Draft Naace Curriculum Framework Information and Communication Technology (ICT) Key Stage 3

Contents:

Acknowledgements

Naace are grateful for the contributions, advice and support of the following groups and individuals:

Allison Allen and Paul Heinrich, from whose curriculum the Framework has been developed
Naace ICT Curriculum Community
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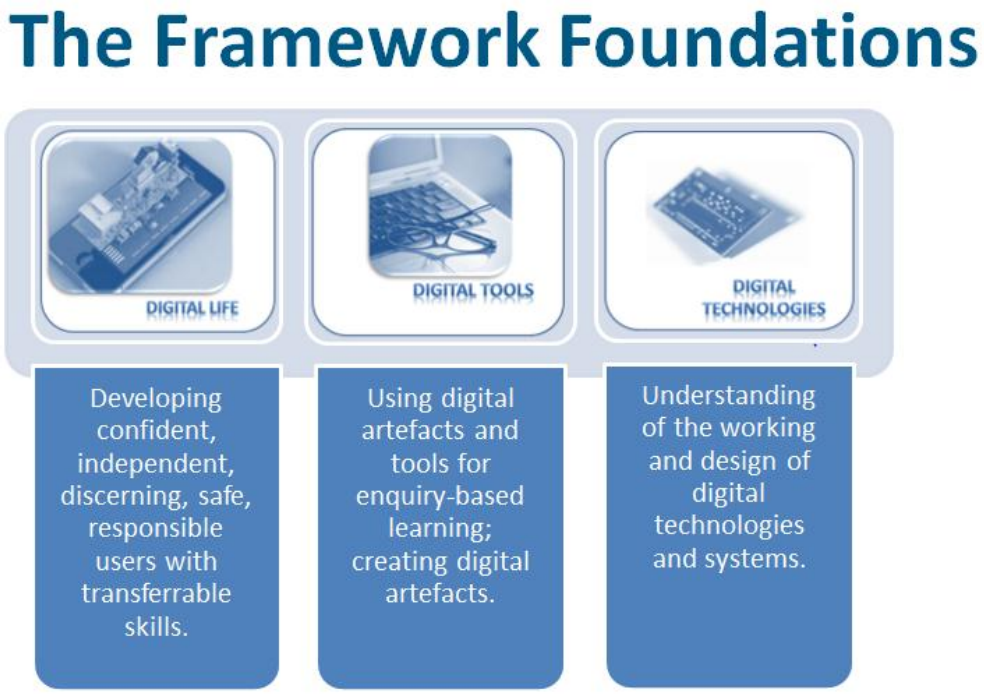
Naace Sponsoring Partners
Naace Board of Management currently; Rachel Ager (Immediate Past Chair), Miles Berry (Chair), Lucinda Searle (Senior Vice Chair), Dughall McCormick (Junior Vice Chair), Richard Allen, Roger Broadie, Drew Buddie, Julie Frankland, James Langley, Allison Allen, Paul Heinrich, Simon Shaw, Mark Chambers
Naace Professional Team, especially Bernadette Brooks (General Manager), Michelle Cank (Events Officer), Jan Webb (Professional Officer)
Members of the LinkedIn Naace group
EdExcel, OCR, Aqa, CCEA and WJEC – elements from their existing GCSE specifications have informed the development of the Framework
Ian Gover/Marc Prensky for ideas about Digital Wisdom

Part 1: Introduction and Principles

Introduction to the Framework

Welcome to the Naace ICT Framework for Key Stage 3. We hope you find it useful when developing your own existing curriculum, identifying areas that may need additional support or input and in moving forward with ICT. It has been introduced to raise standards of learning and teaching and help improve our learner's life chances. It is intended to provide the breadth and depth of skills, knowledge and understanding needed by learners who choose to continue their studies with rigorous studies of ICT (including Computer Science) in KS4. Building on the best, written by Naace practitioners for practitioners in all schools, it focuses on the importance of knowledge, skills and the intelligent application of ICT, and is about bringing life to learning and love of lifelong learning.

The Naace ICT Framework is a skeleton outline with the key areas of skills, knowledge and understanding that fit within the ICT umbrella. Because of the holistic view that we take of ICT in the curriculum, we recognise that there is often not a clear cut boundary between areas of ICT learning. The Foundations of the Naace ICT Framework consist of the three areas: Digital Life, Digital Tools and Digital Technologies.



