The National Strategies
Secondary

Functional Skills Support Programme

Developing functional skills in design and technology

department for children, schools and families

BIS Department for Business Innovation & Skills

LSIS Learning and Skills Improvement Service

Functional Skills Support Programme

Developing functional skills in design and technology

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Key to references

This booklet contains three contexts that highlight opportunities for pupils to develop and apply functional skills (FS), and personal, learning and thinking skills (PLTS). Coloured boxes indicate which specific skills are being developed. Within the boxes the following references have been used:

Reference	Explanation
FS.Eng.L1/SLC	Functional English level 1 – Speaking, listening and communication
FS.Eng.L1/R	Functional English level 1 – Reading
FS.Eng.L1/W	Functional English level 1 – Writing
FS.Ma. L1/	Functional mathematics level 1 followed by reference to one of the three interrelated process skills: representing, analysing and interpreting
FS.ICT.L1/Using ICT	Functional ICT level 1 – Using ICT
FS.ICT.L1/F&S	Functional ICT level 1 – Finding and selecting information
FS.ICT.L1/DP&CI	Functional ICT level 1 – Developing, presenting and communicating information
PLTS	Personal, learning and thinking skills followed by reference to one of the six groups of skills

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Developing functional skills in design and technology

What are functional skills?

> 'In design and technology pupils combine practical and technological skills with creative thinking to design and make products and systems that meet human needs. They learn to use current technologies and consider the impact of future technological developments. They learn to think creatively and intervene to improve the quality of life, solving problems as individuals and members of a team.'
>
> **The importance of design and technology, National Curriculum 2007**[1]

Functional skills underpin and complement many of the key processes in design and technology. They are the core elements of English, mathematics and ICT that enable pupils independently to:

- apply and adapt their knowledge and understanding to a range of contexts
- solve problems in familiar and unfamiliar situations
- gather, interpret and communicate information effectively and confidently.

Each of the three skills has a set of performance statements based on three key areas.

Functional English	Functional mathematics	Functional ICT
• Speaking, listening and communication • Reading • Writing	• Representing – selecting the mathematics and information required to model a situation • Analysing – processing and using mathematics • Interpreting and communicating the results of the analysis	• Using ICT • Finding and selecting information • Developing, presenting and communicating information

The skills are embedded through the programmes of study in the new secondary curriculum at both Key Stage 3 and Key Stage 4 and form an essential part of GCSE and new Diploma courses. Alongside the new Framework for personal, learning and thinking skills, functional skills are fundamental to learning across the curriculum and are key to success for pupils, both now and in their future.

For further information about the functional skills visit: www.ofqual.gov.uk/2578.aspx and www.qcda.gov.uk/6062.aspx

> 'Design and technology provides excellent opportunities for pupils to develop their use of functional skills as they work in real-life contexts within which they can identify and meet needs and opportunities.'
>
> **Design and technology subject leader**

1 The importance of design and technology, National Curriculum 2007. © Qualifications and Curriculum Authority. Used with kind permission.

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The curriculum opportunities in the programmes of study for all subjects, combined with many of the key processes, have been designed to ensure that pupils have **planned** opportunities to transfer the functional skills they are developing to as many varied and relevant situations as possible.

For more information relating to the role of functional skills in Foundation Learning, GCSEs, Diplomas and apprenticeships visit: www.dcsf.gov.uk/14-19/

What does this mean for learners?

Pupils who are able to apply functional skills effectively will make better progress in design and technology and in the rest of their studies. They will not only engage in the content of what is being taught but will become more actively involved in the learning process. They will understand the purpose of the English, mathematics and ICT skills they are transferring and securing and will take greater responsibility for furthering their own progress.

What does this mean for me as a design and technology teacher?

The diagram on page 8 captures the learning process that you will need to support, in order to ensure that pupils secure their functional skills. This process is not linear but cyclical and should respond to the needs of the learners and inform their future learning.

Effective teaching will enhance the development of skills. Pupils need planned opportunities to 'have a go' – to select from and experiment with the skills they have learnt elsewhere in the curriculum, applying them with an increasing degree of independence to new and varied contexts. These should have both relevance to the learner and a real purpose in relation to the subject.

Through peer-assessment, self-evaluation and teacher feedback they then need to reflect on the progress they are making and to identify particular aspects of their skills development that need further reinforcement.

What functional skills can be developed and applied to design and technology?

Designing-and-making activities provide a rich background for learners to draw upon and to apply a range of functional skills. The increased emphasis on designing and making, cultural understanding, creativity and critical evaluation will be providing design and technology teachers with the opportunity to develop more open-ended and problem-solving tasks that require pupils to take more ownership of their learning to:

- respond creatively to briefs by generating and modelling ideas for products, drawing on their knowledge of materials, ingredients and technologies
- use their understanding of others' designing
- plan and organise activities and evaluate tools and equipment, solving technical problems when manufacturing
- reflect critically and modify their ideas to improve their products.

Pupils develop competence and confidence in using functional skills in an interrelated way. Their functionality develops over time as they learn to select and apply skills to tackle tasks accordingly. Subject teachers can support this process by ensuring that pupils have access to the full range of skills.

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The tables below outline a few examples of ways in which functional skills can be deployed in design and technology.

Functional English

Learning through discussion, from text and through writing is integral to functional English and to the activities that you will ask your pupils to complete as part of your design and technology syllabus. However, in addition, pupils will need to deploy specific functional English skills such as those listed in the table below.

