The Framework for secondary ICT: overview and learning objectives

Overview of strands

Strands	Substrands
1 Finding information	1.1 Using data and information sources
	1.2 Searching and selecting
	1.3 Organising and investigating
2 Developing ideas	2.1 Analysing and automating processes
	2.2 Models and modelling
	2.3 Sequencing instructions
3 Communicating information	3.1 Fitness for purpose
	3.2 Refining and presenting information
	3.3 Communicating
4 Evaluating	4.1 Evaluating work
	(Discrete but also embedded into the other nine substrands)

Learning objectives

1 Finding information

1.1 Using data and information sources

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• use information from primary or secondary sources	• use information from primary or secondary sources and know when to choose the different types	• collect data systematically from sources for an identified purpose			
• create information from data for specific purposes and audiences, and recognise how the presentation of information can affect its validity and bias	• recognise how the content and style of information can influence the message it gives and that data can be distorted and misused	• synthesise information from secondary sources and understand how this can lead to bias	• recognise that the types of information sources they use and how they present these has an impact on different users, and that the source should be questioned for its relevance and value		

• combine and refine information and data sources to answer and pose questions	• justify the use of particular information sources to support an investigation or presentation, and devise and apply criteria to evaluate how well various information types support a task	• create an efficient data-collection process that collects validated data	• develop and justify appropriate information-capture systems for others to use	• evaluate and compare different information sources for relevance, clarity, usefulness, ease of use, and provenance, as part of the design and implementation of a system for others to use	• evaluate in depth a range of different information sources and give fully justified reasons for the choice made for a particular purpose, taking relevance, compatibility with intended processing, and ease of understanding by user into consideration

1.2 Searching and selecting

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• select information for a task from a range of sources and be aware of the relative strengths and weaknesses of these sources	• select information from a range of sources and assess the potential value of the information for a task	• select information for a task, using other sources to check the suitability of the information	• independently select appropriate information from a wide range of sources for a specific task, taking account of their ease of use	• independently select appropriate information from a wide range of sources for a specific task, taking account of their ease of use for other users	• identify the range of approaches which others could take in searching and selecting information and identify the most appropriate approaches
• frame searches in an appropriate and considered way in relation to the required results	• frame searches in an appropriate and considered way in relation to the required results, for a more complex problem	• frame searches in an appropriate and considered way in relation to the required results for a more complex and unfamiliar problem	• identify the advantages and limitations of different information-handling applications and information sources in relation to the needs of the user	• compare and contrast in detail different information-handling systems in relation to their functionality and underlying technology	
• search for information, altering and developing the search as appropriate, checking findings for plausibility	• use basic logical operators and apply these when searching for information	• construct queries and complex searches to explore information for a specific purpose, such as testing a hypothesis	• develop systems and files to aid others in searching for and selecting information	• design, develop, document and implement an information system for others to use	• identify in detail the varying needs of a range of users and the implications of these for the possible improvement of the system

• use search terms correctly	• understand that the different ways in which search engines work can affect which information is returned	• carefully consider search results and review the interpretation of data, judging its value	• carefully consider search results and review the interpretation of data for other users	• incorporate features to meet user needs when designing their system	• incorporate the needs of all potential users into the design of their system
• acknowledge sources and recognise copyright	• acknowledge all sources, recognising copyright and other constraints	• acknowledge sources, defining primary and secondary sources, and recognise copyright and other constraints	• acknowledge both primary and secondary sources and the need to obtain copyright permission	• apply copyright law and acknowledge intellectual property rights, and use the correct terminology	

1.3 Organising and investigating

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• save files using appropriate file names and organise files in a hierarchical folder structure	• save files in appropriate formats and create a hierarchical folder structure				
• identify the significant data required to solve a problem	• identify the essential data and ICT tools required to solve a problem				
• develop closed questions which will lead to specific answers in a suitable form – e.g. text, numbers – and act safely and responsibly in seeking information	• develop open and closed questions with sensitivity, recognising people's cultural, social and ethical differences	• use automated processing at the point of collection to gather responses efficiently using open and closed questions	• develop validation within systems and understand the need for conversion of responses to make them fit to process		

• design a questionnaire or data-collection sheet to collect relevant data	• design a questionnaire or data-collection sheet to collect relevant data, and obtain and use feedback to establish what are good questions	• develop testing, including employment of user feedback, to refine existing approaches and create new ones	• use the system life cycle to plan an information system, taking account of feedback at the various stages	• carry out systematic analysis of user needs and incorporate this into the design, documentation, implementation and evaluation of a system for others to use	• carry out systematic analysis of the needs of a range of users for a complex problem, seeking information from a range of sources
• recognise the structure and format of data that can support checking and correcting to remove errors after entry; recognise that data may not be plausible and that this affects results	• produce or adapt a data structure, enter data into this and check that data is reasonable and accurate	• produce or adapt a data structure to enhance efficiency, and enter data into this; establish a range of validation checks and visual checks to ensure a viable data set	• produce a data structure to enhance efficiency; create a range of validation checks to ensure a viable data set when developing a data system, and explain the features which make it efficient	• use and compare different approaches to validation in order to successfully support other users	• use a comprehensive validation system to support a range of other users
• generate simple queries using AND/OR operators applied to data items within fields	• use more complex queries – AND, OR, NOT; use different searches to produce the most effective result or to collect extra or different data for more detailed conclusions	• develop a flat-file database structure, taking into account possible ways in which the database may be interrogated	• identify the link between flat-file databases, their interrogation and the over arching purpose of the investigation	• develop and incorporate into the design of a system the links between the database structure, its interrogation and the overall system specification	• design and develop a relational database structure, incorporating data storage efficiency, and test the strategy design against the system specification

