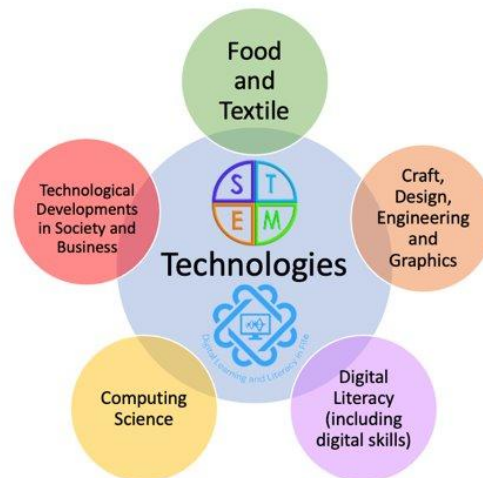


Fife Technologies Progression – Craft, Design, Engineering and Graphics



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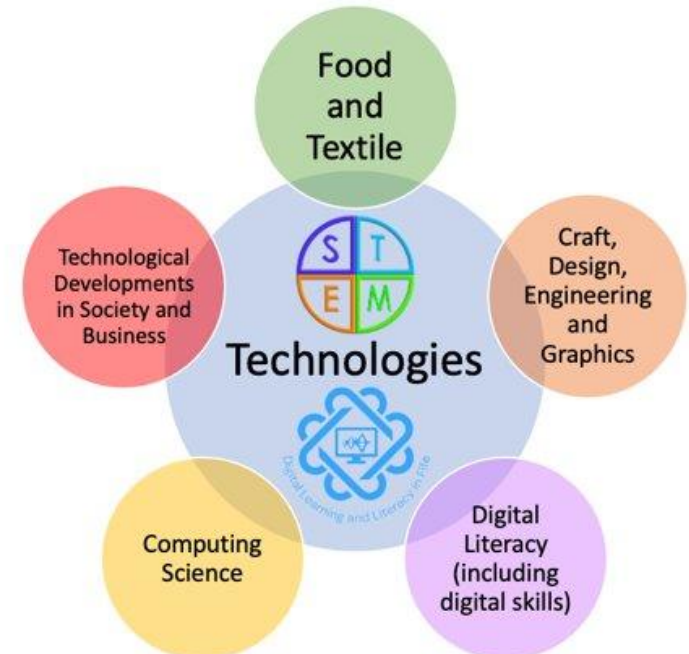
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ACKNOWLEDGEMENT

This programme is extensively based on the guidance and recommendations of the Curriculum for Excellence and Benchmarks set out by Education Scotland.

These progressions allow for a fluidity of approaches that facilitate the opportunity for learners to think creatively and independently, whilst at the same time supporting practitioners to plan in a structured and coherent way. Using these shared standards and expectations within Schools, Clusters and Local Improvement Forums across Fife will ensure that all learners have an equitable experience to develop skills for their learning, life, and work.

We would like to acknowledge the efforts of Fife practitioners in supporting the development of the Fife Technologies Progression through engaging with consultations and providing feedback on the programme. This has been crucial in ensuring that the programme is cohesive, progressive and practical.

The progression pathways align to the [Technologies Planning Resource](#) which has been developed through the RAiSE Programme with support from Education Scotland and Scottish Government. Raising Aspirations in Science Education (RAiSE) is a programme of The Wood Foundation, Education Scotland, Scottish Government and participating local authorities which enhances the delivery of STEM education in primary schools. This resource supports planning for technologies around the experiences and outcomes from early to second level. These activities and approaches should be viewed as useful starting points and suggestions, and they are in no way prescriptive.

IMPLEMENTATION

Learning in the Technologies should be delivered through an appropriate blend of well-planned discrete and interdisciplinary learning. Schools and teachers will plan to offer different combinations of the Experiences and Outcomes across the Technologies organisers to provide programmes that meet the needs of children and young people.

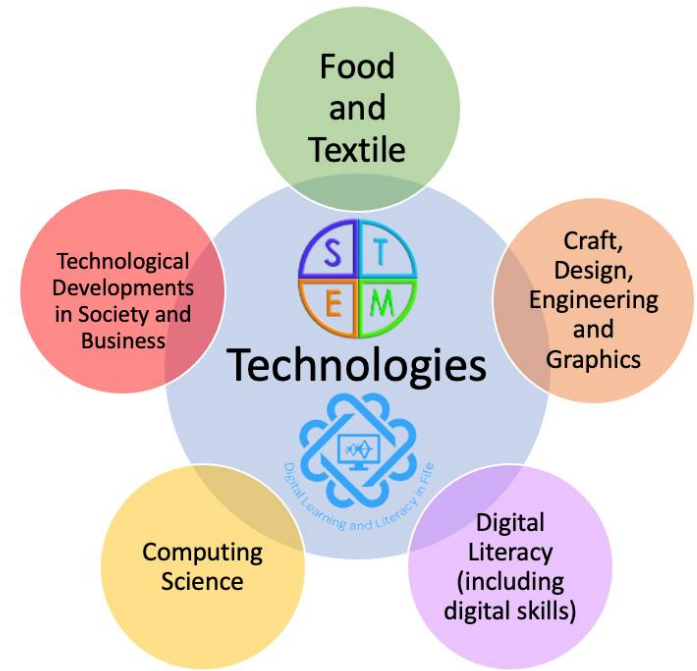
See [Education Scotland's Technologies Principles and Practice](#) document for further information on what learning in the Technologies offers.

Schools may choose to specifically allocate time to the Technologies or embed within the curriculum, linking with other curricular areas, such as Sciences, Social Studies, Numeracy, Literacy, Health and Wellbeing. Schools may also link the Technologies with learning in the real world, by using Learning for Sustainability, STEM, the Sustainable Development Goals and Developing the Young Workforce as a lens to explore Technologies.

Craft, Design, Engineering and Graphics

To support the exploration and implementation of this curricular organiser, there are key links with the Cultivating and Capturing Creativity Pathway.

The [RAiSE Technologies Planning Resource](#) can be used for further support and contains lesson ideas, links and key questions. A link for each planning resource can be found within the progression for each sub organiser. Note that the planning resource has been developed for Early to Second Level.



GUIDANCE

The [Technologies Curriculum](#) has been split into five curricular organisers:

- Digital Literacy
- Food and Textile
- Technological Developments in Society and Business
- Craft, Design, Engineering and Graphics
- Computing Science

This progression pathway is intended to provide a framework for practitioners as they plan and deliver the Technologies curriculum organisers to ensure all learners have the skills and experiences required to use resources including digital tools safely to support their learning across the curriculum.

Within the Progression Pathways, developmental stages of learning are clearly outlined. These amalgamate both [Experiences and Outcomes](#) with the national [Benchmarks](#). These are not prescribed in a hierarchical way but rather enable practitioners to be responsive and flexible in their planning of learning pathways as appropriate to the needs of their learners. Though knowledge and skills at the base are often required for further learning to be built upon, these are not aligned to any particular year group nor always the starting point for all. Learners will progress through their learning pathways within each curricular organiser as appropriate to their developmental needs.

The national Benchmarks, which support practitioners' professional judgement of achievement of a level, are embedded within each of the Progression Pathways. These are emboldened for ease of identification.

The [RAiSE Technologies Planning Resource](#) complements the Progression Pathways for each Experience and Outcome, providing clear and concise practical ideas and guidance for teachers. The resource includes key skills and suggested learning experiences, common misconceptions, glossary of key vocabulary, key questions, IDL opportunities, suggested assessments, extended learning and for each E and O. Practitioners may draw on these to inform their practice when developing rich and varied learning experiences to effectively motivate, challenge and support all learners.

