

# **Toynbee Curriculum**

## **KS3 Topic Summaries**

# **DESIGN AND TECHNOLOGY**

**Toynbee School**



# Scheme of Learning: User Centred – Mechanical Toy: Timbers and Mechanical Devices

Topic Sequence: Year 7 Design & Technology Rotation		
1	2	3
User Centred Tiny House	Mechanical Toy	Food Technology

## Topic Overview:

This project serves as an introduction to working with timber and builds students’ knowledge of mechanical devices. Students are introduced to the concepts of using mechanical devices to gain “mechanical advantage” – building awareness of levers, cams, gears, and pulleys. Students apply this knowledge through manufacturing a timber framed mechanical toy.

This is students’ first introduction to working with “resistant materials” and requires them to handle workshop tools with skill and accuracy. They also have the opportunity to use the powered workshop tools and develop their knowledge of workshop health and safety practices.

Through manufacturing a functioning product, students are encouraged to develop a “problem solving” approach in the workshop to adapt their methods, reflect on what is going well and how they might improve further. Students develop their knowledge of “stock forms” of materials, the sources and life cycle of common materials.

## Lesson Sequence:

The lessons have been sequenced to purposely build pupils’ understanding and knowledge of Design & Technology that should have been delivered during Key Stage 2. There needs to be a balance between delivering core knowledge, all of which must be related to the intended practical outcome and also developing students confidence in using effectively and accurately the equipment and tools in the workshop.

The topic starts with a lesson for exploring some standard mechanical devices, to make the link to KS2 study. This sets the scene for the practical project that will follow. It is good practice for students to become practised in research, completed in a range of methods, from handling existing products, web based research and accessing specific relevant software. There is a subsequent lesson that draws this knowledge together further and introduces the concepts of mechanical levers.

The main material group used through this project is timber based materials, students are introduced to the categories and stock forms, which will be used throughout. This encourages the use of subject specific vocabulary throughout the project and beyond, from their first experience in the workshop.

The following sequence of lessons takes the students through a basic project manufacture, including accuracy and skill in measuring and marking out, using hand and powered tools, the use of glasspaper and adhesives. These lessons also require students to accurately and logically assemble a working product, diagnosing and solving faults throughout.

The final sequence of lessons explores the use of CAD and CAM, using 2D design and the laser cutter to create decorative follower toppers. Introducing an awareness of this technology and encouraging independent use is a useful foundation on which to build in subsequent years/projects.

## Sequence of Lessons:

<b>1</b>	Analysis of existing products
<b>2</b>	Levers
<b>3</b>	Timber based materials
<b>4</b>	Marking out
<b>5</b>	Sawing and drilling
<b>6</b>	Sanding and adhesives
<b>7</b>	Continuation of all practical skills
<b>8</b>	Assembly – using adhesives
<b>9</b>	Computer aided design
<b>10</b>	Forms Assessment
<b>11</b>	Computer aided manufacture - Laser cutting
<b>12</b>	Assembly of mechanism
<b>13</b>	Final finishing of toy

## Topic Resources:

<b>Knowledge Map:</b>	Mechanical Toy	<b>Prescribed Sources:</b>	None
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## Assessment:

<b>Knowledge:</b>	Microsoft Forms Assessment
<b>Application of Knowledge:</b>	Production of a working mechanical toy, incorporating CAD/CAM toppers

## Supportive Reading:

<b>Technology Student</b>	technologystudent.com
<b>Focus Education - Focus on Mechanisms</b>	Via the Design & Technology Curriculum Zone on the school website.

# Scheme of Learning: User Centred – Tiny House Project: User centred design and Card/CAD modelling

## Topic Sequence: Year 7 Design & Technology Rotation

1	2	3
User Centred Tiny House	Mechanical Toy	Food Technology

### Topic Overview:

This project serves as an introduction to user centred design, giving students the opportunity to explore the needs of different users, and design a suitable solution. Students are introduced to the idea of iterative design, developing their ideas through a process of sketching, physical and computer aided design models. This is a critical skill for students in Design & Technology to develop, so they understand the first draft will always need further development and improvement.