Functional English	Example of how applied in design and technology
Present information and points of view clearly and in appropriate language, including discussions of unfamiliar subjects *(Speaking, listening and communication)*	Using appropriate technological language when presenting design proposals to groups or other individuals
Read and summarise succinctly information/ideas from different sources *(Reading)*	When investigating the work of other designers, pupils use a range of texts to support the development of design proposals
Use a range of writing styles for different purposes *(Writing)*	Using a range of writing, for example, when analysing and evaluating or when compiling design portfolios

Functional mathematics

Mathematical skills of **representing, analysing** and **interpreting** can be used and developed in a wide range of ways in design and technology.

Functional mathematics	Example of how applied in design and technology
Interpret and communicate results of calculations involving ratio and proportion *(Interpreting and communicating)*	When adapting recipes and measuring the correct proportions for ingredients When designing and manufacturing food products for a range of users
Decide when and how to use 2-D representations of 3-D objects *(Representing)*	When generating orthographic drawings for the production of final design solutions
Use, convert and calculate, using metric and, where appropriate, imperial measures *(Analysing)*	When working with food ingredients, construction materials and tools available in both units of measurement

Functional ICT

Design and technology provides a rich vein of opportunity for pupils to use, apply and secure ICT skills in new contexts.

Functional ICT	Example of how applied in design and technology
Interact with and use ICT systems to meet requirements of a straightforward task in a familiar context *(Using ICT)*	When using computer-aided design and manufacturing systems safely for designing and manufacturing products
Select information from a variety of ICT sources for a straightforward task *(Finding and selecting information)*	When researching components and materials to be used in the manufacture of products they design
Evaluate own use of ICT tools *(Developing, presenting and communicating information)*	When reviewing the selection, use and effectiveness of ICT tools and facilities used to present design proposals and manufacture the products they design

How can I secure the development of functional skills within my lessons?

As a design and technology teacher you can support a cohesive and planned approach to the skills development of your pupils by:

- familiarising yourself with the functional skills criteria (see reference on page 3)
- talking to your colleagues, for example, those in the English, mathematics and ICT departments, about how and when certain functional skills are being taught
- making clear from the beginning of a teaching sequence both the subject learning objectives that will need to be achieved and the functional skills that will be developed and applied
- referring at regular intervals in lessons to the objectives and to the functional skills that are being used, encouraging pupils to assess their progress and to inform where they next need to focus
- designing problem-based activities, both within design and technology and, where possible, in conjunction with other subject areas, that provide pupils with the opportunity to make choices about which functional skills they will use, individually and in combination, to seek solutions to challenges that are real, relevant and purposeful
- encouraging pupils to reflect on their learning, using probing questions that require them to identify how they have used their functional skills and how they can transfer and apply these skills to other contexts within and beyond design and technology and the school.

What's in this booklet?

Three teaching sequences

The booklet contains three worked examples of teaching sequences that support how an organisation might embed and support the development of functional skills within design and technology as follows:

1. **Key Stage 3 teaching sequence:** Design and make a weighing machine
2. **Key Stage 3 teaching sequence:** Design and make high-energy food products for Olympic athletes
3. **Key Stage 4 teaching sequence:** Design for manufacture

Each teaching sequence exemplifies three key principles:

- Problem-solving needs to be at the core of planning for functional skills.
- Real, purposeful and relevant contexts are essential for engagement and applied learning.
- Supporting pupils to progress and use functional skills independently is the ultimate goal.

Functional skills focus

The teaching sequences support the development of a range of functional skills, for example, speaking and listening as well as reading and writing. In mathematics, pupils will usually deploy the skills of representing, analysing and interpreting in an integrated way to solve problems. Similarly, the functional skills of using ICT systems, finding and selecting information, developing, presenting and communicating information will also be used together.

However, within each sequence, particular functional English, mathematics and ICT skills have been highlighted as part of the learning focus to show how they can be explicitly developed and applied.

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Design and technology teachers would need to consider how, over a period of time, teaching sequences support the development and application of a broad skills set.

Functional skills progression

In line with the English, mathematics and ICT programmes of study, functional skills have been mapped at level 1 to the Key Stage 3 examples and at level 2 to the Key Stage 4 example. However, it is important to note that these are target levels to be achieved **at the end of** each of these key stages and that some learners will be working towards securing their functional skills at lower levels and some at higher levels. The teaching sequences can be tailored to the needs of your learners, as appropriate.

A learner's **level of performance** in functional skills and the **level of demand** of a task depend on the interplay of four factors that are crucial to success:

- the **complexity** of tasks and problems and the contexts in which they are embedded
- the **technical demand** of the content that might be applied in these contexts
- a learner's level of **familiarity** with the type of task or problem and context
- the level of **independence** required of the learner.

The need for **problem-solving** underpins all of them. The four factors are key to reflection on **progress** in functional skills. For more detail see the diagram on page 8 and visit the functional skills qualifications criteria on the Ofqual website.

Personal, learning and thinking skills

Functional skills and personal, learning and thinking skills work together to build independent, confident and successful learners. Therefore in addition, references to opportunities to develop specific personal learning and thinking skills have been provided.

For more information relating to personal learning and thinking skills visit:
http://curriculum.qcda.gov.uk/key-stages-3-and-4/skills/plts/

How can I use this booklet?

You can use the examples that follow, plus the additional information contained within this booklet, to:

- provide ideas that will inform your own planning (see planning tool on page 21)
- open a dialogue with teachers in your school who have the primary responsibility for delivering functional skills to find out more
- begin a discussion with other colleagues within your department about how to enhance functional skills development within design and technology
- raise challenges and opportunities concerning working within and between subjects in your organisation.