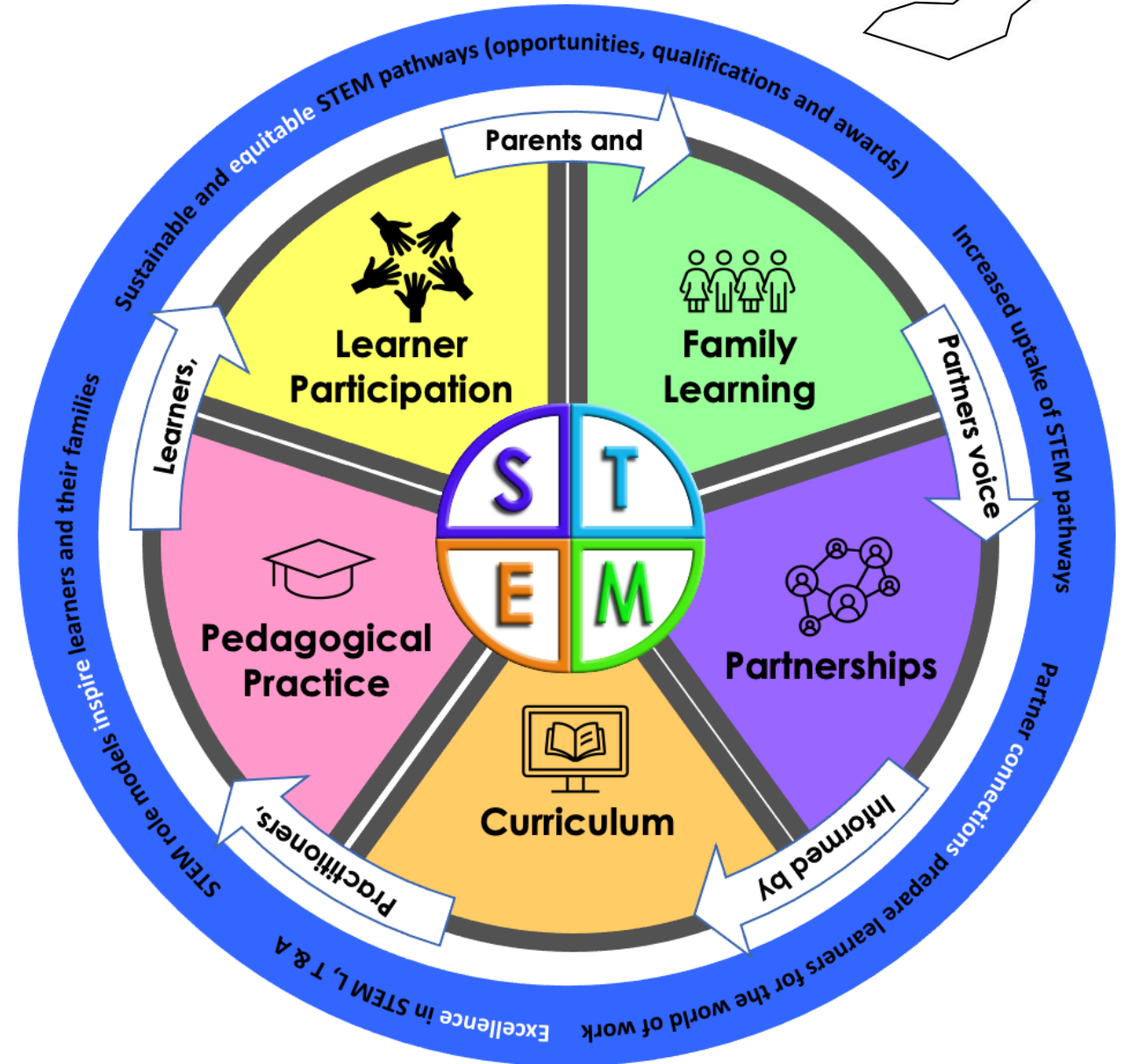
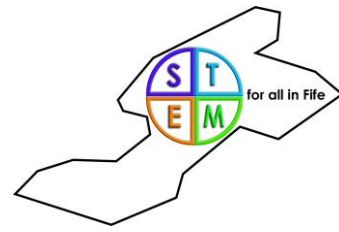
Effective use of the documentation is best supported by engaging with the whole school culture to identify how it can be used consistently for planning and assessment purposes. Ongoing professional learning will be a core element for all practitioners to meet the ever-evolving requirements.

STEM FOR ALL IN FIFE FRAMEWORK

Technology (including digital skills) is core to the foundations of STEM. Technology is the application of knowledge and skills to extend human capabilities and to help satisfy human needs and wants, and it has had profound effects on modern society. Learning in the technologies enables children and young people to be informed, skilled, thoughtful, adaptable and enterprising citizens. Science, Engineering and Mathematics allow us to apply knowledge and skills to innovate, make new discoveries and find sustainable solutions to real world problems.

The STEM for all in Fife Framework outlines our vision that all Fife Learners will be supported to have equitable opportunities to participate in progressive STEM learning, inspiring and equipping our children and young people with skills for the 21st century, securing sustainable positive destinations in STEM industries now and in the future.

The Technologies Progression Pathways have been designed to support practitioners to develop high quality, progressive Technology learning experiences, integrating Science, Engineering and Mathematics as well as other curricular areas to support positive outcomes for our children and young people.



Craft, Design, Engineering and Graphics Overview

Early to Fourth Level

Early Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I explore ways to design and construct models. TCH 0-09a	• Builds models using different materials eg. junk modelling, wooden blocks. • Uses tools and materials (paper, card, wood, plastic) to create models.
Exploring uses of materials	I explore everyday materials in the creation of pictures/models/concepts. TCH 0-10a	• Describes materials by touch for example sticky, squidgy, soft, fluffy, hard, rough, wet, heavy, light. • Uses a range of materials when creating a pictures/models/concepts. • Identifies when a material is suitable or not for specific function or task.
Representing ideas, concepts and products through a variety of graphic media	I explore and discover different ways of representing ideas in imaginative ways. TCH 0-11a	• Uses a range of materials(natural and man-made) and resources to create pictures. • Shares ideas with others. • Recognise 2D shapes and how they can be used to visually represent ideas/concepts.
Application of Engineering	I explore a variety of products covering a range of engineering disciplines. TCH 0-12a	• Recognises engineering in the world around them for example bridges, construction, electronics, computers.

First Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can design and construct models and explain my solutions. TCH 1-09a	- Creates and justifies a solution to a given design challenge considering who is it for, where and how will it be used. - Uses appropriate tools and joining methods to construct a model.
Exploring uses of materials	I can recognise a variety of materials and suggest an appropriate material for a specific use. TCH 1-10a	- Identifies different materials. - States the properties of materials (hard, soft.....). - Recognises different materials and why they have been selected for a task. - Selects materials to use in a specific task.
Representing ideas, concepts and products through a variety of graphic media	I can explore and experiment with sketching, manually or digitally, to represent ideas in different learning contexts. TCH 1-11a	- Recognises 2D and 3D shapes and how they can be used to visually represent ideas/concepts. - Creates manual and/or digital sketches to represent ideas.
Application of Engineering	I explore and discover engineering disciplines and can create solutions. TCH 1-12a	- Recognises and identify different engineering disciplines. - Builds a solution to a specific task, which has moving parts.

Second Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can extend and enhance my design skills to solve problems and can construct models. TCH 2-09a	• Uses tools and equipment in order to carry out a task safely. • Uses a range of methods to join and strengthen materials. • Estimates and then measures accurately using appropriate units and tools. • Creates a range of ideas and chooses a suitable solution. • Evaluates solutions and explains why they are or are not suitable.
Exploring uses of materials	I can recognise basic properties and uses for a variety of materials and can discuss which ones are most suitable for a given task. TCH 2-10a	• Recognises characteristics of groups of materials such as wood, plastic and metal. • Selects suitable materials to use in a task. • Discuss the uses of materials.
Representing ideas, concepts and products through a variety of graphic media	I can use a range of graphic techniques, manually and digitally, to communicate ideas, concepts or products, experimenting with the use of shape, colour and texture to enhance my work. TCH 2-11a	• Sketches geometric shapes to create objects. • Produces sketches to communicate ideas that include pattern and texture. • Draws geometric shapes accurately. • Sketches 2D and 3D drawings of objects. • Describes primary and secondary colours and the moods/feeling associated with each. • Demonstrates planning for a targeted audience when creating a graphic display.
Application of Engineering	I can extend my knowledge and understanding of engineering disciplines to create solution. TCH 2-12a	• Understands the difference between different engineering disciplines. • Understands different energy types. • Builds/simulates solutions to engineering problems.