Students develop an awareness of drawing to scale, and the requirement to work with accuracy when modelling. Students also learn basic modelling skills using suitable equipment and become familiar with the health and safety of working with these materials.

Developing a knowledge of basic CAD modelling in Year 7, provides another critical skill for future success. Students have the opportunity to deepen their understanding and appreciation of CAD modelling through an immersive virtual reality tour of their designs where time permits.

### Lesson Sequence:

Often the first stage of a design process is to gain a deep understanding of the “what” students need to design. To structure this aspect of the design process, we can use the acronym “ACCESSFM” to ensure students have a rubric to support their initial thinking. For this project, students consider customer, function, materials and manufacturing (SCALE).

Another important aspect of gaining a detailed understanding of a design task can be to consider in depth the existing solutions to a problem. Doing this well requires students to consider “similar” products, from which to find applicable solutions that can be applied to their design problem. Summarising this research into a user specification ensures students are clear about what their design needs to be/dd to be successful.

The next sequence of lessons requires students to design on paper (to scale) a viable interior layout for a tiny home, this is then modelled using card in 3D to evaluate their own success and identify areas for further develop,

From this point in the project, students are introduced to the 3D CAD modelling software – Sketchup for Web. Students learn to build basic shapes, use a component library and personalise their designs to suit their chosen user.

Using the snipping tool, students export “snips” of their design, to emulate those images used by estate agents, to sell homes. Once they have a library of images, these are incorporated into a sales pitch on a page, to “sell” their design to the intended user.

Sequence of Lessons:	
<b>1</b>	Exploring a design context
<b>2</b>	Researching and analysing existing products
<b>3</b>	User requirements (Design Specification)
<b>4</b>	2D Block modelling
<b>5</b>	Card Modelling Introduction
<b>6</b>	Card modelling complete
<b>7</b>	Evaluation and development of design
<b>8</b>	Sketchup - introduction
<b>9</b>	Sketchup – component libraries
<b>10</b>	Forms Assessment
<b>11</b>	Sketchup – Application of finishes/textures
<b>12</b>	Sketchup – Outputting final design images
<b>13</b>	Design promotion/VR experience

Topic Resources:			
<b>Knowledge Map:</b>	Tiny House	<b>Prescribed Sources:</b>	None
Assessment:			
<b>Knowledge:</b>	Microsoft Forms Assessment		
<b>Application of Knowledge:</b>	Production of card models and promotional product using final CAD designs		
Supportive Reading:			
<b>Technology Student</b>	technologystudent.com		
<b>Focus Education - Focus on Mechanisms</b>	Via the Design & Technology Curriculum Zone on the school website.		

# Scheme of Learning: Electronics, Timbers and Polymers USB Mood Light

## Topic Sequence: Year 8 Design & Technology Rotation

1	2	3
LED Mood lamp	Textiles – Wearable Modern Textiles	Food Technology

### Topic Overview:

This project serves as an introduction to electronics, giving students confidence using tools and equipment to solder and create a working circuit. Students are introduced to a range of polymers. They will find out about the properties of those polymers and common uses. Pupils will produce a working LED colour changing lamp with a decorative vinyl design on the outside.

### Lesson Sequence:

The lessons have been sequenced to purposely build pupils' understanding and knowledge of Design & Technology that should have been delivered during Key Stage 2. There needs to be a balance between delivering core knowledge, all of which must be related to the intended practical outcome and also developing students' confidence in using effectively and accurately the equipment and tools.

This topic starts by recapping some basic electronic knowledge and teaching some new knowledge about resistance using the conductive dough. This allows students to test and trail different circuits in a safe manor helping to develop their curiosity for the subject. This basic knowledge will then help them through out the project and allow them to fault find at the end.

The main material group used through this project is polymers. Students are thought how to categorise polymers in to thermoset and thermoforming polymers. They develop knowledge of the different properties of these 2 different categories of polymers. Pupils find out about different types of common polymer and their current uses. This encourages the use of polymer specific vocabulary throughout the project and beyond.

The following sequence of lessons takes the students through a basic project manufacture, including accuracy and skill in measuring and marking out, cutting, shaping, filing and finishing products.