For the key to the functional skills references that have been used in each context please see the grid on page 2.

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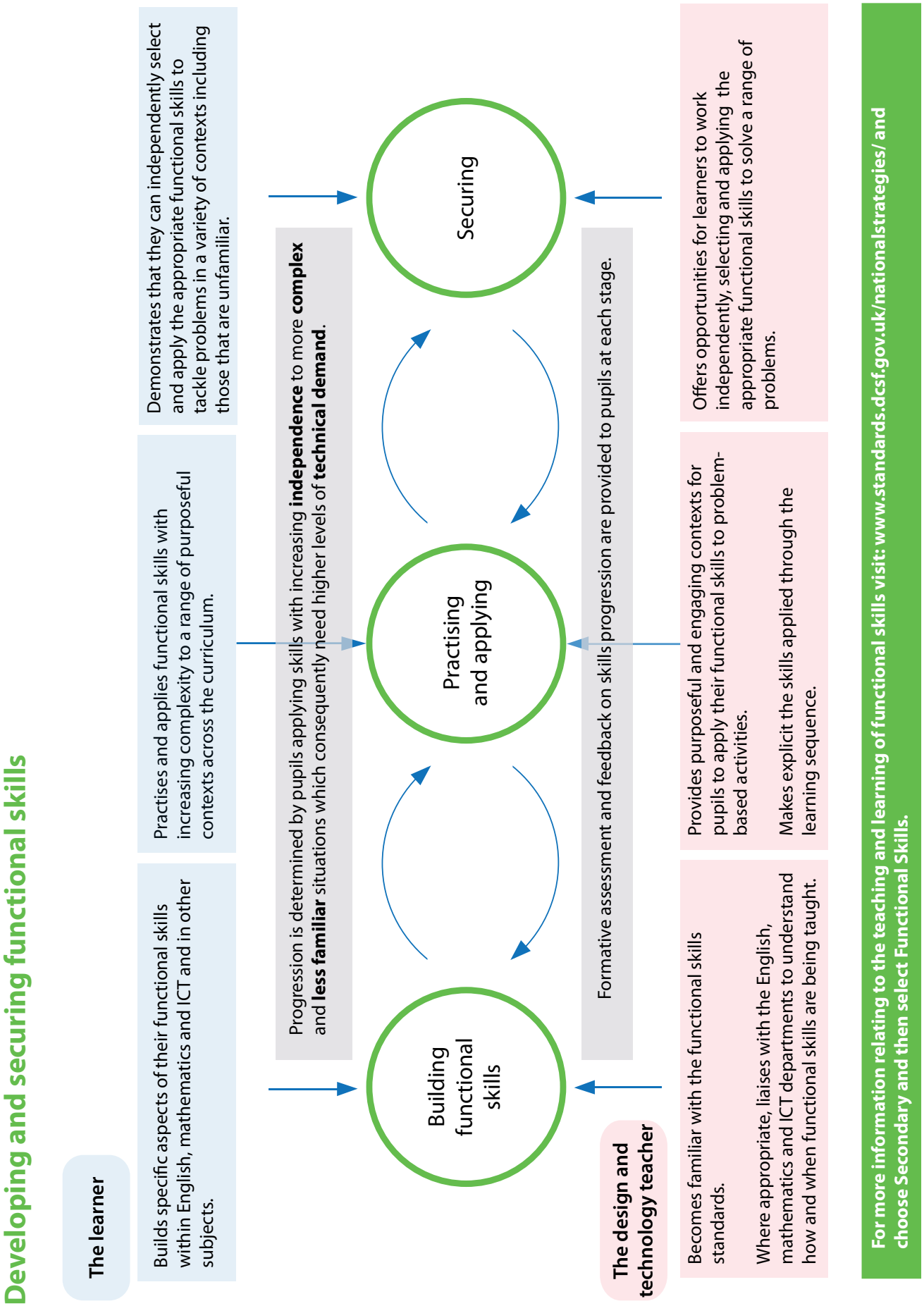


Context 1: Key Stage 3 – Design and make a weighing machine

Aims and overview

This module will enable learners to develop selected functional skills while engaging in the design and technology programme of study. Transferable functional skills will be used to analyse, make sense of and respond to a brief, by exploring the key concept of designing and making. Learners can investigate the context of their school and community to find situations where objects need to be weighed and to develop a prototype weighing machine with an instruction manual. Focused at Year 8, the project will build on design and technology skills that the learners have already encountered.

The big question

How will you solve the problem of weighing objects in a school context?

Learning focus – design and technology

Pupils should be able to:

- analyse products to learn how they function, using criteria to judge the quality of products and how they meet a clear need
- develop an understanding of mechanical control systems and how to use them effectively
- evaluate the needs of users and how products are used ergonomically to inform design decisions
- prepare and assemble components to achieve functional outcomes.

Learning focus – functional skills target: level 1

This teaching sequence supports the development of a range of functional skills. However, particular functional English, mathematics and ICT skills have been highlighted and annotated below to model, for illustrative purposes, how they can be explicitly developed and applied.

English	Mathematics	ICT
Speaking, listening and communication, reading and writing	Representing, analysing and interpreting	Using ICT, finding and selecting information, developing, presenting and communicating information
Reading: Read and understand a range of straightforward texts.	*Representing:* Select mathematics in an organised way to find solutions.	*Using ICT:* Interact with and use ICT systems to meet requirements of a straightforward task in a familiar context.