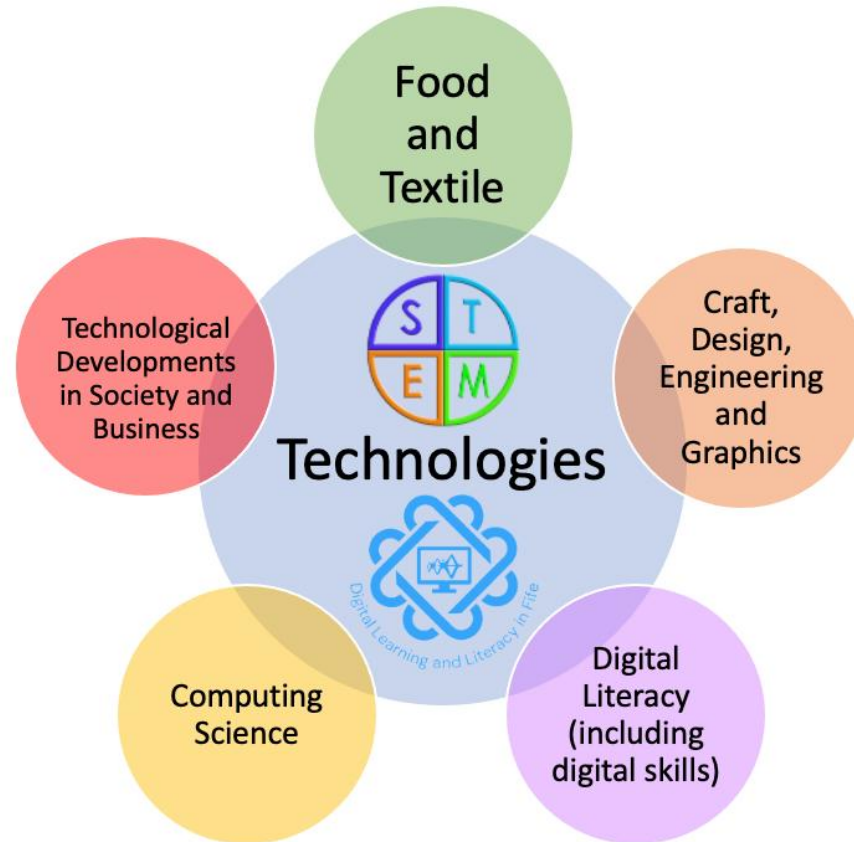
Third Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can create solutions in 3D and 2D and can justify the construction/graphic methods and the design features. TCH 3-09a	• Uses aspects of the design process to reach a solution for a given brief. • Identifies relevant design factors in a design brief. • Applies knowledge of design factors and construction methods to justify a design solution. • Uses tools and equipment to manufacture models/products. • Applies safe working practices when creating a model/product. • Extracts dimensions from a drawing and transfer these onto materials to create a model/product.
Exploring uses of materials	I can explore the properties and performance of materials before justifying the most appropriate material for a task. TCH 3-10a	• Identifies the different categories of materials. • Recognises that materials have different properties and uses. • Recognises that material properties have an impact upon manufacturing processing choices. • Recognises that materials come in different forms. • Justifies selection of materials when developing a solution to a problem or brief. • Discusses sustainability and environmental impact of sourcing and using different materials.
Representing ideas, concepts and products through a variety of graphic media	I can apply a range of graphic techniques and standards when producing images using sketching, drawing and software. TCH 3-11a	• Produces sketches which show an understanding of proportion. • Produces 2D and 3D sketches using a range of techniques. • Produces rendered drawings which may include colour, surface texture, tonal change. • Justifies the choice of colours, layout in a promotional graphics. • Recognises design principles and DTP terms. • Produces orthographic and pictorial drawings/sketches of everyday objects, products or buildings by extracting information from given pictorial drawings accurately. • Use appropriate drawing standards, symbols and conventions where these apply. • Uses computer aided design (CAD) commands, techniques and practices required to create a model. • Produces 3D rendered CAD models. • Produces a range of 2D and 3D CAD drawings.
Application of Engineering	I can apply my knowledge and understanding of engineering disciplines and can develop/build solutions to given tasks. TCH 3-12a	• Explain why something is an Input, process, output. • Builds/simulates solutions to engineering problems. • Explains energy transfers within a system. • Uses given formulae to calculate outcomes to engineering problems.

Fourth Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can apply design thinking skills when designing and manufacturing models/products which satisfy the user or client. TCH 4-09a	- Understands approaches to designing and that a range of strategies and phases can help arrive at a potential proposal that meets specific criteria. - Uses modelling techniques to evaluate design concepts and design proposals. - Justifies design decisions. - Selects tools and equipment to mark-out, cut, shape, form and finish models/products independently. - Identifies potential health and safety risks in the manufacture of models/products and plan the safe working practices required. - Produces accurate prototypes, in scale, by reading drawings and sketches to retrieve dimensional and material information.
Exploring uses of materials	I consider the material performance as well as sustainability of materials and apply these to real world tasks. TCH 4-10a	- Describes the different categories of materials. - Describes the properties of materials. - Recognises sustainability issues when selecting materials.
Representing ideas, concepts and products through a variety of graphic media	I can extend my use of manual and digital graphic techniques to realise ideas, concepts and products and recognise the importance of real world standards. TCH 4-11a	- Produces sketches which show proportion and scale. - Produces 2D and 3D sketches using perspective techniques, surface texture, tonal change and colour. - Uses colouring media when drawing/sketching. - Plans and justifies the choice of colours, layout and presentation techniques in graphic displays. - Recognises and can apply the design principles and DTP terms. - Plans, produces and justifies the choice of informational graphics to suit a given scenario or brief. - Produces orthographic and pictorial drawings by extracting information from given drawings, including detail such as hidden detail, centre axis. - Identifies and uses appropriate drawing standards, symbols and conventions, including third angle projection, dimensioning, line types and use of scale. - Creates assembled and exploded pictorial drawings from a 3D CAD assembly model. - Identifies CAD commands, techniques and practice employed in the production of 3D graphics and models. - Produces rendered 3D CAD models to show the light source, surface texture, materials applied to the model and a background.
Application of Engineering	I can solve problems through the application of engineering principles and can discuss the impact engineering has on the world around me. TCH 4-12a	- Produces systems diagrams, including open and closed loop and the identification of sub-systems. - Designs and builds/simulates solutions to problems. - Selects and uses formulae to calculate outcomes to engineering problems. - Identifies and describes the function of specific components to justify their use within the solution to a problem. - Evaluates and explains design decisions around an engineering solution, including the advantages, disadvantages, consequences and the social, economic and environmental impact.

Craft, Design, Engineering and Graphics Early Level



Design and Constructing Early Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I explore ways to design and construct models. TCH 0-09a	- Builds models using different materials e.g. junk modelling, wooden blocks. - Uses tools and materials (paper, card, wood, plastic) to create models.

What the learning may look like in Fife	Glossary of terms
- Exploring junk modelling using a variety of materials and resources. - Joining different materials together, e.g. paper, lollipop sticks, foam, string. - Access to a range of building objects/materials e.g. Lego, stickle bricks, natural materials, and using these to make objects and structures. - Planning designs and model using drawings and talking to peers. - Choosing from a range of materials to create a model and explaining the reasons for choices made. - Represents everyday objects and/or characters using a variety of materials and resources. - For ideas from RAiSE for TCH 0-09a: https://drive.google.com/drive/folders/1Qkue5DNW4HkMEKLblo79XbeyJKOlkaZU	Arch - curved structure Construct - build or make something Create - to make Design - a plan to show the look of something before it is made Drawing - a picture or diagram made with a writing tool Foundation - the lowest and strongest part of a building Height - how tall or small it is Join - putting two or more parts together Length - measurement vocabulary e.g. height, length, width, short, tall, narrow, wide Material - physical substance objects are made from Model - a 3D representation of something on a smaller scale Modelling - the activity of making 3D models Resources - supply of available materials Strong - not easily broken or damaged Structure - the way in which something is built or made up of parts Weak - easily broken or damaged

Design and Constructing Early Level

See Art and Design Pathway in Expressive Arts to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See Materials and Forces Pathways in Sciences to link learning.

States the identity and explains the purpose of a model e.g. "I have made a ..., this can be used for...."

Builds models using different materials e.g. junk modelling, wooden blocks.

Identifies suitable tools and materials for the task.

Uses tools and materials (paper, card, wood, plastic) to create models.

Develops a sense of size, shape and mass through exploring different materials.

Experiments with balancing when building structures by learning from previous unsuccessful attempts.

Discovers a way to solve problems, e.g. bending card if it doesn't fit.

Investigates how different materials can be joined together e.g. using glue, string etc.

Safely explores ways to change the shape of an object, e.g. cutting, tearing, folding, bending.

Identifies different materials e.g. paper, card, wood, plastic etc.

Explores different materials e.g. plastic blocks, cardboard boxes.

Creating rich play environments in your setting will support learners to explore, investigate and talk about design and construction.

Exploring Uses of Materials Early Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Exploring uses of materials	I explore everyday materials in the creation of pictures/models/concepts. TCH 0-10a	- Describes materials by touch for example sticky, squidgy, soft, fluffy, hard, rough, wet, heavy, light. - Uses a range of materials when creating a pictures/models/concepts. - Identifies when a material is suitable or not for specific function or task.

What the learning may look like in Fife	Glossary of terms
- Using senses to describe what different materials look/feel/sound like. - Suggesting which materials would be most suitable for certain purposes, e.g. a pillow for a teddy bear. - Testing materials to see if they are waterproof/strong/absorbent/light or heavy/flexible (bendy)- e.g. what happens to different materials when they are added to the water tray, e.g. Sponges, cotton wool, cloths, etc. - Testing the strength of materials e.g. by building houses for The Three Little Pigs and using a hairdryer to try to blow them down. - Sorting materials into simple categories, e.g. natural & manmade; light & heavy; hard & soft. - Investigating methods of joining materials together, e.g. understands that glue has to dry; sellotape does not stick to wet surfaces. - Discovering that force may be needed to put nails into wood; screws have to be turned in a certain direction. - For ideas from RAiSE for TCH 0-10a: https://drive.google.com/drive/folders/1Qkue5DNW4HkMEKLblo79XbeyJKOlkaZU	Absorbent - ability to soak up liquids Flexible - bends easily without breaking Manmade – material that is created by human beings e.g. brick, fabric, plastic, leather etc. Media - the materials used to create an artwork e.g. pictures, diagrams, models Natural - material that can be found in the environment e.g. wood, stones, shells, leaves, conkers etc. Purpose - reason for something to be made or its function Texture - the feel, appearance or consistency of a material

Exploring Uses of Materials Early Level

See Materials Pathway in Sciences to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See Forces, Electricity and Waves Pathway in Sciences to link learning.

Uses a range of materials when creating a pictures/models/concepts.