The Foundations are delivered through five areas of skills, processes, knowledge, and understanding, which provide opportunities for deeper, focused learning to support the three themes of Digital Life, Digital Tools and Digital Technologies. Each Foundation theme can be found within each the five areas, all of which should be included in planning so that a broad and balanced learning experience is given to learners, whilst providing the depth of knowledge needed for future rigorous studies. Schools may find there is a need for further CPD for staff to ensure they feel confident to teach all areas effectively.

We recognise that personalising a curriculum to a school and to the learners in that school is crucial – whilst some suggestions are given about fleshing out the framework skeleton and about approaches to teaching and learning, there is sufficient flexibility and choice for a school to develop the curriculum so it works for them in their own context and builds on existing provision; a Toolkit is offered to support this. Strong leadership and effective coordination will be needed to ensure a balanced approach to consolidating and applying digital skills, knowledge and understanding in subject areas other than ICT.

It is important that there are opportunities for contextual problem solving and application of ICT skills and knowledge, but it cannot be assumed learners will have sufficient skills or insight for problem solving and creative approaches without them being "taught" discretely within that context. There needs to be a systematic approach to teaching ICT in order to ensure that ALL aspects are learnt effectively. A systematic, holistic approach will equip learners for the digital lives that they are leading now and which will continue to evolve throughout their lifetimes.

The Framework areas will support teachers as they plan learning experiences that are rich, broad, building on prior experiences throughout EYFS, KS1 and KS2 and should have sufficient depth to prepare for increasingly rigorous ICT in KS4. In order to aid planning for progression, there are areas of study that can be linked to expected levels such as the current QCDA level descriptors for ICT or Bloom's Taxonomy. The Framework is not a scheme of work. Teachers should develop their own schemes, choosing the structure, order and combination of areas of study to best meet the needs of their pupils.

Proposals are based on the concept that learners have a "Digital Life". In practice this will be several interwoven digital lives - school, work, social networks, gaming, day to day activities such as shopping and possibly use of Web 3.0 technologies. In order to be effective, safe and knowledgeable citizens, learners should be able to choose and use tools appropriately for effective communication of ideas, finding information or solving problems. Making these choices wisely requires levels of understanding and a range of skills, knowledge and competence. It may involve understanding aspects of hardware and software, choosing to use a wiki to prepare shared information pages or deciding between Scratch and Kodu when creating a game to show what has been understood in a history topic. Having a high level of "Digital Wisdom" will result in learners who can make decisions about using technology in interesting, creative and productive ways and involves having a "bigger picture" of all the aspects of ICT and being able to make connections between them. Developing learners with

Digital Wisdom lies at the heart of the ICT learning experiences and incorporates the wisdom that is not ours innately, but which we are able to develop through the appropriate use of technology.

The whole ICT learning experience lies within the context of 3rd Millennium Learning – a down-to-earth approach to using 21st century tools to empower learners, enabling learning that wouldn't otherwise be possible. Third Millennium schools embody a culture of embedded and effective ICT use across the curriculum, to the extent that it becomes invisible and the learning becomes paramount. They use resources and learning environments creatively, including opportunities to develop higher level thinking skills throughout each area of the ICT curriculum, equipping, empowering and enabling learners to adapt to an ever-changing digital landscape. Levels from Bloom's taxonomy have been mapped successfully to National Curriculum ICT levels and are available as part of the supporting materials in the Naace ICT Framework Toolkit.

In a Digital Life, tools and resources enable us to innovate, research and generate knowledge. They enable the generation of "artefacts" which can be used or created by learners - including digital documents, presentations, programmes and codes, video and audio files, images and photographs. There are some overlaps with digital technologies, where tools and artefacts are likely to be combined for a purpose or to build a system, e.g. creating a website containing information, photos and video about a particular interest *for others to use*. Creating an artefact can include aspects of ICT which involve computational thinking, knowledge and understanding of computer science and coding, e.g. designing, developing and creating a game by programming, or developing an app *for others to use*. The program which is written may in turn act as an artefact for others. Understanding key characteristics of tools and being able to evaluate their design and suggest improvements are part of design processes. Alongside enquiry based approaches to learning, they provide valuable opportunities to incorporate higher level thinking skills, as learners apply their expanding range of knowledge, understanding and skills of tools and the technologies that support them.

Using the Framework

It is widely acknowledged that many schools are well advanced in the adoption of a transformational ICT Curriculum. The framework should enable tweaking, refining and adapting of current curricula being used in school. The five areas of the Naace ICT Framework are outlined and defined in this document, along with some indicators for content which could be included in a curriculum. Definitions are provided in the Appendices and further examples and resources to support the implementation of the framework will be available in the Framework Toolkit.