Stage and focus	Learning outcomes
Stage 1 – The context Introduce the 'big question'. Pupils start to analyse the key requirements to complete the task. They work from given criteria, such as a clear context, timescales for the project and existing products. Ask pupils to start identifying ways in which they can solve the problem, using these questions. • How do you investigate the context to start identifying needs? • What do you need to find out? • What do you need to carry out the investigation and how will you communicate your findings? • What needs to be put into the plan to carry out the project? • What materials are available? Use specific design and technology creative resources that will enable pupils to begin to develop the answers to questions. Bring together group discussions to formulate a class design brief and a specification for the product. • Practise 'planning a sequence of events' in relation to 'product life cycle and sustainability', using an ICT planning tool for flow charts and spreadsheets.	Pupils, in groups, brainstorm ideas to identify needs for design within the context. Pupils write and share design briefs and specifications to demonstrate understanding. Pupils use ICT planning tools to create a diagram that illustrates the product life cycle.
Stage 2 – Research and exploration **Product analysis** As a class, identify a range of questions that could be asked when analysing an existing product. Write and share out questions for other groups to address. In groups, using materials from the Key Stage 3 National Strategies: *Foundation subjects design and technology framework* and training materials, carry out product analysis on existing products collected from around the school. Draw an accurate representation or photograph the product. Label the drawing with questions and answers from the analysis activity. Prepare pupils to make decisions about how to use mathematics to develop their product analysis activity by exploring: • the requirements for accuracy and purpose of measurement • the mathematical aspects of scale calibration and units of measurement • the graphical aspects of representing units of measurement. Provide input, with pupils drawing out key information from scientific texts with regard to turning moments and the behaviour of springs. **Designing** Build pupils' ability to make informed design decisions by revisiting mechanisms and how they work. Pupils will need to make some decisions for their own design, based on the following questions. • Will it include an overall mechanical system-beam, compression spring, tension spring? • Will it incorporate a set of subsystems using input process, output, to provide a reading of weight? • Will it comprise a set of components combining to give a set of subsystems? Pupils can model, through a range of focused practical tasks, different mechanisms, drawing out what they can achieve for their own products with careful analysis of their limitations.	Through representation, pupils demonstrate an understanding of form and function, mechanisms and ergonomics to be integrated into modelling of products. Pupils will recognise the need to add more to the specification, using ergonomic principles and showing their understanding of measurements. Pupils use appropriate information from texts to be applied to their own final design decisions. Pupils evaluate models of possible mechanisms to inform their own design decisions. Pupils evaluate and explain why they made certain design decisions.

FS.Eng.L1/R Identify the main points and ideas and how they are presented in a variety of texts.

FS.ICT.L1/Using ICT Select and use software applications to meet needs and solve straightforward problems.

PLTS Team workers

FS.Ma.L1/ Representing Decide how to use mathematics to solve problems requiring calculation, with common measures of weight.

Convert units of measure in the same system.

FS.Eng.L1/R Read and understand texts in detail.

Stage and focus	Learning outcomes
Through group tasks, pupils can now organise their designing activities by: • producing some initial sketches, notes and research materials • coming up with a design proposal, for example, taking into consideration use of mechanisms and ergonomics and how users can read measurements easily. Pupils can then identify in their final designs how they intend to use this information to make their designs, using independent application of the pupils' functional skills based on an increased emphasis on technical demand in their learning.	
Stage 3 – Deploying ideas and information **Production of working drawing, planning stages and making their product** Pupils now work through the stages for planning and making their prototype products. They will: • produce accurate working drawings with measurements to show how designs will be made • draw up a production plan for Planning stages for making their product using ICT programmes where available • mark out their materials • use ICT to graphically reproduce scales of measurements for their product • use computer-aided design and manufacture (CAD/CAM) to ensure consistency and precision where available • prepare and assemble mechanical systems, components and graphical structure to achieve functional results • finish their product, using appropriate finishes.	Pupils will learn through the production of a prototype how to use planning and design processes to solve technical problems, adapting the design where necessary. Pupils engage in a number of evaluative techniques, providing a full account of their product and how it functions against original specifications.
Stage 4 – Consolidating and reflecting (moving towards functional skills level 2) When the substantial task of designing and making is completed, pupils will have the opportunity to test their products in a range of ways. • The obvious test is to test out the product in relation to its intended target market (who?) and in its place in the school (where?). • It will need to be examined in relation to the original specification, with full documentation of changes that have been made during manufacture. • Production methods can be evaluated, with a rating for quality that could be a scale decided by another group of pupils. • The ICT systems and software used can also be evaluated and tested against the quality of the product. • In groups , pupils establish design evaluation criteria and research responses from a range of possible users. • Pupils then write up their findings and identify key areas for improvement.	

PLTS
Effective participators

FS.Ma.L1/ Representing
Construct diagrams using common measures and scale.

FS.ICT.L1/Using ICT
Interact with and use ICT systems to meet requirements of a straightforward task in a familiar context.

FS.ICT.L1/Using ICT
Select and use software applications to meet needs and solve straightforward problems.

FS.ICT.L1/Using ICT
Select and use interface features effectively to meet needs.

PLTS
Team workers

Extending

Pupils take part in appropriate activities such as:

- further research into educational suppliers and analysis of products used around the school by others to inform design decisions
- investigation into further ranges of equipment that can be designed for user-specific purposes
- bringing together all units of measurement and identifying their origins
- identifying a range of different materials that would be suitable for the product, including smart materials and new technology
- thinking about marketing the product, writing instructions and designing packaging
- using employer links with design engineers to set the design problem, support the activity and to evaluate products.