Builds structures using objects that are different shapes and sizes.

Experiments with simple everyday media to create pictures e.g. string / spaghetti / sponges / vegetables dipped in paint.

Creates pictures and sculptures using natural materials found in the local environment.

Explores a range of resources to make an identifiable image.

Identifies materials which common objects in the classroom are made from, e.g. wood, glass, plastic, tile etc.

Identifies when a material is suitable or not for specific function or task.

Explores the properties of different materials to identify which materials are suitable for a particular purpose.

Describes materials by touch for example sticky, squidgy, soft, fluffy, hard, rough, wet, heavy, light.

Investigates a variety of natural and man-made materials, e.g. collections of shells, playdough, shaving foam, etc.

Sorts objects according to their characteristics.

Creating rich play environments in your setting will support learners to explore and investigate materials.

Representing Ideas, Concepts and Products Early Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Representing ideas, concepts and products through a variety of graphic media	I explore and discover different ways of representing ideas in imaginative ways. TCH 0-11a	• Uses a range of materials (natural and man-made) and resources to create pictures. • Shares ideas with others. • Recognises 2D shapes and how they can be used to visually represent ideas/concepts.

What the learning may look like in Fife	Glossary of terms
• Experimenting with different media for drawing, e.g. pencils, crayons, felt-tip pens, chalk, charcoal. • Creating lines and shapes of varying colour and thickness digitally using an appropriate programme, e.g. Paint.net • Constructing a digital model using pre-installed shapes and images in programmes like Tinkercad. • Using 2D and 3D shapes to represent different parts of a body or a house, for example. • Identifying different material characteristics and choosing the most suitable form to represent something, e.g. using seaweed or wool for hair. • Explaining what has been made and describing the parts/function. • Discussing different ideas and works with others to achieve an end goal. • For ideas from RAiSE for TCH 0-11a: https://drive.google.com/drive/folders/1Atf6tMoRI0HrSFOCBkugmspVA0nlrbnS	• 2D - two dimensional e.g. flat • 3D - three dimensional e.g. has depth/height • Characteristics - the ways a material behaves (properties) • Digital - produced on a screen of a technological device • Equipment - tools or supplies needed for a purpose • Function - purpose of something • Graphic media - any type of media that is made up from graphic techniques, mark making, digital and traditional painting, 3D modelling, pretty much anything that makes an image on a surface • Idea - thought or suggestion • Model - a 3D representation of something on a smaller scale • Programme - a set of coded instructions to achieve a goal

Representing Ideas, Concepts and Products Early Level

See Art and Design Pathway in Expressive Arts to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See [Digital Literacy Pathway](#) to develop skills in using technology.

See Shape, Position and Movement in Maths to link learning.

Shares ideas with others.

Explains use of different shapes and materials to represent ideas, concepts and products.

Experiments with a range of different graphic media e.g. painting and digital art to create pictures and models.

Recognises 2D shapes and how they can be used to visually represent ideas/concepts.

Uses a range of materials (natural and man-made) and resources to create pictures.

Selects materials based on their characteristics to represent ideas, concepts and products.

Creating rich play environments in your setting will support learners to explore and investigate materials.

Application of Engineering Early Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Application of Engineering	I explore a variety of products covering a range of engineering disciplines. TCH 0-12a	Recognises engineering in the world around them for example bridges, construction, electronics, computers.

What the learning may look like in Fife	Glossary of terms
- Sorting images of structures into natural and man-made categories. - Grouping images according to the materials they are made from, e.g. bricks, plastic, metal. - Discussing how something moves/works, e.g. batteries, wind, elastic band, wheels. - Identifying moving parts on a model or familiar object. - Building simple structures using knowledge of construction, e.g. bridges 'cross over' (span) something else and need supports. - Talking about the purpose/function of an object or machine – what is it for? What does it do? - Using resources such as https://www.letsdoengineering.com/ to explore different types of engineering. - Link with Social Studies – People, Place and Environment. - For ideas from RAiSE for TCH 0-12a: https://drive.google.com/drive/folders/1Qkue5DNW4HkMEKLblo79XbeyJKOlkaZU	Engineer - see “What are engineers?” at https://www.letsdoengineering.com/about-engineers for a definition Engineering - the branch of science and technology concerned with the design, building, and use of engines, machines, and structures Function - work or operate in a particular way Job - a task or piece of work; a form of regular employment Moving parts - a part in an object/machine which can move separately from the rest Product - a thing produced by, or as a result of, a process Purpose - reason for something to exist or be made Sort - separate into groups

Application of Engineering Early Level

See Technological Developments in Society and Business Pathway to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See Sciences Progression Pathways to link learning.

Recognises engineering in the world around them for example bridges, construction, electronics, computers.

Identifies and discusses the purpose of a range of products.

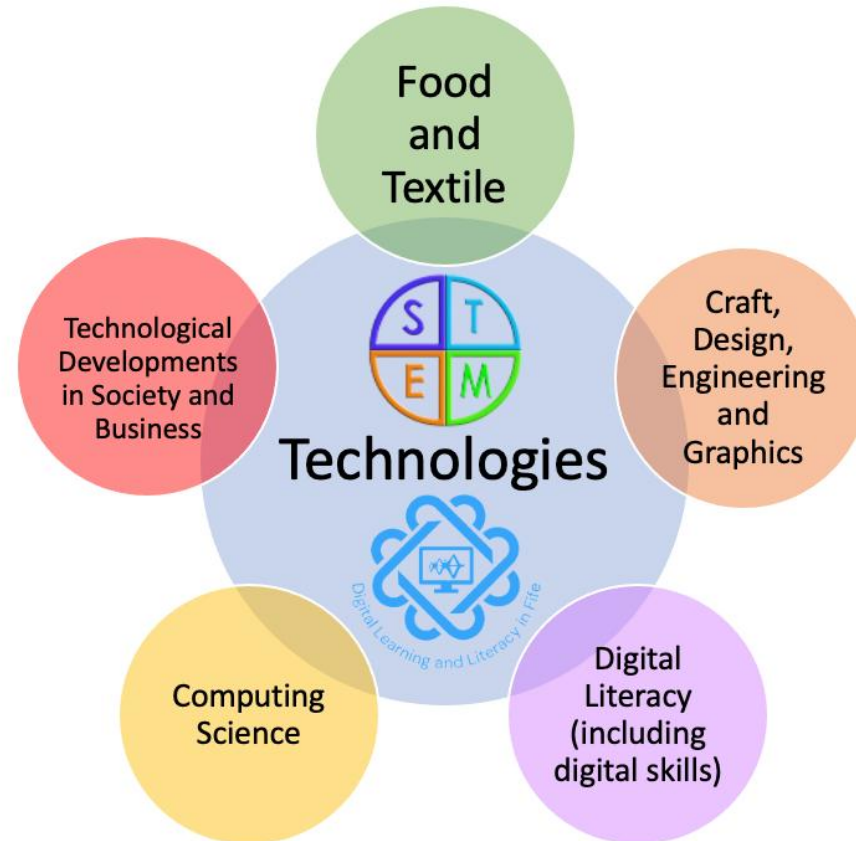
Demonstrates understanding that all manmade objects have been designed to meet a specific need.

Explores and identifies engineering in different settings/environments e.g. manmade structures, technology.

Asks questions about how things are made and work.

Creating rich play environments in your setting will support learners to explore and investigate engineering in the world around them.

Craft, Design, Engineering and Graphics First Level



Design and Constructing First Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can design and construct models and explain my solutions. TCH 1-09a	- Creates and justifies a solution to a given design challenge considering who is it for, where and how will it be used. - Uses appropriate tools and joining methods to construct a model.

What the learning may look like in Fife	Glossary of terms
- Engineer Design Cycle: https://www.letsdoengineering.com/introduction-to-engineering. - Drawing and labelling diagrams to plan what is going to be made. - Labelling the chosen materials on a diagram. - Justifying choices of materials to suit purpose. - Exploring different materials for joining things together including paper fasteners, treasury tags, panel pins, nails, sellotape, masking tape, PVA glue and glue sticks. - Using Tinkercad or similar digital programmes to create 2D and 3D designs. - Creating a prototype to test ideas. - Improving the design of a prototype – second/subsequent attempts (reiterations). - For ideas from RAiSE for TCH 1-09a: https://drive.google.com/drive/folders/1CPHWjOtg1BSZ6ly_f1InX_1hXtL73LFF	Construct - build or make Design - an arrangements of parts in a structure Diagram - a simple representation of an object to what it will look like Equipment - tools or supplies needed for a purpose Foundation - the lowest and strongest part of a building Function - purpose of something Improve - make better based on testing results Label - identify objects/parts of objects and what they are made from for clarification Model - a small or exact copy of something Prototype - an early representation of the model or first attempt Structure - something built or arranged in a certain way

Design and Constructing First Level

See Art and Design Pathway in Expressive Arts to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See Materials and Forces Pathways in Sciences to link learning.

Presents final solution providing a simple evaluation of the design process.

Tests and improves a prototype model.

Compares and contrasts different methods of construction to produce a successful prototype.