• describe how the system could be developed to improve the efficiency of the solution	• evaluate the effectiveness of different solutions when integrating information using different ICT tools	• represent information in different forms and integrate information from different ICT tools to produce an effective solution	• represent information in different forms and integrate information from different ICT tools to produce a solution	• use graphs to represent information; show all key features; justify their choice of chart or graph; produce a report from the information and check the accuracy of their conclusions	• represent information in graphs, charts or tables, and in a report where appropriate; justify the form of representation and check the plausibility of their conclusions
	• incorporate safety issues into the design documentation and implementation of a system for others to use	• show an awareness of safety issues in the planning and implementation of their work	• describe the impact of electronic databases on learning, everyday life and employment, and the potential for misuse of personal data	• consider examples of electronic databases in everyday life	• identify examples of automated data collection and recognise the impact of electronic databases on learning, everyday life and employment
• evaluate the system against the derived success criteria and suggest non-trivial areas for development	• evaluate the design of their systems against the original specifications	• create a specification and plan against this, documenting the process throughout	• establish complex success criteria to evaluate a solution to a problem	• evaluate different applications in terms of the structure and method of processing data	• check whether the ICT tools they use are appropriate for the task

2　Developing ideas

2.1　Analysing and automating processes

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
● represent simple processes as diagrams to plan the task	● identify the key elements of a problem and represent components in a plan	● represent complex information systems in diagrammatical form to support their development			
● use automated processes to support consistency of style and presentation	● automate simple processes by harnessing software tools; recognise where automation tools, such as filtering, can be used to improve safety when using the internet	● refine existing systems and make them more efficient through automation	● use automation, where appropriate, to support users of a system; recognise the benefits of planning for automation within the process of scoping a system	● plan for and incorporate automated features when designing and implementing a system for others to use	● originate and design automated features when developing and implementing a system for others to use

2.2 Models and modelling

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• recognise the difference between data, text and formulae in a computer model and organise these so that the model is fit for purpose	• combine variables within a model in different ways to form rules	• extend the scope of a complex model by incorporating or changing rules	• design or develop a complex model to meet a need, identifying appropriate assumptions, variables and rules	• design or develop a complex model, identifying appropriate assumptions, variables and rules to meet a specific need for other users	• suggest and justify in sufficient detail the structure and components required for specific models for others to construct
• use a model to predict an outcome	• recognise that the rules contained within a model determine its output, and make more complex predictions based on several variables	• refine rules (to increase validity), using information from other sources	• list, describe and justify the input, process, and output characteristics of a model		

• explain how rules govern a model	• amend existing simple models by changing variables and formulae	• extend existing more complex models and create their own from a given design, reviewing efficiency	• create complex models to solve a problem	• compare and contrast in detail different approaches to modelling the same problem	• understand the process used in industry and commerce for the development of models and start to relate these to the way they develop their own models
• obtain information from a model and check this for plausibility	• identify whether a model has an appropriate set of variables to make it suitable for a particular purpose, and assess its accuracy by comparing its outcomes with those from other sources	• check their output against that from other sources to assess the validity of the model, where appropriate	• identify criteria to test whether a model is fit for purpose	• design and create complex models, considering a range of approaches, as part of the design and implementation of a system	• extend the design by considering the needs of different groups of users

2.3 Sequencing instructions

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• rationalise a set of instructions by repeating sections	• use precision and accurate syntax when framing instructions	• use efficient structuring of instructions and recognise how this increases flexibility and eases testing	• use variables to create increasingly complex systems	• use feedback within an increasingly complex system	
• plan and implement sets of instructions, predicting outcomes before execution	• test and refine sequences in order to achieve specific outcomes	• break down a problem into manageable sections that can be represented by sub-procedures where appropriate	• plan the integration of sequences of instructions with other elements to form an ICT system	• plan, design and implement linked and structured sequences of instructions as part of a system for others to use	
	• recognise that sequencing instructions is fundamental to a wide range of ICT applications	• review own and others' sequences of instructions to improve efficiency			• identify and communicate the key benefits and advice required to support others in developing a system