Useful resources

www.youngforesight.org For the Young Foresight toolkit for teaching, select 'Resources' and follow the link via 'Print materials' and 'YF2 Understanding needs through the PIES approach'.

www.standards.dcsf.gov.uk/nationalstrategies This is the website for Key Stage 3 National Strategies, foundation subjects, the Design and Technology Framework and training materials (2004).

http://curriculum.qcda.gov.uk/key-stages-3-and-4/subjects/key-stage-3/design-and-technology/index.aspx This website offers the new programmes of study for Key Stage 3.

www.secondarydandt.org The Nuffield Foundation offers resources for secondary D&T. Follow the link 'Designing at KS3', then select 'Year 9 RM (resistant materials) capability tasks' and 'Better Weighing'.

www.data.org.uk The Design and Technology Association offers a wide range of teaching and learning resources that can be downloaded.

Context 2: Key Stage 3 – Design and make high-energy food products for Olympic athletes

Aims and overview

This module will enable learners to develop selected functional skills, in an appropriate manner, to study themes and concepts as part of design and technology. They will use transferable functional skills to develop the key concept of cultural understanding in the context of healthy eating. This module builds on the range and content of food technology, in particular, the nutritional needs of different groups in society and the characteristics of a broad range of ingredients, including their nutritional functional and sensory properties.

The big question

How can our diets support our lifestyle?

Learning focus – design and technology

Pupils should be able to:

- explore how products contribute to lifestyle and consumer choices
- understand user needs and the problems arising from them
- develop a range of practical skills, techniques, equipment and standard recipes to develop, plan and cook meals
- plan and carry out practical cooking tasks safely and hygienically.

Learning focus – functional skills target: level 1

This teaching sequence supports the development of a range of functional skills. However, particular functional English, mathematics and ICT skills have been highlighted and annotated below to model, for illustrative purposes, how they can be explicitly developed and applied.

English	**mathematics**	**ICT**
Speaking, listening and communication, reading and writing	Representing, analysing and interpreting	Using ICT, finding and selecting information, developing, presenting and communicating information
Writing: Write a range of texts to communicate information, ideas and opinions, using formats and styles suitable for their purpose and audience.	*Interpreting*: Interpret and communicate solutions to practical problems, drawing simple conclusions and giving explanations.	*Developing presenting and communicating information:* Interact with and use ICT systems to meet requirements of a straightforward task in a familiar context.

Stage and focus	Learning outcomes
Stage 1 – The context Introduce the design brief: 'Design and make a range of suitable food products for athletes competing in the 2012 Olympic games.' Recap and extend pupils' previous knowledge about nutrition, using the 'eatwell plate'. Pupils work in groups to find 20 facts about the nutritional needs of athletes and then produce a poster illustrating the foods most suitable for athletes. They show their peers their findings. Extend this activity by asking: 'Are current high-energy foods suitable for purpose?' Pupils answer this by conducting a product analysis on a range of high-energy foods, including packaging and labelling. Pupils record information for a report or portfolio, using self-defined headings and layouts that effectively record what is required, for later use. Develop the context by asking what the staple foods are and where they are grown in the world. Introduce the concepts of: • staple foods and where they come from, including local produce • sugary and starchy carbohydrates and their role in the body • the best combination of carbohydrates, in terms of sugar, starch and NSP content, to ensure high energy levels • the 'nutritional function' of the food. Different people need different types of food during their lives. Ask pupils to define three groups of people, one of which should be athletes, and to suggest the types of food required.	Groups show their 'suitable foods for athletes' by presenting their findings and talking through their poster images to the rest of the class.
Stage 2 – Research and exploration In groups, pupils source and adapt a recipe for athletes in competition, ensuring that healthy choices have been made and recipes have been modified accordingly. They trial the recipe after a demonstration of the key elements and the production of a planning sheet. Each group then makes one product and the whole class can taste products, using sensory analysis, and feeding back their findings to the group. Pupils decide how to record, collate and analyse nutritional and taste-test data for each product, in order to inform decisions about their second product. They prepare a presentation to the class, deciding how to interpret and present the data to justify their proposals. Pupils can then analyse the information and display findings, using graphs and charts. Pupils make their second product, after which a full evaluation of the food products results in further development of 'design ideas', based on feedback and analysis of findings and data.	Pupils use sensory analysis information and develop a pictorial view of statistics to analyse and inform final design. Pupils develop a list of actions outlining their plans to solve the problem posed by the brief.

FS.Eng.L1/W Present information in a logical sequence.

FS.Ma.L1/ Interpreting Collect and record discrete data and organise and represent information in different ways.

FS.Eng.L1/W Use language format and structure suitable for purpose and audience.