Creates and justifies a solution to a given design challenge considering who is it for, where and how will it be used.

Uses appropriate tools and joining methods to construct a model.

Draws and labels ideas on paper or on screen.

Safely experiments with a variety of tools for cutting and construction, including scissors, saws, bench hooks and vices.

Identifies the problem to be solved or purpose of object to be designed.

Explores different items/materials that can be used to successfully join things together for a variety of purposes.

Use the steps of the Engineering Design Cycle to engage with this pathway (see 'What the learning may look like' for link).

Exploring Uses of Materials First Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Exploring uses of materials	I can recognise a variety of materials and suggest an appropriate material for a specific use. TCH 1-10a	- Identifies different materials. - States the properties of materials (hard, soft.....). - Recognises different materials and why they have been selected for a task. - Selects materials to use in a specific task.

What the learning may look like in Fife	Glossary of terms
- Sorting materials according to their properties, e.g. hard/soft; smooth/rough; stiff/flexible; rigid/pliable; shiny/dull; absorbent/non-absorbent. - Experimenting with changing the shape of materials by pulling, stretching, squashing, flattening, twisting and rolling. - Testing materials to identify which is most suitable for a given purpose. - Naming a variety of materials and giving an example of what each one might be useful for. - Choosing from a selection of materials and explain reasons for choice. - Giving feedback about how effective a chosen material was for a given task – identifying what might have been a better alternative next time. - For ideas from RAiSE for TCH 1-10a: https://drive.google.com/drive/folders/1CPHWjOtq1BSZ6ly_f1InX_1hXtL73LFF	Absorbent – able to soak up a liquid easily Flexible – capable of bending easily without breaking Man-made – material that is created by human beings e.g. brick, fabric, plastic, leather etc. Material – the matter that something is or can be made from Natural - material that can be found in the environment e.g. wood, stones, shells, leaves, conkers etc. Pliable – can easily be stretched or molded into shape Rigid – unmovable or stiff, allows no movement Texture – the feel, appearance or consistency of a material Transparent – allows light to pass through so that objects behind can be distinctly seen

Exploring Uses of Materials First Level

See Materials Pathway in Sciences to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

Recognises different materials and why they have been selected for a task.

Justifies the choice of materials by referring to their properties.

Compares and contrasts how a variety of materials behave in different conditions.

Explains why some materials are not suitable for a given task.

Selects materials to use in a specific task.

Sorts different materials according to their properties.

Describes the properties of different materials using appropriate vocabulary such as rigid, flexible, rough, smooth and waterproof.

States the properties of materials (hard, soft.....).

Identifies different materials.

Representing Ideas, Concepts and Products First Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Representing ideas, concepts and products through a variety of graphic media	I can explore and experiment with sketching, manually or digitally, to represent ideas in different learning contexts. TCH 1-11a	- Recognises 2D and 3D shapes and how they can be used to visually represent ideas/concepts. - Creates manual and/or digital sketches to represent ideas.

What the learning may look like in Fife	Glossary of terms
- Observational drawing to learn about line, form, shape, colour, shade. - Using a variety of media to draw with, e.g. pencil, ink, charcoal, chalk. - Using a variety of drawing and painting programmes and tools within these to create a variety of effects e.g. Microsoft Paint. - Identifying 2D shapes and explore ways in which they tessellate together (explore tiling). - Identifying 3D shapes and how they are constructed from 2D shapes. - Exploring nets of boxes by opening them up and drawing the composite shapes. - Using nets of shapes to create 3D shapes, e.g. boxes. - Creating digital images using simple drawing programmes such as Paint.net or TinkerCad. - For ideas from RAiSE for TCH 1-11a: https://drive.google.com/drive/folders/1CPHWjOtq1BSZ6ly_f1InX_1hXtL73LFF	Composite - made up of several parts or shapes Construct - to build or make something Design - an arrangements of parts in a structure Equipment - tools or supplies needed for a purpose Form - the way a shape occupies a space Foundation - the lowest and strongest part of a building Function - purpose of something Image - picture or photograph Line - a path which connects two points; often defines the edges of a form Model - a small or exact copy of something Net - shows what a 3D shape would be like if opened out and laid flat Structure - something built or arranged in a certain way Tessellate - a pattern of repeated shapes that fit together without a gap

Representing Ideas, Concepts and Products First Level

See Art and Design Pathway in Expressive Arts to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See [Digital Literacy Pathway](#) to develop skills in using technology.

See Shape, Position and Movement in Maths to link learning.

Evaluates ideas, concepts and products outlining strengths and areas to improve.

Creates and represents an idea/concept as a series of connected 2D and 3D shapes.

Creates manual and/or digital sketches to represent ideas.

Experiments with depth and perspective to create 3D shapes.

Recognises 2D and 3D shapes and how they can be used to visually represent ideas/concepts.

Experiments with different lines to create sketches and represent ideas.

Identifies different 2D and 3D shapes within everyday objects.

Uses a variety of tools to sketch different ideas.

Application of Engineering First Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Application of Engineering	I explore and discover engineering disciplines and can create solutions. TCH 1-12a	- Recognises and identifies different engineering disciplines. - Builds a solution to a specific task, which has moving parts.

What the learning may look like in Fife	Glossary of terms
- Exploring a variety of engineering disciplines and linking to the world of work. - Discussing ideas and watching video footage to see how things are made. - Learning about simple machines and the 6 mechanical devices which create movement. - Investigating the history of design to illustrate how the design of modern-day objects have evolved. - Creating and constructing models with moving parts e.g. transport, puppets, clocks etc. - Using resources such as https://www.letsdoengineering.com/ to explore different types of engineering. - Engineer Design Cycle: https://www.letsdoengineering.com/introduction-to-engineering - Link with Social Studies – People, Place and Environment. - For ideas from RAiSE for TCH 1-12a: https://drive.google.com/drive/folders/1CPHWjOtq1BSZ6ly_f1lnX_1hXtL73LFF	Aeronautical Engineering - aeronautical engineers work on machines that fly inside Earth's atmosphere, including airplanes, jets, helicopters, blimps, zeppelins, and gliders Chemical Engineering - chemical engineers use mathematics, chemistry, and physics to solve problems. They design equipment and find ways to make chemicals Civil Engineering - civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems Computer Engineering - computer engineers are scientists who combine their knowledge of electricity, mathematics, and computer sciences to think of new ways that computers can be used Discipline - a branch of knowledge or area of practice Electrical Engineering - electrical engineering is the name for the field in which people invent, create, improve and fix electronic devices, tools and equipment Engineer - see "What are engineers?" at https://www.letsdoengineering.com/about-engineers for a definition Engineering - the branch of science and technology concerned with the design, building, and use of engines, machines, and structures Mechanical Engineering - a field that deals with how things are made, how machines operate, and other elements of forces and motion

Application of Engineering First Level

See Technological Developments in Society and Business Pathway to link learning.

See Sciences Progression Pathways to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

Researches the world around us to identify products that have been engineered and made for a purpose, making links to engineering sectors.

Investigates a chosen engineering discipline and links to the world of work.

Recognises and identifies different engineering disciplines.

Builds a solution to a specific task, which has moving parts.

Develops a plan to show how something will work to achieve its goal.

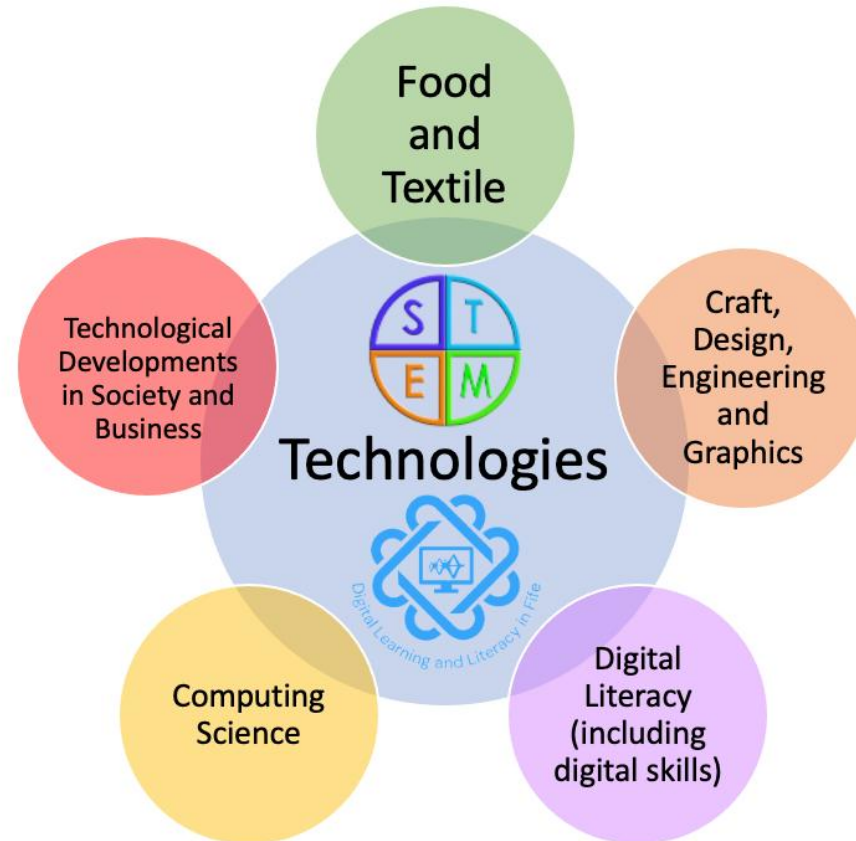
Explores examples of products with moving parts and investigates how they work.