Naace believes that there is no prescribed way of delivering messages to learners and there should be no prescribed script for any lesson. There is no comprehensive "right way" or "right tool" for delivering the Framework and as it is appropriately adapted in your own context, you will be able to recognise what is already good in your own curriculum and practice. The suggestions in the Framework Toolkit will supplement what you may already be using in school so that aspects of good practice can be continued, whilst areas for development can be easily identified. Those areas for development will assist in addressing recent developments and ideas about *what* needs to be learnt and the *how* it should be taught.

Although the tools and the current issues (e.g. the use of social learning, bring your own devices or the "flipped classroom" at the moment) keep evolving, the five areas of the Naace ICT Framework will remain relevant and need less frequent review than the materials in the Framework Toolkit, which will be subject to regular review every 2 years in order to remain relevant and up to date. There will be many ways of using the ideas provided in this Framework, which is why we will be encouraging teachers to share how they have used it to adapt existing curriculum to provide rich, effective learning experiences. By encouraging teachers to share the resources they have used when implementing the Framework, we will be able to learn from and support each other.

Digital Wisdom and ICT Capability – Teaching and Learning Strategies

ICT capability is about having the technical, cognitive and affective proficiency to access appropriately, to use, develop, create and communicate information using technological tools. Learners demonstrate this capability by purposefully applying technology to be creative, solve problems, analyse and exchange information, develop ideas, create models and control devices. They are discriminating in their use of information and ICT tools and systematic in reviewing and evaluating the contribution ICT can make to their work as it progresses.

ICT capability is much broader than a set of technical competences in software applications although, clearly, these are important. ICT capability involves the appropriate selection, use and evaluation of ICT. *In essence, pupils need to know what aspects of ICT are available to them, when to use it and why it is appropriate for the task.* Prensky suggests that this is an aspect of Digital Wisdom, which includes the wisdom arising from the use of technology to access cognitive power beyond our innate capacity, as well as prudent use of technology to enhance capabilities.

It is important that lessons are not driven by the tools available – either hardware or software - but focused on clear teaching and learning objectives. In such a context, ICT is used as a vehicle or as a powerful tool to solve problems and develop Digital Wisdom. Effective and appropriate use of ICT, knowledge, skills and understanding will need explicit, discrete ICT learning opportunities which incorporate higher level thinking skills, with opportunities for pupils to demonstrate their ability in the higher levels of attainment and application, rather than focusing on lower level skills of how to use software or knowledge of technology – level 1 and 2 in the diagram of Bloom's taxonomy below. Modelling project management ideas such as systems design or user-centred design processes encourages learners to use higher level thinking skills such as level 4, 5 and 6 in the diagram below.

Figure 1 Bloom's Taxonomy

Moving beyond basic levels in Bloom's taxonomy (see above) enables learners to develop features identified by ISTEnets (see below).

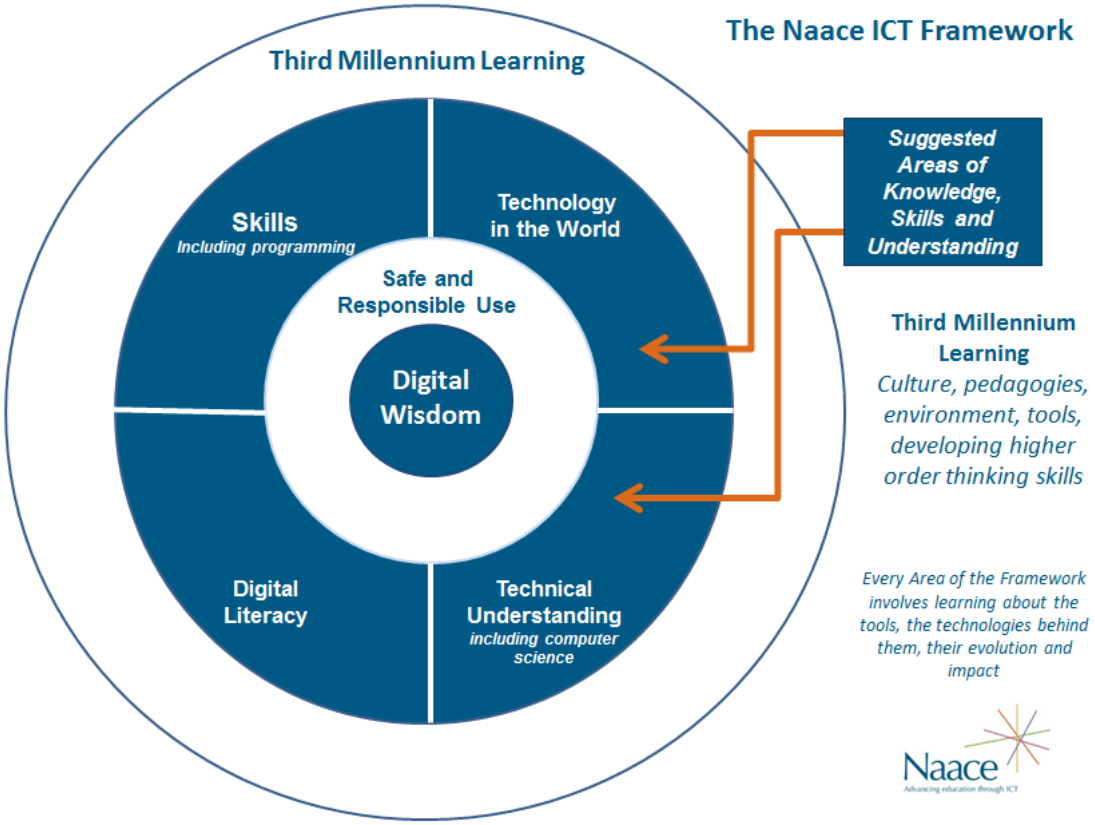
- Innovator
- Evaluator
- Creator
- Communicator
- Collaborator
- Problem solver
- Analyst
- Social conscience
- Decision maker