Stage and focus	Learning outcomes
Stage 3 – Deploying ideas and information Ask pupils to discuss what they think they need to determine regarding the requirements for their final product based on these key questions. • What is a healthy, high-energy food and does this differ from high-energy food that isn't healthy? • How do you plan for prototype production, ensuring that all systems and processes such as 'develop, plan and cook' are done safely and hygienically? • What decisions will you need to make regarding the chosen food? • How will you let the athletes know the food is specifically designed for their needs?	Pupils write a specification based on their findings. Pupils generate a planning process to take into account health and safety and quality assurance.
Build and develop Pupils use ICT to build and present a visually appealing presentation, outlining the values of their chosen product, based on the needs in the design brief, which demonstrates how the production of final design proposals that have been planned and prepared take into consideration key points for quality control (HACCP) and health, safety and hygiene. Pupils make the products and invite experts to trial and comment on the high-energy foods they have produced. The teams will design feedback forms for experts who are tasting the food. These will be collated and the results analysed.	Pupils demonstrate an understanding of the activity and the related health and safety elements through the development of a presentation that meets agreed criteria.
Stage 4 – Consolidating and reflecting (moving towards functional skills level 2) Pupils will gather relevant material to produce evidence for a portfolio. This will need to include: • a design brief and specification for the chosen product • a poster identifying high-energy foods • product analysis feedback • information and research about staple foods • details of nutritional requirements for athletes and a nutritional analysis for each food product • a range of product ideas, with calculations of nutritional values • a plan for making products • an evaluation of food products trialled • final design ideas. Pupils with access to ICT could create an e-portfolio with an introductory page that has working hyperlinks to each of the sections.	Pupils calculate quantities of ingredients, based on numbers and using ratios. Pupils calculate the nutritional value of products.
Pupils should produce an evaluation that explains the decisions made in relation to the development of their products, in particular, how they fit the original brief and specification. Feedback from consumers also needs to be taken into account, alongside analysis of mathematical data to inform the reasoning behind the products. This is a particular opportunity for independent application of pupils' own functional skills and for increased technical demand, which they select and deploy. Ask the pupils to produce a 'day in the life' type documentary, using aspects of ICT to communicate their findings.	Pupils write concisely and persuasively, drawing on key data and a written report that presents an argument for the invention. Pupils bring together information to suit the content and purpose.

FS.ICT.L1/DP&CI
Apply editing, formatting and layout techniques to meet needs, including text, tables, graphics, records, numbers, charts, graphs or other digital content.

FS.ICT.L1/DP&CI
Enter, develop and refine information using appropriate software to meet the requirements of straightforward tasks.

Extending

- Encourage pupils to extend their knowledge of user groups and their specific nutritional needs.
- Arrange for an outside speaker, such as a nutritionist, sports trainer or health professional, to explain athletes' requirements and to set the task.
- Use other subjects to support the topic, developing a wider theoretical context for the design-and-make project.
- Bring in other ICT programs that model and predict athletes' requirements.
- Use university research findings in this scientific and well-publicised media area.

Useful resources

www.eatwell.gov.uk/healthydiet/eatwellplate The Food Standards Agency website offers the 'eatwell plate' as a resource.

www.activekidsgetcooking.org.uk This website offers the 'Olympic resource'. Follow the links to 'Teacher Support' and then 'London 2012'.

www.secondarydandt.org/designing-at-ks3/resources/capability-tasks/year-9-food-capability-tasks,138,SA.html This link to the Nuffield resources website offers a download of a PDF of Year 9 capability tasks on food.

www.data.org.uk A wide range of teaching and learning resources can be downloaded from the Design and Technology Association.

Context 3: Key Stage 4 – Design for manufacture

Aims and overview

This Key Stage 4 module will enable pupils to select from a repertoire of functional skills activities to support decision making, producing practical solutions to needs and wants and to develop creative skills by responding to the brief: to produce a quantity of printed fabric, to be used to make a collection of fashion garments and textile accessories for a particular target market.

The big question

How do we identify the market's needs and wants in fashion?

Learning focus – Design and technology GCSE

Pupils should be able to:

- actively engage in the processes of design and technology, to develop as effective and independent learners
- make decisions, consider sustainability and combine skills with knowledge and understanding, in order to design and make high-quality products
- explore ways in which aesthetic, technical, economic, environmental, ethical and social dimensions interact to shape designing and making
- analyse existing products and produce practical solutions to needs, wants and opportunities, recognising their impact on quality of life
- develop decision-making skills through individual and collaborative working
- understand that designing and making reflect and influence cultures and societies, and that products have an impact on lifestyle
- develop skills of creativity and critical analysis through making links between the principles of good design, existing solutions and technological knowledge.

Learning focus – functional skills target: level 2

This teaching sequence supports the development of a range of functional skills. However, particular functional English, mathematics and ICT skills have been highlighted and annotated below to model, for illustrative purposes, how they can be explicitly developed and applied.

English	**Mathematics**	**ICT**
Speaking, listening and communication, reading and writing	Representing, analysing and interpreting	Using ICT, finding and selecting information, developing, presenting and communicating information
Speaking, listening and communication: Make a range of contributions to discussions in a range of contexts, including those that are unfamiliar, and make effective presentations.	*Analysing*: Apply a range of mathematics to find solutions.	*Using ICT*: Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts.

Stage and focus	Possible outcomes
Stage 1 – The context Start by asking pupils to analyse the 'big question'. The aim is for them to understand the implications behind a 'fashion industry' and designing in an intensely competitive market place. Develop their understanding further, using film, TV programmes and printed materials to illustrate ethical design versus commercial viability. Through research of a particular topic, pupils working in groups can prepare a presentation to be given to their peers.	Through discussion and peer-to-peer presentations, pupils demonstrate an understanding of some key ethical issues relating to the fashion industry.
Introduce the 'designing and making task'. Ask pupils to 'develop a fabric pattern that can be manufactured in a number of ways, using all methods available including CAD and CAM, and to use the fabric produced for manufacturing a range of fashion garments and textile accessories suitable for an identified market'. Teaching input will need to include: • reflecting on how art and design have influenced fashion in the past: for example, how Yves Saint Laurent was influenced by Mondrian • technical demonstrations of CAD or CAM and other equipment used for print production • health and safety implications and risk analysis procedures when using heat-transfer equipment and machinery with moving parts, COSHH regulations for using dyes and other substances • production of designs, using drawings and other artists as inspiration • using software to produce a range of printed repeat patterns and range of colour ways.	
Through group discussion, leading to individual reflection on information and processes they have explored, pupils will make key design decisions. • Who will be the target market? • What artist's or designer's style will I choose? • What techniques will I use to produce my printed fabric? • What research will I have to undertake to find out about fashion garments and accessories? • What information will I need to make the pattern for the product I have chosen? • What fabrics, fastenings and finishes can I choose? • How will I note my progress through this project?	Pupils write their design brief and initial specification, based on their discussions, as a response to the questions posed by the project requirements.