Identifies an everyday design problem and discusses possible solutions.

Explores simple examples of engineering e.g. buildings, bridges, structures, everyday products (computer, clocks, telephone), to discuss and compare.

Use the steps of the Engineering Design Cycle to engage with this pathway (see 'What the learning may look like' for link).

Craft, Design, Engineering and Graphics Second Level



Design and Constructing Second Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can extend and enhance my design skills to solve problems and can construct models. TCH 2-09a	• Uses tools and equipment in order to carry out a task safely. • Uses a range of methods to join and strengthen materials. • Estimates and then measures accurately using appropriate units and tools. • Creates a range of ideas and chooses a suitable solution. • Evaluates solutions and explains why they are or are not suitable.

What the learning may look like in Fife	Glossary of terms
• Creating small products from a variety of materials: wood, plastic, metal, modelling materials etc. • Using tools and products safely and skillfully. • Identifying safe working practices for tasks. • Measuring and marking exercises. • Creating a product to specific sizes. • Using idea generation to create a range of ideas and selecting one to work on. • Peer or self-evaluation of ideas or models. • Preparing material for finishing and applying a suitable finish to the model. • Assembling models using the correct joining techniques. • Link to Measurement in Numeracy, MNU 2-11/11b/11c. • Link to Talking and Listening in Literacy, LIT 2-02a. • For ideas from RAiSE for TCH 2-09a: https://drive.google.com/drive/folders/19_pT6aWztkZG9v0YOaobgzkZlIXswMSW	• Cutting and shaping material - using resources such as scissors, sandpaper, craft knife etc. to create shapes and products • Development - a process of creating a more detailed, refined design • Joining materials - a material or technique that can be used to fix and join two different materials together either permanent or non-permanent • Lifestyle - the way in which a person lives • Measuring and marking out tools - tools which are used for measuring and marking out a product prior to cutting/ constructing etc. • Product design - the process of imagining, creating and iterating products that solve user's problems or address certain needs • Technology - machinery and equipment developed from the application of scientific knowledge

Design and Constructing Second Level

See Art and Design Pathway in Expressive Arts to link learning.

See Measurement Pathway in Numeracy to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

Presents final solution providing an informed evaluation of the design process, through peer and self-evaluation.

Evaluates solutions and explains why they are or are not suitable.

Initiates suitable tests (e.g. 2D to 3D model) to inform evaluation and make improvements to design solutions.

Produces a model demonstrating safe use of appropriate tools, accurate measuring and using suitable joining and strengthening techniques.

Selects and evaluates a suitable idea that meets the brief.

Uses a range of methods to join and strengthen materials.

Analyses suitable joining and strengthening techniques for a given material.

Creates a range of ideas and chooses a suitable solution.

Generates a range of ideas to create new ideas and models using 2D/3D graphic techniques.

Recognises important information from a design brief to support idea generation and evaluation of a product.

Uses tools and equipment in order to carry out a task safely.

Estimates and then measures accurately using appropriate units and tools.

Explores measuring with appropriate units and tools and discusses the importance of measuring accurately.

Identifies, selects and names the correct tool(s) required for a given task.

Discusses how to be safe when using tools and equipment around the school environment.

Exploring Uses of Materials Second Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Exploring uses of materials	I can recognise basic properties and uses for a variety of materials and can discuss which ones are most suitable for a given task. TCH 2-10a	- Recognises characteristics of groups of materials such as wood, plastic and metal. - Selects suitable materials to use in a task. - Discuss the uses of materials.

What the learning may look like in Fife	Glossary of terms
- Exploring different types of materials such as wood (hardwood/softwood), metal (ferrous/non-ferrous) and plastic (thermoplastics/thermosets) to identify different characteristics/ properties. - Inside or outside of the classroom learners explore new opportunities to work with a range of materials to construct various structures or models (e.g. cardboard, paper, junk modelling, KAPLA, block play, wood, Duplo, Stickle Bricks, marble run, loose parts, den building). - Considering the characteristics of a range of materials, explore how these can be used in the world around us. - Experimenting using a range of conditions such as using water, force, heat to reveal the characteristics of materials. - Researching the special skills and techniques needed to work with different materials such as wood, plastic and metal. - Exploring the use of different materials in the future related to the sustainable development goals. - For ideas from RAiSE for TCH 2-10a: https://drive.google.com/drive/folders/19_pT6aWztkZG9v0YOaobgzkZlIXswMSW	Absorbent - able to soak up a liquid easily Flexible - capable of bending easily without breaking Man-made - material that is created by humans e.g. brick, fabric, plastic, leather etc. Material - the matter that something is or can be made from Natural - material that can be found in the environment e.g. wood, stones, shells, leaves, conkers etc. Opaque - not able to be seen through; not transparent Rigid - unable to bend or be forced out of shape; not flexible Texture - the feel, appearance or consistency of a material Transparent - allowing light to pass through so that objects behind can be distinctly seen Translucent - (of a substance) allowing light, but not detailed shapes to pass through; semi-transparent

Exploring Uses of Materials Second Level

See Materials Pathway in Sciences to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

Researches the uses of materials in the world around us and justifies why certain materials have been used for a designated purpose.

Selects suitable materials to use in a task.

Discuss the uses of materials.

Considers sustainability factors when selecting materials for a task.

Compares and contrasts the suitability and performance of materials based on their properties e.g. weight, colour, shape.

Recognises characteristics of groups of materials such as wood, plastic and metal.

Explains the properties of materials in relation to their suitability for different tasks using increasingly complex terminology e.g. rust, magnetic, durable, and waterproof.

Representing Ideas, Concepts and Products Second Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Representing ideas, concepts and products through a variety of graphic media	I can use a range of graphic techniques, manually and digitally, to communicate ideas, concepts or products, experimenting with the use of shape, colour and texture to enhance my work. TCH 2-11a	• Sketches geometric shapes to create objects. • Produces sketches to communicate ideas that include pattern and texture. • Draws geometric shapes accurately. • Sketches 2D and 3D drawings of objects. • Describes primary and secondary colours and the moods/feeling associated with each. • Demonstrates planning for a targeted audience when creating a graphic display.

What the learning may look like in Fife	Glossary of terms
• When creating ideas, make use of SAM style techniques to help create objects. • Freehand sketching of objects broken down into geometric shapes. • Rendering ideas to show different textures and materials (wood, plastic, metal). • Using rulers, square paper etc. to draw geometric shapes. • Looking at posters, publications and focusing on the colour theory within the document. • Looking at different fonts and styles to suit target audiences. • Creating digital images using a simple drawing programmes such as Paint.net or TinkerCad. • For ideas from RAiSE for TCH 2-11a: https://drive.google.com/drive/folders/19_pT6aWztkZG9v0YOaobgzkZlIXswMSW	• Design - an arrangements of parts in a structure • Geometric - meaning they are mathematically created, like circles and squares. Geometric shapes have straight lines, angles, and points • Primary colours - red, yellow, blue • SAM - subtract, add, multiply - idea generation by combining various geometric shapes together • Secondary colours - orange, green, purple, created when 2 primary colours are mixed • Rendering - using colour pens, pencils to create a realistic image with use of light, shadows, texture, pattern • Target audience - a group defined by (gender, age, style, theme)

Representing Ideas, Concepts and Products Second Level

See Art and Design Pathway in Expressive Arts to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See [Digital Literacy Pathway](#) to develop skills in using technology.

See Shape, Position and Movement in Maths to link learning.

Explains sketches to demonstrate understanding of shape, pattern, texture, colours and design brief to represent ideas.

Follows a design brief for a targeted audience.

Explores the process of sketching simple 3D drawings e.g. taking 2D drawings and turning them into 3D drawings.

Sketches 2D and 3D drawings of objects.

Demonstrates planning for a targeted audience when creating a graphic display.

Produces sketches to communicate ideas that include pattern and texture.

Discusses a design brief and ideas to support planning for a graphic display.

Compares and contrasts the effectiveness of different graphic displays for a variety of audiences.

Uses basic shapes to show different patterns and textures of materials.

Explores how colours, shape, pattern and texture are used in everyday products.

Draws geometric shapes accurately.

Uses primary and secondary colours in sketches and designs to express mood/feeling.

Uses tools accurately to draw shapes manually and digitally e.g. measuring lines to produce shapes to a given size.

Describes primary and secondary colours and the moods/feeling associated with each.

Sketches geometric shapes to create objects.