3 Communicating information

3.1 Fitness for purpose

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• recognise the common layouts and conventions used in different types of communication and how these address intended and familiar audience needs	• plan communication projects and select the appropriate communication (type, length, media) for the intended audience (considering audience needs and expectations), purpose and environment	• use an understanding of technical considerations to produce effective and efficient digital communications	• produce solutions that are accessible for any user: solutions that recognise accessibility issues and apply the conventions relating to digital media	• recognise and describe the impact of different formats and conventions on presentation, ease of use, ease of understanding and accessibility	• consider the impact of different formats and conventions for different groups of users for whom the system might be extended or adapted
• recognise the limitations and opportunities of different layout formats and use these appropriately	• reflect on the work of others to help plan and amend their communications and understand how effective presentations or publications address specific audience needs and expectations	• use a knowledge of publications and media presentation techniques to devise complex success criteria to assess the quality and impact of communication products, and apply these criteria to their work	• use feedback from the audience to inform the development of their digital communications	• make their work more appropriate for a given audience by developing structured methods of capturing specific feedback and using it to refine their work	• make their work more appropriate for a range of audiences, some unknown, by developing structured methods of capturing specific feedback and using it to refine their work

3.2 Refining and presenting information

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
● use ICT to improve their work through drafting and refining	● draft, refine and structure their work using a combination of ICT tools to convey meaning more effectively				
● combine text, images, tables and sounds from a number of sources to convey meaning	● modify and develop text, images, tables and sounds from several sources within the structure of a piece of work	● refine and combine different components of text, images, tables and sounds from a range of sources			

			• develop and refine the design and implementation of an automated, interactive system, based on feedback from different groups of users
• match the content and style of their work to the audience and purpose	• extract, combine and modify relevant information for a specific purpose, and structure and sequence this to meet audience needs	• work independently and efficiently to synthesise information from a range of sources, structuring and refining presentations for specific audiences and purposes	• combine ICT tools to input, process and output information to meet the needs of a user	• understand the techniques and systems needed to support information processing and communication, including the hardware and software subsystems needed to support the techniques and systems
• import and export data in appropriate formats	• use a range of ICT tools efficiently to refine the presentation of information for a specific purpose	• identify the advantages and disadvantages of different software applications for specific purposes, and justify their choices, integrating ICT tools where appropriate	• scope the range of information required to develop an automated interactive communication system	• design and implement an automated interactive system for others to use

3.3 Communicating

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• capture, store and exchange information digitally by a variety of means	• select appropriate methods of exchanging digital information and recognise that the format affects the method of exchange	• recognise and describe the technical limitations and strengths associated with a range of digital communication methods			
• use digital communication to share information and collaborate with others for a purpose	• use digital communications for the sharing and collaborative development of ideas for a variety of purposes	• use a range of tools to automate the sharing of information and communication for a range of purposes	• refine the use of tools to create an efficient communication system to facilitate collaboration	• apply communication systems to facilitate collaboration and dissemination of information with a wider and possibly unknown audience, taking account of appropriate use of feedback	

• recognise the risks associated with the sharing of personal information digitally and to take actions to protect themselves	• work in a safe and responsible way when communicating with others	• be responsible, safe and secure in all communications	• describe the moral, social, legal and ethical issues relating to digital communication and the sharing of information, and apply them when communicating in a responsible, safe and secure manner	• exchange information securely, minimising the risks and the misuse of personal information; reflect critically on the use of digital communications, the implications for international communication and the impact on global life	• support and direct organisations to develop acceptable use and safety policies that contain appropriate guidelines on exchanging and sharing information

4 Evaluating

4.1 Evaluating work

Year 7	Year 8	Year 9	Year 10	Year 11	Extension
• select ICT tools which will support the development and accuracy of their work, and learn the benefits of checking, correcting and refining their work as it progresses	• improve the quality of outcomes for specific audiences and purposes by using a range of ICT tools	• use ICT tools together to demonstrate a variety of outcomes, enabling the most appropriate choice of tool to be made	• compare and contrast the effects on a system of combining different ICT tools in different ways	• evaluate their use of ICT tools in enabling a user to interact with the system efficiently	• compare and contrast existing solutions to the same problem, identifying reasons for particular approaches
• agree and use simple criteria, and understand how to improve their work	• make and use simple success criteria that ensure fitness for purpose	• devise and review complex success criteria to modify and develop their work as it progresses	• devise and review complex success criteria to modify and develop their work as it progresses; pupils recognise the need to interpret end-user requirements into the system's success criteria	• incorporate complex success criteria into the design and implementation of a system and amend these throughout the development of the system life cycle	• outline and describe the process for the identification of detailed success criteria, to support others in developing a complex system

explain the reasons for choices they have made	justify the process they use in relation to the task	evaluate the effectiveness of their approach to developing an ICT solution	consider other related tasks and problems in order to define the increasing scope of their ICT solution	carry out linked evaluations of different aspects of their work, from specification to reporting	outline and describe the testing processes required, to support others in solving a complex problem
act purposefully on feedback	gather and use feedback to inform future work	gather, record and use systematic feedback from users to improve their work	plan and implement a testing regime that incorporates trials with users, and use the information gathered to refine their work in a discriminating way	apply user feedback and their own evaluations to maximise efficiency and optimise user interaction with the system	
understand when to use ICT to solve a problem	reflect on their previous work and learning in order to improve their work	apply prior learning to their work	apply prior learning in their work and understand how it has improved their work	use their wide range of previous learning to help them design, develop and implement ICT systems	identify the learning required by others, to prepare them to solve a specific problem or design a system