | Identify areas of success from the initial sketches.  Use these to produce design ideas for seating. |
| Cut materials efficiently to minimise waste | 3.3.9 Material management | Use of Computer Aided Design (CAD) to introduce the idea of reducing waste when cutting /manufacturing parts of their seating (scaled) (maths link – working out the surface area needed for parts and the amount of wastage).  Exploration of shape, tessellation/nesting.  Links made to stock size, cost and wastage.  Students modify their seating designs in light of this information and draw out part/s using CAD to help them maximise material use. |

Week 19

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| Key idea | Specification content | Learning activity and resources |
| Commercial processes  Tolerance  Quality Control (QC)  Students to record information for revision purposes. | 3.2.8 Specialist techniques and processes (the use of production aids, tolerance, commercial processes and QC) | Video clips looking at offset lithography printing and die cutting:  [How offset printing works](https://www.youtube.com/watch?v=5LMU-zB8Sro)  [Die cutting](https://www.youtube.com/watch?v=kaokWmrxsIc)  [Die cut process](https://www.youtube.com/watch?v=FQIzECrn3mo)  Discussion based around commercial methods used to manufacture with paper and boards.  Identify ways of introducing QC and working to tolerance and question the importance of these.  Diagrams of key processes drawn and labelled. |

Week 19–20

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| Key idea | Specification content | Learning activity and resources |
| Prototype designs which:   * demonstrate innovation * are functional * consider aesthetics * assess if prototypes are fit for purpose. | 3.3.6 Prototype development | Continued use of CAD to develop scaled seating solutions.  Designed in the style of their studied designer /company.  Be functional considering forces and stresses.  Minimise wastage when cut. |
| Prototypes  Batch  Mass  Continuous  Use of Revision booklet to record information | 3.2.7 Scales of production | As an introduction to scales of production – identify from a range of products which would be needed most frequently, which may be lower/ higher in cost and which are hand/ machine made.  Definitions discussed and products/production scales clarified. |

Week 21–24

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| Key idea | Specification content | Learning activity and resources |
| Use of automation in the workplace | 3.1.1 Industry, robotics | Video clip – automation:  [Oddly satisfying automated factories](https://www.youtube.com/watch?v=rNL229D0C3g)  Use of robotics to manufacture in batch/mass/continuous production. Looking into the design and organisation of the workplace to manufacture.  Group work – discussion of advantages and disadvantages of the use of robotics to manufacture in quantity. |

Week 25

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| Key idea | Specification content | Learning activity and resources |
|  | 3.3.6 Prototype development  3.3.10 Specialist tools and equipment  3.3.11 Specialist techniques and processes  3.1.1 Production techniques and systems, use of Computer Aided Design (CAD) | Continue to develop the prototype of a scaled piece of seating.  Use of CAD to modify ideas quickly and respond to feedback.  Development to focus on the design style, functional solution (forces/stresses), ability to nest the parts to minimise waste.  Ideas to be laser cut and evaluated in terms of the above.  Materials can be explored to improve design. |
| Society | 3.1.1 New and emerging technologies | Video clip: [Trevor Baylis](https://www.youtube.com/watch?v=SJ_XWbEM9dk)  Identify groups of people that have particular needs.  In groups look at a particular audience and research their needs further and problems they encounter.  Re-issue the design brief – to design seating for their given audience with a specific problem outlined. |

Week 26

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| Key idea | Specification content | Learning activity and resources |
| Society  User-centred design | 3.1.1 New and emerging technologies  3.3.4 Design strategies  3.3.6 Prototype development | Building on learnt skills, students work collaboratively to produce a seating design to meet their given brief.  Using CAD, sketching, modelling – ideas are trialled and tested. |
| Society  User-centred design | 3.1.1 New and emerging technologies  3.3.4 Design strategies  3.3.6 Prototype development | Building on learnt skills, students work collaboratively to produce a seating design to meet their given brief.  Using CAD, sketching, modelling – ideas are trialled and tested. |

Week 27

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| Key idea | Specification content | Learning activity and resources |
|  | 3.1.1 New and emerging technologies  3.3.4 Design strategies  3.3.6 Prototype development | Building on learnt skills, students work collaboratively to produce a seating design to meet their given brief.  Using CAD, sketching, modelling – ideas are trialled and tested. |
|  | 3.3.5 Communication of design ideas | Presentation of design ideas and models.  Explanation of idea and how their audience’s needs have been met.  Functionality, aesthetics, materials management also explained. |