Application of Engineering Second Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Application of Engineering	I can extend my knowledge and understanding of engineering disciplines to create solution. TCH 2-12a	- Understands the difference between different engineering disciplines. - Understands different energy types. - Builds/simulates solutions to engineering problems.
What the learning may look like in Fife		Glossary of terms
- Researching engineering disciplines from the past, present and future. - Researching engineering jobs available in the local area. - Using resources such as https://www.letsdoengineering.com/ to explore different types of engineering. - Engineer Design Cycle: https://www.letsdoengineering.com/introduction-to-engineering - Link with Sciences – Forces, Electricity and Waves and Energy Sources. - Link with Social Studies – People, Place and Environment. - For ideas from RAiSE for TCH 2-12a: https://drive.google.com/drive/folders/19_pT6aWztkZG9v0YOaobgzkZlIXswMSW		Aeronautical Engineering - aeronautical engineers work on machines that fly inside Earth's atmosphere, including airplanes, jets, helicopters, blimps, zeppelins, and gliders Chemical Engineering - chemical engineers use mathematics, chemistry, and physics to solve problems. They design equipment and find ways to make chemicals Civil Engineering - civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems Computer Engineering - computer engineers are scientists who combine their knowledge of electricity, mathematics, and computer sciences to think of new ways that computers can be used Discipline - a branch of knowledge or area of practice Electrical Engineering - electrical engineering is the name for the field in which people invent, create, improve and fix electronic devices, tools and equipment Energy – the power to do work Engineer - see “What are engineers?” at https://www.letsdoengineering.com/about-engineers for a definition Engineering - the branch of science and technology concerned with the design, building, and use of engines, machines, and structures Engineering Design Process - cycle of steps engineers engage in when creating a solution to a problem: ask, imagine, plan, create, test & improve, share Engineering Habits of Mind - describes the ways engineers think and act – systems thinking, adapting, problem finding, creative problem solving, visualising, improving Mechanical Engineering - a field that deals with how things move, how machines operate, and other elements of forces and motion Sources of energy - food, fuels, wind, wave, hydro, solar etc. Types of Energy - movement (kinetic), heat, electricity, chemical, potential etc.

Application of Engineering Second Level

See Technological Developments in Society and Business Pathway to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See Sciences Progression Pathways to link learning.

Compares and contrasts the similarities and differences between chosen engineering disciplines.

Understands the difference between different engineering disciplines.

Researches engineering disciplines and identifies how different disciplines have contributed to real world solutions.

Builds/simulates solutions to engineering problems.

Investigates an engineering problem and explores ways to build/simulate solutions.

Relates examples of engineering to different engineering disciplines e.g. a civil engineer would design/construct bridges.

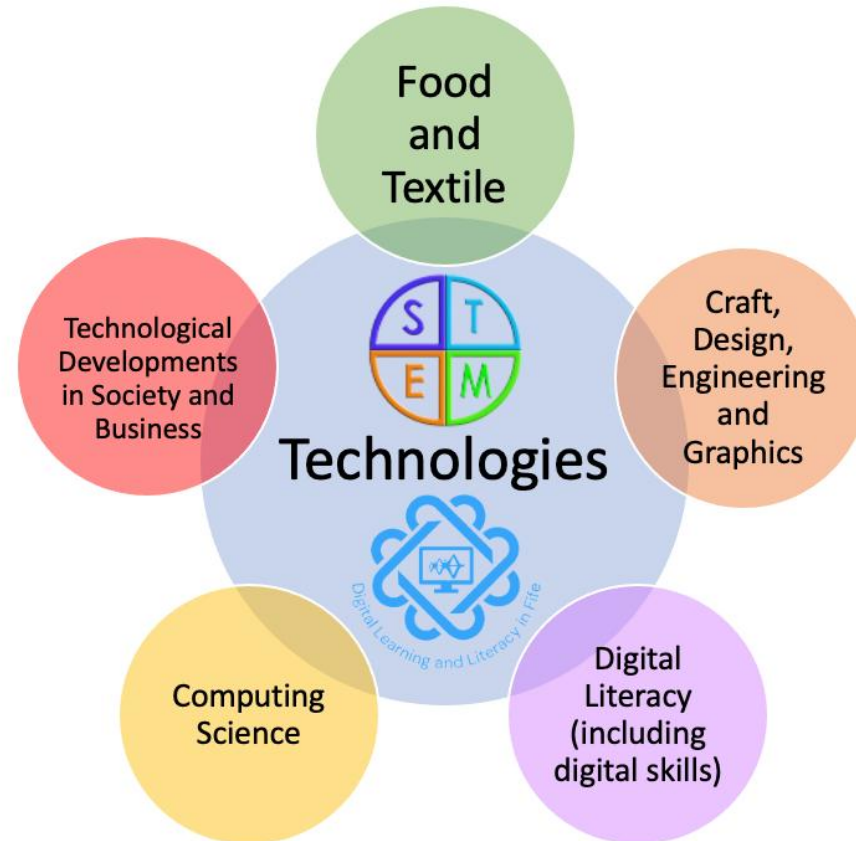
Explores examples of engineering e.g. buildings, bridges, structures, everyday products (computer, clocks, telephone), to discuss and compare.

Understands different energy types.

See Sciences – Energy Sources and Sustainability, and Electricity Pathways to develop knowledge and understanding around the different energy types and applications.

Use the steps of the Engineering Design Cycle to engage with this pathway (see 'What the learning may look like' for link).

Craft, Design, Engineering and Graphics Third Level



Design and Constructing Third Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Design and constructing models/product	I can create solutions in 3D and 2D and can justify the construction/graphic methods and the design features. TCH 3-09a	• Uses aspects of the design process to reach a solution for a given brief. • Identifies relevant design factors in a design brief. • Applies knowledge of design factors and construction methods to justify a design solution. • Uses tools and equipment to manufacture models/products. • Applies safe working practices when creating a model/product. • Extracts dimensions from a drawing and transfer these onto materials to create a model/product.

What the learning may look like in Fife	Glossary of terms
• Analysing a brief to look at design factors (PFAME – Performance, Function, Aesthetic, Market and Ergonomics). • Link with Numeracy for measuring. • Link with Expressive Arts when exploring design. • Idea generation techniques: Pencil for a walk, image board, morphological analysis, SAM. • Tools used for cutting and shaping material: tenon saw, coping saw, chisel, guillotine, tin snips, jr. hacksaw, hacksaw, folding bars, knotcher, files, sandpaper, emory paper (wet and dry). • Machines used include: pillar drill, belt sander. • Tools and materials used in assembly include: PVA glue, clamps, tape, nuts, bolts, screws. • Materials used in finishing include: wax, varnish, paint, dip coating, polish. • Safety equipment used include: goggles, apron, gloves. • Following a design process to a given brief to produce a prototype. • Creating a product to given sizes.	• Design factors - Factors which influence a design including function, performance, market, aesthetics, ergonomics • Design process - Research, initial design ideas, evaluation of design ideas, develop, change and modify design to determine final solution • Design specification - List of all key requirements needed to ensure the product is successful. • Measuring and marking out tools - tools which are used for measuring and marking out a product prior to cutting/ constructing e.g. steel rule, tri-square, marking gauge, scribe, engineers square, odd-leg caliper, center punch etc. • Model - a 3D representation of something on a smaller scale • Product - a thing produced by or as a result of a process • Prototype - The first working model of a design used for testing, development and evaluation

Design and Constructing Third Level

See Measurement Pathway in Numeracy to link learning.

See Art and Design Pathway in Expressive Arts to link learning.

Applies knowledge of design factors and construction methods to justify a design solution.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

Uses design specification to justify changes/modifications to the design.

Produces a step-by-step instruction of manufacturing a piece of work.

Models the order of the design process when generating ideas and creating a design solution.

Uses aspects of the design process to reach a solution for a given brief.

Creates a design specification based on research.

Uses research techniques to investigate design factors to inform the design specification.

Uses research techniques to gather information (e.g. questionnaires, user trials) to inform design specification.

Identifies relevant design factors in a design brief.

Demonstrates understanding of design factors.

Lists important information from the design brief.

Demonstrates understanding of a graphic technique to select information needed to create a model/product.

Measures (within a tolerance) the given size of material using correct tools.

Extracts dimensions from a drawing and transfer these onto materials to create a model/product.

Uses tools and equipment to manufacture models/products.

Locates workshop tools that are suitable for a given material/task.

Identifies safe workshop practises when using machines and tools.

Applies safe working practices when creating a model/product.

Exploring Uses of Materials Third Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Exploring uses of materials	I can explore the properties and performance of materials before justifying the most appropriate material for a task. TCH 3-10a	- Identifies the different categories of materials. - Recognises that materials have different properties and uses. - Recognises that material properties have an impact upon manufacturing processing choices. - Recognises that materials come in different forms. - Justifies selection of materials when developing a solution to a problem or brief. - Discusses sustainability and environmental impact of sourcing and using different materials.