PLTS
Team workers

FS.ICT.L2/Using ICT
Select and use a range of interface features and system facilities effectively to meet needs. Select and adjust system settings as appropriate to individual needs.

FS.ICT.L2/Using ICT
Select and use software applications to meet needs and solve complex problems.

FS.Eng.L2/SLC
Consider complex information and give a relevant, cogent response in appropriate language.

Stage and focus	Possible outcomes
Stage 2 – Research and exploration **Introduce** pupils to a range of possible sources of design inspiration. **Develop** pupils' knowledge and skills of printing techniques through a programme of focused practical tasks (FPTs). Scan parts of their sketchbooks to capture images for manipulation, or simply cut a window to capture an abstract image. These can be repeated to form a pattern such as 'half-drop', using a CAD program that enables manipulation of images. Pupils practise all techniques available and produce samples such as: • wood blocks, cut by CNC router, engraver or laser cutter • stencils, cut by CAM and screen printing • fabric, designed using pattern design software, with a repeat, and fabric printed using a printer • heat transfer techniques, such as dye sublimation. Pupils share their experimentation with peers, to discuss the pros and cons of each particular technique.	Pupils generate a sketchbook of notes, drawings, diagrams and sketches and samples, to show their ideas and their sources, and evidence of a range of techniques for printing. Pupils select the most appropriate methods for producing printed fabric and justify choices in relation to the original brief and specification.
Stage 3 – Deploying ideas and information Pupils will use visual source materials, samples and existing knowledge of fastening and fixings to develop their design proposals to meet the brief. They need to use their research into fashion shapes, forms and colours for the next season, to draw up a product design specification, responding to their identified target market and using CAD to present their final ideas. Pupils will need to produce a toile (a scale model or full-size mock-up of the final product), using pattern-drafting techniques. Pupils will need to decide the essential measurements and calculations that are required to produce these models and use them appropriately and accurately. Discuss with pupils the different ways to produce a pattern: 1. disassemble an existing product 2. use a commercial pattern 3. use standard pattern blocks 4. use pattern-generation software. Once the toile has been produced it must be tested for fit. Pupils should plan how the product can be made, leaving an evaluation box at each stage so that progress can be quality assured. When all planning and preparation is complete, pupils begin making their product, solving technical problems as they arise.	Pupils create an agreed portfolio of evidence including: • production of the final design proposal • a plan that incorporates quality-control points • awareness of health and safety considerations • production of the exact quantity of fabric required • drafting the pattern and making the toile • the final product.
Stage 4 – Consolidating and reflecting Pupils start to identify their own manufacturing processes in school and ask: 'If my prototype was to be made by an industrial manufacturing process, what would the stages of production be?' Create the opportunity for pupils to reflect on others' work by displaying products and design work created by other pupils taking part in this project.	Pupils produce a flow chart and written comment, demonstrating their understanding of the manufacturing process.

FS.ICT.L2/Using ICT
Respond to ICT problems and take appropriate action.

FS.Eng.L2/SLC
Present information and ideas clearly and persuasively to others.

FS.Ma.L2/ Analysing
Understand, use and calculate ratio and proportion, including problems involving scale; use convert and calculate using metric and, where appropriate, imperial measures.

PLTS
Reflective learners

Extending

- Pupils present final designs to a real audience, drawn from either the specified target market or the more general public for comment.
- Pupils organise and produce a fashion show or exhibition for all garments.
- Pupils use feedback from the activities above to reflect on and change designs.
- Pupils identify further possibilities for other products to be marketed and establish what design developments would be required.