Figure 2 ISTEnet Features

Part 2: Key Stage 3 Naace ICT Framework

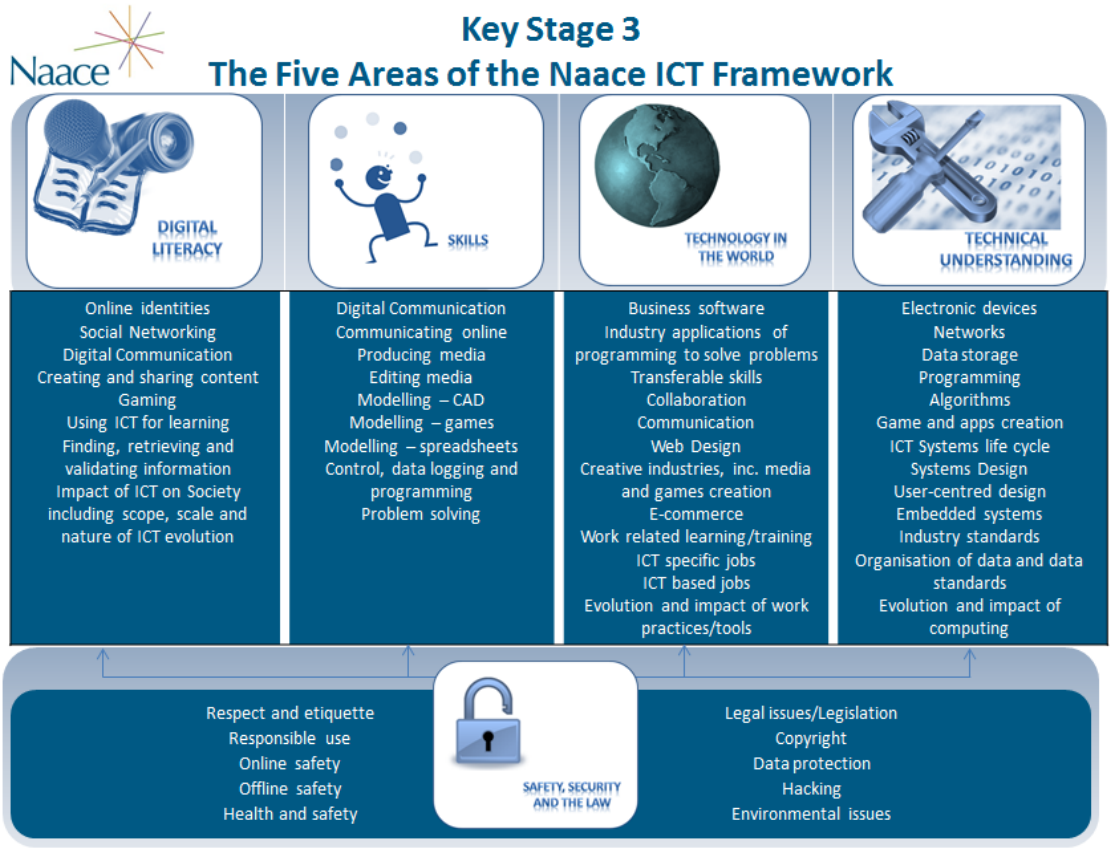
The Naace Knowledge Hub

The Framework is based around the 5 areas of technical knowledge, digital wisdom, e-safety/security, world of work and digital literacy. Many aspects can and should be taught within contexts that are made relevant to pupils. Each of the indicated areas for study contains elements of Digital Life, Digital Tools and Digital Technologies, and when using the Framework opportunities should be incorporated for learners to see how areas are interconnected and interdependent. Some aspects of ICT may appear in more than one area of the Framework, e.g. programming is a skill that needs to be learnt, but it will also provide an insight into technologies and how they work. Because there is a natural overlap between aspects of these areas of knowledge, schools will be able to plan flexibly for the ability and aptitude of learners, including Gifted and Talented and available time-table time and ICT resources.