Sequence of Lessons:	
<b>1</b>	Conductive Dough
<b>2</b>	Crumble
<b>3</b>	Soldering
<b>4</b>	Polymers
<b>5</b>	Marking out
<b>6</b>	Cutting
<b>7</b>	Shaping and Filing
<b>8</b>	Timber Finishing
<b>9</b>	Template and shade
<b>10</b>	Designing vinyl
<b>11</b>	Assessment and energy
<b>12</b>	Types of finish
<b>13</b>	Finishing off

Topic Resources:			
<b>Knowledge Map:</b>	LED Mood Light	<b>Prescribed Sources:</b>	None

Assessment:	
<b>Knowledge:</b>	Microsoft Forms Assessment
<b>Application of Knowledge:</b>	Practical skills – final product

Supportive Reading:	
<b>Technology Student</b>	technologystudent.com

# Scheme of Learning: Smart and Modern Materials Wearable project

Topic Sequence: Year 8 Design & Technology Rotation		
1	2	3
LED Mood lamp	Textiles – Wearable Modern Textiles	Food Technology

## Topic Overview:

This project serves as an introduction to the use of a sewing machine, giving students confidence using machinery, and making them aware of Smart and Modern materials used for many products and uses; both to solve real-life problems or just to make novelty products. Students are introduced to a range of natural and synthetic fabrics and will understand where a range of fabrics originate, and how they are produced using either weave, knit or bonded techniques. Once this basic fabric knowledge is acquired, students then research reflective fabrics and other smart fabrics to design their own product. Students will make a reflective snap band, using the sewing machine safely. They will gain a knowledge of the parts of a sewing machine, how to use a sewing machine, and how to troubleshoot their own errors whilst using the sewing machine.

## Lesson Sequence:

The lessons have been sequenced to purposely build pupils' understanding and knowledge of Design & Technology that should have been delivered during Key Stage 2. There needs to be a balance between delivering core knowledge, all of which must be related to the intended practical outcome, also developing students' confidence in using effectively and accurately the equipment and tools.

The topic starts with a lesson for exploring some smart and modern materials. This is a new topic which many will not have visited in KS2. This sets the scene for the practical project that will follow. It is good practice for students to become practised in research and comprehension. Teachers demonstrate a range of smart and modern fabrics explaining how they work to cement this theory knowledge. There is a subsequent home learning tasks and comprehension tasks throughout the project which refer back to this knowledge.

The main material group used through this project is textile materials; neon polycotton and reflective strips. Students are thought how to categorise fabrics into natural and synthetic and how to distinguish between a woven, knitted and bonded fabric. This encourages the use of Textile specific vocabulary throughout the project and beyond.

The following sequence of lessons takes the students through a basic project manufacture, including accuracy and skill in measuring and marking out, using paper patterns to mark their fabric, using sewing equipment and the becoming confident on the sewing machines.

With these practical skills, students produce a reflective snap-band for use when cycling or walking in the dark. How to design a product is then explained, with the use of ACCESSFM to aid their design thought process. Students design their own cycle-product which includes smart materials to enhance the safety of the wearer/user.

Sequence of Lessons:	
<b>1</b>	introduction to smart and modern fabrics
<b>2</b>	Fabric construction experimentation – weave, knit, bond
<b>3</b>	Introduction to a sewing machine – learning the parts
<b>4</b>	Introduction to a sewing machine – Sewing using paper
<b>5</b>	Cutting and measuring of snap band fabric
<b>6</b>	Flow Chart of the making process
<b>7</b>	Stage 1 of making – threading a machine sewing reflective strip down
<b>8</b>	Product analysis – reflective jacket
<b>9</b>	Stage 2 of making – Sewing seams
<b>10</b>	Revision lesson
<b>11</b>	Assessment lesson & Literacy task
<b>12</b>	Product Design – Design Smart fabric product
<b>13</b>	Stage 3 of making – Insert snap band and complete product

Topic Resources:			
<b>Knowledge Map:</b>	Wearable Modern Textiles	<b>Prescribed Sources:</b>	None

Assessment:	
<b>Knowledge:</b>	Microsoft Forms Quiz Comprehension starter tasks.
<b>Application of Knowledge:</b>	Flow Diagram of their making process. Practical skills – final product Design of a cycle product with smart materials