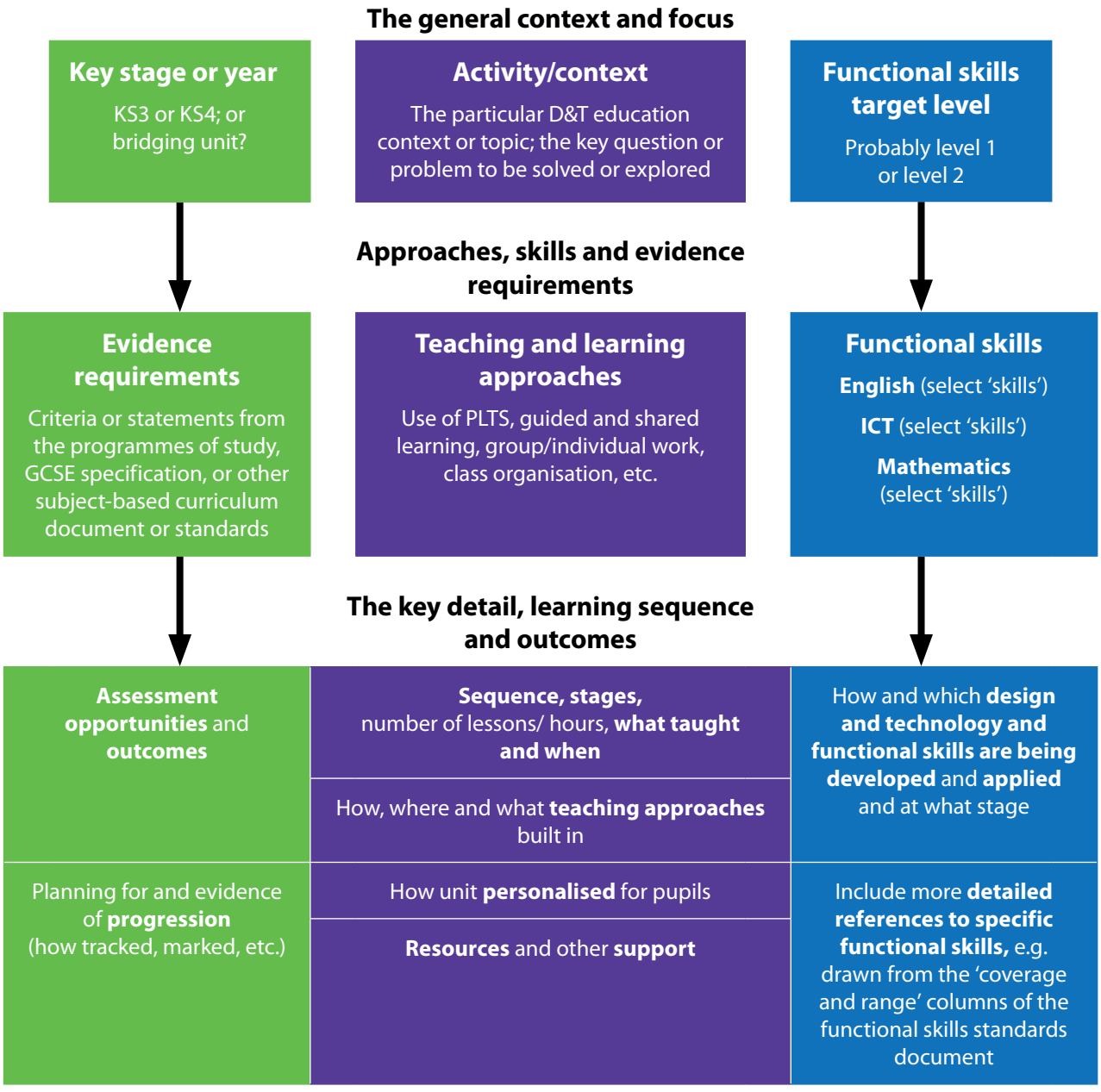
Useful resources

www.secondarydandt.org On the Nuffield secondary D&T website, select 'Designing at KS4' then 'Design guides', 'Textiles 9' and find 'Fashion Accessories'.

www.data.org.uk A wide range teaching and learning resources can be downloaded from the Design and Technology Association.

Functional skills in design and technology: A planning process

The planning diagram below provides a structure for planning a design and technology activity or topic that integrates functional skills. Note that it starts from the design and technology activity or topic and that the functional skills are an integral part in the successful completion of the activity. It is a mistake to distort a design and technology activity simply to ensure that it includes functional skills; however, the inclusion of functional skills may well allow for a greater degree of independent learning and skills application. A cross-curricular model would look different insofar as the focus would be on more than one subject area.



Resources

Literacy and learning in design and technology DfES 0660-2004G

The purpose of this booklet is to help design and technology teachers support the development of:

- learning through talk
- learning from text
- learning through writing.

Leading in learning: Exemplification in design and technology DfES 0058-2005G

The purpose of the booklet is to demonstrate how design and technology teachers can contribute to the development of pupils' learning and thinking skills. It provides examples of the 10 teaching strategies contained in the Leading in learning teachers' handbooks for Key Stage 3 (Ref: DfES 0035-2005G) and Key Stage 4 (Ref: 2111-2006DWO-EN), which are the main sources of guidance for Leading in learning.

ICT across the curriculum: ICT in design and technology DfES 0182-2004G

The **ICT across the curriculum** (ICTAC) pack is a set of materials designed to promote the use of ICT across all subjects in schools. The ICT in design and technology guide is designed to raise awareness of how ICT can be applied and developed in design and technology, analyse the opportunities that exist in design and technology for developing and applying ICT and consider how ICT can enhance the teaching and learning of design and technology.

Pedagogy and practice: Teaching and learning in secondary schools DfES 0423-2004G

The **Pedagogy and practice** materials consist of a suite of 20 study guides supported by a series of video sequences on DVD-ROM.

All of the materials listed are available for download from the National Strategies web area, along with the other 10 subject booklets in this series and a suite of e-learning modules.

Visit: **www.standards.dcsf.gov.uk/nationalstrategies** for subject-specific National Strategies materials for design and technology, including the Key Stage 3 Framework, training modules and sample planning; select 'Foundation subjects' and then 'Design and technology'.

The Functional Skills Support Programme (FSSP)

A dedicated website for the Functional Skills Support Programme (FSSP) provides a first point of contact for all functional skills support. It includes the Learning and Skills Improvement Service (LSIS) training modules for functional skills for the post-16 sector and a series of booklets to support teaching functional skills in Diplomas. The FSSP website can be accessed at: **www.fssupport.org**

For case studies and further guidance about planning for functional skills, visit **http://curriculum.qcda.gov.uk/key-stages-3-and-4/skills** and select Functional skills.

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