The Five Areas of the Naace ICT Framework

These are broad areas of ICT knowledge, skills and understanding that Naace considers essential for learners in the Third Millennium. Content cannot be fixed in time as the speed of technological advance means that the schemes of work must be flexible enough to enable teaching on new tools, ethical and safety issues and ways of working and learning to be adopted quickly, both within the subject of ICT and the wider use of ICT tools throughout learning and teaching. However, these are intended to be generic and not tied to particular tools or technologies.



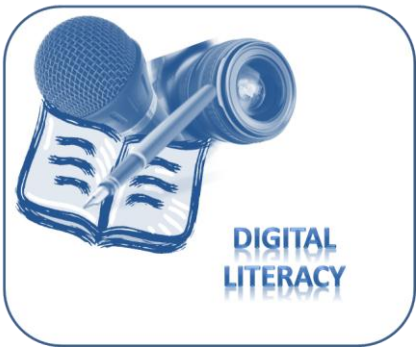
Safe and Responsible Use

Personal e-safety is of increasing importance and should include knowledge of how to protect computers and personal devices as well as the legal issues surrounding copyright, data protection and computer misuse. It is an area of knowledge that Naace recommends should be embedded throughout the other areas of knowledge, with contextual opportunities to apply knowledge and understanding within those other areas of ICT, as well as in other curriculum subjects that use ICT as a tool.

Areas of the Naace ICT Framework	**Indicated Areas for study**
 **Safe and Responsible use**	
Online identities	Security of user names and passwords, protecting accounts and logons, bio-metrics, two-factor authentication, identity theft, identity protection, false representation, anonymous users, misuse, blocking others, identity tracking and protection, linking accounts and identities.
Personal e-safety	Data and information theft, keeping personal data safe, erasing data, misuse of personal data, invasion of privacy, abuse, cyber-bullying, trolling, cyber-stalking, online theft and fraud.
Computer e-safety	Secure authentication of users, administrative permissions, viruses and antiviruses, worms, Trojan and bot viruses, data loss, firewalls, filters, secure and private connections
Offline safety	Safe and appropriate use of equipment
Ethical issues	Sharing sensitive information, seeking permissions, use of personal data by companies, implications for health and medical records, sharing and mashing of personal data across applications, advertising and selling within apps. Use of records and logs to track and audit users.
Legal issues – Copyright, data-protection, hacking	Defamation, copyright, digital rights management systems, data protection, online purchasing, spamming, proxy avoidance, obscenity, discrimination,
Legislation concerning ICT	Copyright, Designs and Patents Act 1988 (CDPA) as amended, Digital Economy Act 2010, Creative Commons, Computer Misuse Act 1990, Data Protection Act 1998, Information Commissioner, Health and Safety at Work Act 1994. Law relating to intellectual property rights (IPR). Safe Harbor Agreements
Environmental issues	Energy issues for personal devices, workplaces and datacentres, EU WEEE Directive – disposal, recycling.

Digital Literacy

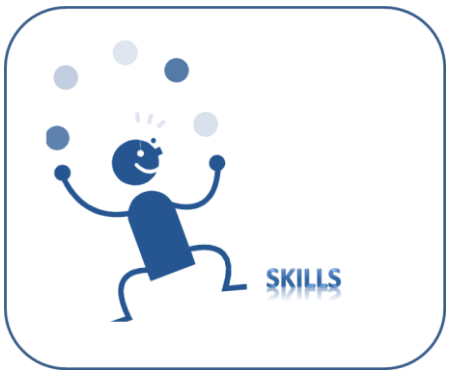
The focus of this theme is safe, effective personal use of ICT including secure use of social networking, sharing of good quality personally generated content, gaming and personal learning together with an understanding of the impact of ICT on society. There is deliberate overlap between some aspects of these core areas of knowledge in order to enable schools to plan flexibly for the ability and aptitude of learners, including Gifted and Talented and available time-table time and ICT resources.