Term 3: Environmental, clock

Week 28

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| Key idea | Specification content | Learning activity and resources |
| Enterprise  Design ideas and sketches | 3.1.1 New and emerging technologies  3.3.4 Design strategies | Key terms given and definitions discussed (enterprise, crowd funding, virtual marketing, co-operatives, fair trade).  Design brief analysed and the idea of being an enterprise put into context.  Design ideas produced to begin to answer the brief.  Questions that have been highlighted during the designing to be discussed further (how could the clock be powered? What materials are environmentally friendly?). |
| Using data to understand needs  Fossil fuels  Nuclear power  Renewable energy  Energy storage  Students to record information for revision purposes. | 3.3.1 Investigation, primary and secondary data  3.1.2 Energy generation and storage | Data given to be analysed. Data based around energy sources and importance of sustainability from the prospective client’s view point.  Demonstrate clock that is powered by potato/lemon – begin to think about energy sources that can be used.  Card match-up activity to energy types and impacts/advantages.  Group research activity into ways of storing energy. |

Week 29

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| Key idea | Specification content | Learning activity and resources |
| Iteration | 3.3.4 Design strategies | Post-it notes/white boards – key findings from previous sessions?  Take initial idea/s – develop these using the information regarding energy usage and storage. |
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Week 30

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| Key idea | Specification content | Learning activity and resources |
| Environment – pollution, global warming  Sustainability – finite/non-finite  Students to record information for revision purposes. | 3.1.1 New and emerging technologies | Look at a range of products from a variety of material areas – how will they impact on the environment (re-visit obsolescence, life cycle).  Discussion around finite/non-finite resources – carry out a life cycle assessment for their design idea so far.  What improvements could they make? |
| Product analysis and evaluation  The six Rs (reduce, refuse, re-use, repair, recycle and rethink)  Students to record information for revision purposes. | 3.3.1 Investigation, primary and secondary data  3.2.3 Ecological and social footprint | Investigate similar products that have been designed with the environment in mind.  Find inspiration in products that have considered the six Rs. |

Week 31

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| Key idea | Specification content | Learning activity and resources |
| Modelling – using card  Iteration | 3.3.5 Communication of design ideas  3.3.4 Design strategies | Make further modifications to design ideas and begin to produce 3D models of these.  Models could be scaled. |

Week 32

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| Key idea | Specification content | Learning activity and resources |
| Critical emerging technologies:   * obsolescence * design for maintenance * ethics * environment. | 3.1.1 New and emerging technologies | Introduce the four key terms and give definitions.  Given specific amounts of time, students make a change to their design based around one of the four key headings. After each modification is made it is discussed to evaluate the improvement to the design.  Original design is compared to the fourth modification. |
| Commercial processes  Students to record information for revision purposes. | 3.2.8 Specialist techniques and processes | Use of questioning and whiteboards to test /re-visit commercial processes used with paper and card.  For another or several material areas use video clips to understand commercial processes.  [Plastic injection molding](https://www.youtube.com/watch?v=d4F9jvMBk0Y)  Discussion of products manufactured in this way. Highlight any environmental advantages and disadvantages to the processes.  Diagrams used to record processes. |

Week 33

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| Key idea | Specification content | Learning activity and resources |
| Linking to manufacture –ecological issues, life cycle of products | 3.2.3 Ecological and social footprint | Chose a commercial process – draw and label it.  Build on this information to understand the concept of social and ecological footprints. Record the definitions.  Have scenario cards – in pairs decide which would be considered a social impact or an ecological impact.  Take one product and as a class identify all of the ways from extraction to disposal that it impacts on the environment and society. Produce a class analysis diagram. |

Week 33–35

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| Key idea | Specification content | Learning activity and resources |
| Further development  Sketching, 2D, 3D drawing | 3.3.5 Communication of design ideas | Whiteboard activity:  Make a list of all the key considerations covered so far – what do they need to consider before they develop their product again?   * energy sources * six Rs * social/ecological footprint * sustainability * obsolescence * maintenance * commercial production and impact.   Use sketches to develop ideas further.  Justify modifications made against the consideration list. |

Week 35–39

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| Key idea | Specification content | Learning activity and resources |
| Select and use specialist techniques and processes.  Consider accuracy  Shape, fabricate and construct a high quality prototype | 3.3.6 Prototype development  3.3.10 Specialist tools and equipment  3.3.11 Specialist techniques and processes | Produce a prototype of their developed idea.  Re-visit knowledge and experience from previous two projects. |

Week 40

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| Key idea | Specification content | Learning activity and resources |
| Surface treatments and finishes | 3.3.11 Specialist techniques and processes | Finish the end product using treatments and finishes. Demonstrations used to ensure understanding of appropriate methods. |