What the learning may look like in Fife	Glossary of terms
- Identifying the different categories of materials – metals, plastics, wood. - Investigating the manufacturing processes for each material category. - Carrying out different practical investigations to observe the materials properties. - Testing different materials to see their properties. - Creating a model from wood/plastic/metal. - Selecting correct modelling materials during design tasks. - Link with Learning for Sustainability. - Link with Sciences.	Aesthetic - refers to the way a product looks and feels Alloys - created when metals, or a metal and other elements, are combined Durability - the ability to withstand wear, pressure, or damage Ferrous - metals that contain iron Hardwoods - wood from deciduous trees Non-ferrous - metals that do not contain iron Opaque - not able to be seen through; not transparent Softwoods - wood that comes from coniferous trees Sustainability - the ability to maintain or support a process continuously over time recognising environmental, health and wellbeing and economic factors. Thermoplastics - most commonly used plastic which becomes soft and malleable when heat is applied and becomes hard again once cooled Thermosets - plastic that once heated cannot be reshaped Translucent - allowing light, but not detailed shapes to pass through; semi-transparent Transparent – allowing light to pass through so that objects behind can be distinctly seen

Exploring Uses of Materials Third Level

See other pathways in Craft, Design, Engineering and Graphics to link learning.

Justifies selection of materials when developing a solution to a problem or brief.

Explores a range of materials suited to the problem or design brief.

Predicts how different solutions will perform based on material selection.

Discusses the advantages and disadvantages of materials in their different forms and the impact this has on manufacturing processing choices.

Recognises that material properties have an impact upon manufacturing processing choices.

Discusses why materials need to have different forms e.g. plastic powder, liquid, granules, sheets etc.

Recognises that materials come in different forms.

Recognises that materials have different properties and uses.

Recognises key features of materials based on their category.

Identifies the different categories of materials.

Selects the correct category for a given material.

Discusses sustainability and environmental impact of sourcing and using different materials.

Compares and contrasts materials based on their sustainability and environmental impact.

Investigates the environmental impact and sustainability of different materials.

Representing Ideas, Concepts and Products Third Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Representing ideas, concepts and products through a variety of graphic media	I can apply a range of graphic techniques and standards when producing images using sketching, drawing and software. TCH 3-11a	• Produces sketches which show an understanding of proportion. • Produces 2D and 3D sketches using a range of techniques. • Produces rendered drawings which may include colour, surface texture, tonal change. • Justifies the choice of colours, layout in a promotional graphics. • Recognises design principles and DTP terms. • Produces orthographic and pictorial drawings/sketches of everyday objects, products or buildings by extracting information from given pictorial drawings accurately. • Use appropriate drawing standards, symbols and conventions where these apply. • Uses computer aided design (CAD) commands, techniques and practices required to create a model. • Produces 3D rendered CAD models. • Produces a range of 2D and 3D CAD drawings.

What the learning may look like in Fife	Glossary of terms
• Manually sketching 2D/3D objects, freehand or using tools and resources (e.g. isoSketch, isometric paper, grid paper, drawing board, set squares) • Manually rendering objects to show texture, materials, highlights and shadows using mixed media (pencils, markers) • Producing a promotional graphic following a brief showcasing selected DTP principles and terms. • Producing reverse thumbnails of given media. • Producing thumbnails as part of planning a promotional graphic. • Identifying different DTP terms and principles on media. • Producing 2D/3D graphics to a given scale, size, perspective. • Using 3D modelling software to create 3D objects. • Following a 3D modelling brief to produce the 3D object, orthographic, rendered image. • Applying correct drawing standards and conventions to drawings (e.g. floor plans, location plans, site plans, orthographics).	• CAD - Computer Aided Design • 2D CAD commands - Line, circle, rectangle, chamfer, fillet, array, mirror • 3D CAD commands - Extrude (add, subtract), fillet, chamfer • Drawing standards, symbols and conventions - BSI standards • DTP - Desktop Publishing • DTP principles - Depth, alignment, colour, dominance, unity • DTP terms- Drop cap, gutter, margin, rule, header, footer, heading, subheading, column, text box. • Graphic techniques - orthographic, perspective, isometric and oblique • Primary colours - Red, yellow, blue • Rendering- media (e.g. colour pens, pencils etc.) used to create a realistic image with use of light, shadows, texture, pattern • SAM - subtract, add, multiply - idea generation by combining various geometric shapes together • Secondary colours - Orange, green, purple. Created when 2 primary colours are mixed • Target audience - a group defined by (gender, age, style, theme) • Thumbnails - small, quick sketches to show the planning of a publication

Representing Ideas, Concepts and Products Third Level

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See [Digital Literacy Pathway](#) to develop skills in using technology.

See Art and Design Pathway in Expressive Arts to link learning.

Produces orthographic and pictorial drawings/sketches of everyday objects, products or buildings by extracting information from given pictorial drawings accurately.

Use appropriate drawing standards, symbols and conventions where these apply.

Identifies and applies drawing standards, symbols and conventions across a range of graphic examples.

Visualises and interprets drawings from all views.

Demonstrates understanding of the importance of measurement and proportion.

Produces 3D rendered CAD models.

Applies materials, shadows and reflections to a CAD model.

Identifies graphic technique used in everyday objects, products or buildings.

Selects appropriate view and information from pictorial drawings to carry out selected graphic technique.

Imports 3D CAD files into different software packages.

Produces orthographic drawings from 3D CAD models, adding appropriate dimensions.

Justifies the choice of colours, layout in a promotional graphics.

Applies knowledge of colour theory and design principles.

Produces rendered drawings which may include colour, surface texture, tonal change.

Experiments with different visual elements to enhance drawings.

Produces a range of 2D and 3D CAD drawings.

Selects appropriate CAD tools and commands for the given task.

Produces sketches which show an understanding of proportion.

Identifies design principles and DTP terms used in everyday media.

Recognises design principles and DTP terms.

Produces 2D and 3D sketches using a range of techniques.

Practices a range of graphic techniques e.g. orthographic, perspective, isometric, oblique.

Uses computer aided design (CAD) commands, techniques and practices required to create a model.

Investigates the different areas within CAD software.

Application of Engineering Third Level

Curricular Organiser	Experiences and Outcomes	Benchmarks
Application of Engineering	I can apply my knowledge and understanding of engineering disciplines and can develop/build solutions to given tasks. TCH 3-12a	• Explain why something is an input, process, output. • Builds/simulates solutions to engineering problems. • Explains energy transfers within a system. • Uses given formulae to calculate outcomes to engineering problems.

What the learning may look like in Fife	Glossary of terms
• Constructing or simulating circuits with different components and measuring voltage, current and resistance. • Constructing flowcharts using technology showing solutions to simple control programs. • Investigating the roles of engineers in designing, developing, simulating, building, testing and evaluating solutions to engineering problems. • Exploring different formulae used across engineering topics including energy and efficiency, electricity, forces, pneumatics etc. • Investigating the social, economic and environmental impact of engineering. • Investigating and evaluating existing and emerging technologies. • Exploring simple combinational logic systems e.g. And, Or, Not gates and completes truth tables. • Exploring a range of key concepts and devices used in electronic control systems, including analogue, digital and programmable systems.	• Aeronautical Engineering - aeronautical engineers work on machines that fly inside Earth's atmosphere, including airplanes, jets, helicopters, blimps, zeppelins, and gliders • Chemical Engineering - chemical engineers use mathematics, chemistry, and physics to solve problems. They design equipment and find ways to make chemicals • Civil Engineering - civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems • Computer Engineering - computer engineers are scientists who combine their knowledge of electricity, mathematics, and computer sciences to think of new ways that computers can be used • Electrical Engineering - electrical engineering is the name for the field in which people invent, create, improve and fix electronic devices, tools and equipment • Electronics - engineering discipline studying the design, creation and operation of devices that manipulates electrons and other electrical charged particles • Energy – needed to make things work. It comes in many forms and can be converted from one form into another, but it cannot be destroyed • Energy transfer - the change of energy from one form to another e.g. chemical --> kinetic • Input - what goes into a system to make it work e.g. switches and sensors. • Input, process and output - the series of events that makes a system • Logic System – And, Or, Not gates • Mechanical Engineering - a field that deals with how things move, how machines operate, and other elements of forces and motion • Output - what comes out of the system (product) e.g. movement of a motor, light/heat from a bulb. • Process - how the system will work e.g. control devices • Renewable energy sources – solar, wind, energy from the sea/water etc. • Sources of energy - food, fuels, wind, wave, hydro, solar etc. • System - a number of parts working together to fulfil a complete function • Types of Energy - movement (kinetic), light, sound, heat, electricity etc.

Application of Engineering Third Level

See Technological Developments in Society and Business Pathway to link learning.

See other pathways in Craft, Design, Engineering and Graphics to link learning.

See Sciences Progression Pathways to link learning.

Builds/simulates solutions to engineering problems.

Investigates an engineering problem and explores ways to build/simulate solutions.

Uses given formulae to calculate outcomes to engineering problems.

Explores different formulae used across engineering topics including energy and efficiency, electricity, forces, pneumatics.

Explain why something is an Input, process, output.

Investigates input, process and output components in a system.

Explains energy transfers within a system.

Identifies different types of energy within a system.

See Sciences – Energy Sources and Sustainability, and Electricity Pathways to develop knowledge and understanding around the different energy types and energy transfers.