Areas of the Naace ICT Framework	*Indicated area of study*
Digital Literacy	
Online Identities	Anonymous and guest users, creating identities, multiple identities, linking accounts, keeping accounts secure, profiles, avatars, netiquette, misuse and abuse
Functional use	Use of applications, apps and web applications designed to support a range of tasks such as information searching, reading and viewing content and media, reading and sending email, booking appointments, buying and selling online, managing contacts and address books, taking and sharing notes, images, sounds and video, use of messaging and social networks, telecommunications and video conferencing, creating and editing artefacts, keeping a diary or blogging.
Finding, retrieving and validating information	Basic and advanced search techniques, validity of sites and data, bias, linking, attributions, citations.
Social networking	Social networking, collaboration, email, messaging, benefits, risks, ethics, design, content, advertising and promotion.
Creating and sharing	Selecting appropriate tools for designing and creating artefacts. Collaborative editing and creating. Reusing and repurposing content, copyright and intellectual property rights, attribution and distribution.
Gaming	Games play, design, single player, multi-player and massively multi-player, games platforms, marketing and distribution.
Learning	Self-study, shared study, use of learning platforms, revision, collaboration and plagiarism.
Critical thinking and evaluation	Fact checking, evaluation and validation, interpreting meaning from a range of information sources, determining significance and authenticity.
Impact of ICT on society	Communications, entertainment, publishing, commerce, banking, automated trading, jobs, CCTV etc.

Skills

This area deals with the use of a range of common ICT tools for communication, content creation, control and the application of ICT to everyday personal, social, creative and business outcomes. This theme concerns the teaching and application of digital skills so that learners are able to make informed and sensible choices about when and how they should be using ICT, as well as selecting an appropriate tool for the job.



Areas of the Naace ICT Framework	Indicated area of study
 **Skills**	
Digital communication including online environments	Knowledge of the functions, core technologies and applications of text processing, graphics, sound, video, email, SMS, web – including html, wikis, social networks, user-generated content.
Producing and editing all types of media	Expertise in creating digital documents; planning, producing, editing text, graphics, sound and video for online publication.
Modelling	Computer Aided Design, spreadsheet scenarios and models, simulations including e.g. science, architecture, medical, hydrology; games design and development including aspects of programming.
Control, data-logging and programming	Control of physical devices including sensors and feedback; controlling graphics and motion through programming; create functions and macros in applications such as spreadsheets; programming for a purpose e.g. music composition, creating games.
Problem solving	Applying ICT knowledge and understanding to given problems in personal, social and business contexts. Use of flowcharts and developing algorithms to describe sequences and processes. Reasons for choosing algorithms. Need for accuracy in data and algorithms.
ICT skills for career paths and working life	ICT skills for IT jobs – e.g. programmers, technicians, network managers, systems analysts, database and e-commerce developers, telecommunications designers and engineers etc. ICT skills for non-IT jobs – e.g. games developers, graphic artists, special effects creation, web designers, animators, designers, etc.

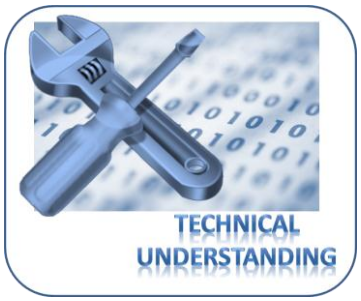
Technology in the World

This area is about applying digital literacy and skills to a diverse range of contexts including business, creative and social contexts and might form the basis of project work or major units at the end of a term or key stage. Key aspects include standard productivity, design and creativity tools, collaboration and communication, web design and e-commerce. *It is expected that this theme would include examples of real world applications of ICT and include visits or video conferencing with users*. This area concerns the application of systems design and user-centred design and might also include the application of programming and coding skills. It is particularly linked to developing higher thinking skills.

Areas of the Naace ICT Framework	***Indicated area of study***
Technology in the World	
Common productivity software and applications (industry standard hardware and software including open source)	Applications centred around office activities including at least word processing, presentation software, spreadsheets and use of databases, Transferable skills including use of common functionality, creating standard outputs and document design, layout, styles and formats.
Collaboration and communication tools and use	Including; email tools, audio and video conferencing, shared document development, smart phones and apps, communication etiquette and protocols, viral marketing.
Design and specifications	Systems Design and User-centred Design. Understanding user requirements, context and interaction between devices and users. Using system design approaches to solve problems using ICT and evaluate results.
Web design	Design process, audience, layout, links, navigation, graphics, objects, authoring tools.
Creative industries	Applications relevant to (for example); advertising, architecture, art and antiques, computer games, crafts, design, designer fashion, film and video, music, performing arts, publishing, software, TV and radio
e-commerce	Transactional and payment systems, authentication, security, data protection.
Use of ICT in practical contexts	Explore and investigate the use of ICT in a range of practical, science, business and industry contexts including visits (actual or virtual) and hearing from practitioners.
Progress and future applications	Consider current trends in technology development and predict future applications of technology and their impact in a range of contexts.
Working with ICT	IT specific jobs – e.g. programmers, technicians, network managers, systems analysts, database and e-commerce developers, telecommunications designers and engineers etc. Para-IT jobs – e.g. games developers, graphic artists, special effects creation, web designers, animators, designers, etc. Impact of digital tools and technologies on working practices. Evolution of working practices.