Supportive Reading:	
<b>Technology Student</b>	technologystudent.com
<b>BBC Bitesize Smart Materials</b>	<a href="#">Smart materials - Developments in new materials - AQA - GCSE Design and Technology Revision - AQA - BBC Bitesize</a>

# Scheme of Learning:

## Topic Sequence: Year 9 DT/FOOD/COMPUTING Rotation

1	2	3
Timber/Polymers/Standard Components Clock Box	Food Technology	Computing

### Topic Overview:

This project builds upon the skills and knowledge from the Year 7 and 8 Design & Technology curriculum. It allows students the chance to revisit working with timber and polymers, developing an understanding of more advanced construction methods, adhesives and finishing methods. Students are also introduced to the concept of standard components and will gain a deeper knowledge of material stock forms, and categories of timber based materials.

This is students' first introduction to working with flexibly and acrylic. Students will learn how lamination allows them to form timber based materials into curved surfaces. Students will develop a deeper understanding of finishing processes applied to acrylic, which translates across a range of material categories and finishes applied to timber based materials.

The themes running through the project are accuracy and quality. Students will also need to take ownership of managing the time and resources in the classroom, working across multiple stages of manufacture, switching between them with fluency.

### Lesson Sequence:

The lessons have been sequenced to build upon students knowledge of timber and polymer based materials, from previous projects in Key Stage 3. This project will introduce more formal timber construction methods – focussing upon cutting and fitting wood joints, working with precision. This requires students to use a range of wood working tools, building their skill ready for GCSE study.

Students will then learn how to manufacture curved parts using formers and lamination. This introduces flexibly and the use of formers – which are a common manufacturing aid. Students will learn how to cut and finish acrylic parts by hand, in contrast to using CAD and CAM, building upon prior learning.

In this project, the students will be more responsible for directing their own practical activities, lesson to lesson, rather than follow one prescribed route, they will be shown a range of manufacturing processes, then take ownership for completing individual aspects over a series of lessons. Students will learn about the broad range of finishes that can be applied to timber based materials, to preserve and protect the material from damage and marks. They will gain an understanding of the functional and aesthetic properties of each and their correct application.

Students will learn about the timber life cycle, making reference to it being a sustainable resource. This will lead onto learning about stock forms, to further develop their knowledge of this important material category.

The concept of “scales of production” will be covered during this project. Students will gain an understanding of the differences between bespoke/batch and mass production. This will be explicitly linked to the practical activities and standard components used in this project. Quality control and assurance will feature in this stage of the project, to allow students to reflect upon the quality of the individual parts of their project, with time to improve and refine them prior to final assembly.

Students will learn about “standard components”, including those used in the project and more broad subject knowledge. Students will develop an understanding of how mechanical fittings are used routinely in products manufactured at all scales of production, for efficiency.

Students will complete their manufacturing, with an opportunity to “finish” any timber parts.

### Sequence of Lessons:

1	Wood joint and basic timber processing
2	Flexibly handling and use of formers/laminating
3	Wood joint fitting and adhesives
4	Man made boards knowledge and processing (CNC)
5	Marking out acrylic and polymers knowledge recap – categories and sustainability
6	Cutting and finishing acrylic
7	Finishing flexibly and knowledge of timber based material finishes
8	Stock forms timber and the timber life cycle
9	Scale of production (one off/bespoke, batch, mas, continuous)
10	Quality Control and Quality Assurance
11	Knowledge Assessment Lesson
12	Acrylic joining and adhesives in depth
13	Standard components and final finishing

### Topic Resources:

<b>Knowledge Map:</b>	Clock Box	<b>Prescribed Sources:</b>	None
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### Assessment:

<b>Knowledge:</b>	Microsoft Forms Assessment
<b>Application of Knowledge:</b>	Production of a highly accurate, quality clock box

### Supportive Reading:

<b>Technology Student</b>	technologystudent.com
<b>Focus Education - Timber based materials</b>	Via the Design & Technology Curriculum Zone on the school website.
<b>Focus Education - Focus on wood joints</b>	Via the Design & Technology Curriculum Zone on the school website.
<b>Focus Education - Surface treatments and finishes</b>	Via the Design & Technology Curriculum Zone on the school website.