Technical Understanding

This area deals with knowledge and understanding of how silicon technology, integrated circuits, computers and computer systems work. It covers aspects of what is sometimes referred to as computer studies or computer science and considers how digital devices work, the reasons for coding, programming, systems, networking and standards and the ICT systems lifecycle, systems design and user-centred design.



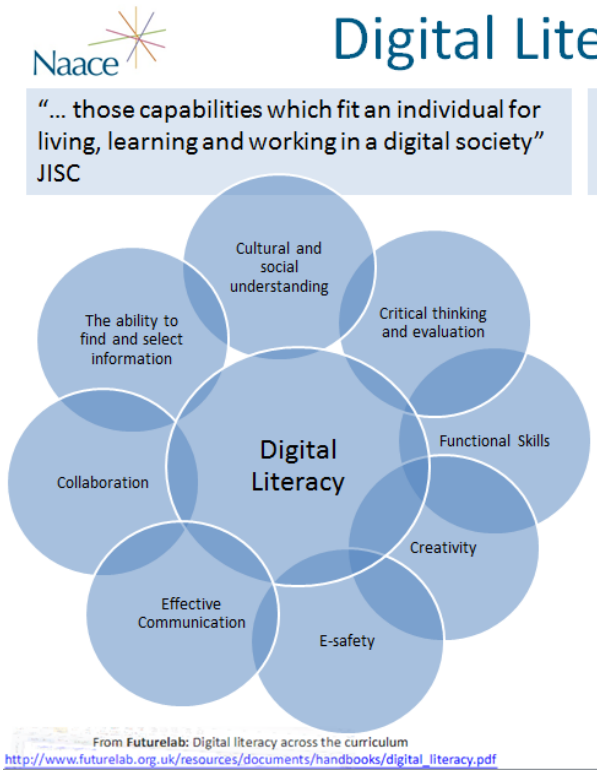
Areas of the Naace ICT Framework	***Indicated area of study***
 **Technical Understanding**	
How computing devices work	Integrated Circuits and silicon technology, circuit boards, computer components, architecture and sub-systems.
Embedded systems	Consumer electronics, transportation systems, medical equipment, environmental control, multi-function telecommunications devices including smart phones.
Data storage	The benefits and risks of disk drives, solid state storage, network storage, optical storage, cloud storage, backup and archive media. Different representations/file types.
Networks	LANs, WANs, wireless networks, cellular telecommunications, network topology, switches, routers, encryption and security. The infrastructure and protocols of the internet.
Programming and control	Binary representation, Boolean logic, logic gates, input, processes and output. Functions and procedures. Types of errors in programming. Control and robotics programming languages. Programming in application, games and apps design and creation.
ICT systems lifecycle	Defining problems, feasibility study, investigation and analysis, design, development (programming), testing, implementation, documentation, evaluation, maintenance.
Organisation of data and data standards	Data types, data structures, flat file and relational databases, data quality, standards for data management, data protection.
Industry standards	Why do we need standards and how do they develop. De facto standards (e.g. embedded data in an MP3), de jure standards (e.g. ASCII, wireless protocols, etc).

In Addition: Evolution and Impact

Naace believes it is important that learners understand the impact of evolving technology on society over the years, how computing has developed and that they consider the future of technology. **Within each** of the suggested areas of knowledge, wider reading should be encouraged, along with creative activity in the classroom, so that learners develop a bigger picture of how technology has and can develop or have an impact on lives. Through the rigour of researching the evolution of ICT, learners can discover a sense of wonder at the speed of technological change and vast increases in capability, as well as 'future-gazing' – debating and contemplating hitherto unknown technologies.

Part 3: Definitions

Digital Literacy:



"Digital Literacy is a complex and contested term... goes beyond a focus on the individual technical competence and functional skills needed in order to operate digital tools; it refers to the more subtle and situated practices associated with being able to create, understand and communicate meaning and knowledge in a world in which these processes are increasingly mediated via digital technologies." - Futurelab

Some of these aspects of ICT may be developed, consolidated and applied through other curriculum areas such as Maths, MFL, Science, etc but in order to be digitally literate across the curriculum, skills need to be taught in a focused way .

Digital Wisdom:

Being able to choose and use tools appropriately for achieving effective communication of ideas, finding information or solving problems involves levels of understanding in order that wise choices may be made, underpinned by a sound understanding of the technologies involved. Digital Wisdom involves having a "bigger picture" of all the aspects of ICT and being able to make connections between them. As well as prudent use of technology, digital wisdom includes the potential that technology has to support learners in being wise beyond their innate capability. Having a high level of Digital Wisdom means decisions can be made about using technology in interesting, creative and productive ways.

"Digital wisdom is a twofold concept, referring both to wisdom arising from the use of digital technology to access cognitive power beyond our innate capacity and to wisdom in the prudent use of technology to enhance our capabilities. Because of technology, wisdom seekers in the future will benefit from unprecedented, instant access to ongoing worldwide discussions, all of recorded history, everything ever written, massive libraries of case studies

and collected data, and highly realistic simulated experiences equivalent to years or even centuries of actual experience. How and how much they make use of these resources, how they filter through them to find what they need, and how technology aids them will certainly play an important role in determining the wisdom of their decisions and judgments. Technology alone will not replace intuition, good judgment, problem-solving abilities, and a clear moral compass. But in an unimaginably complex future, the digitally unenhanced person, however wise, will not be able to access the tools of wisdom that will be available to even the least wise digitally enhanced human." Prensky

Digital Artefacts:

From the Latin phrase *arte factum,* from *ars* skill + *facere* to make

From the Oxford English dictionary, the definition of an artefact is "an object made by a human being, typically one of cultural or historical interest." Another definition is that it is something observed in scientific experiments or investigations, not naturally present but occurring as a result of preparative or investigative procedures.

A digital artefact is made by a human being with skill or art. Although digital content is produced using technology tools and applications, it is "made with skill" and may result from preparative or investigative procedures. Learners need to be taught both the knowledge and skills required to create high quality "artefacts" that can compete against the best in the world. Digital artefacts include information prepared or shared in digital forms e.g. photos, videos, digitally prepared text, multimedia, databases, websites, presentations, music, e-books, programs, coding, etc.

Third Millennium Learning

Culture, attitudes and pedagogies

Responses to technology by whole school community are positive, creative and demonstrate a willingness and open-ness to use technology to enhance learning, teaching, assessment and communication with all stakeholders.

Environment and tools

The physical environment and availability of a wide range of tools supports learning across the curriculum, is conducive to developing effective teaching and learning opportunities and supports the creative use of technology.

Developing Learners

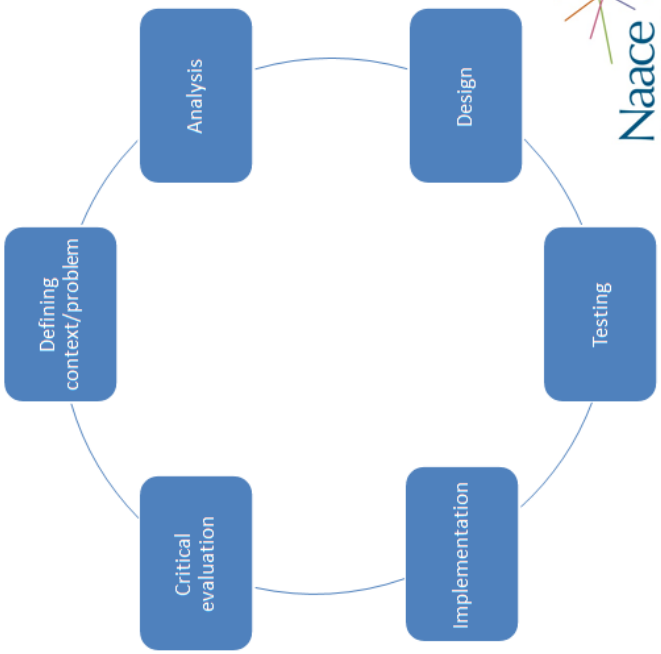
Third Millennium schools promote approaches to teaching and learning that encourage higher level thinking skills. Pedagogies may promote the higher levels of Bloom's taxonomy, or ISTEnets for students, or PLTS (Personal Learning and Thinking Skills). Tech-empowered, constructivist, design process approaches are used.

Features often seen in Third Millennium Schools

- Embedded technology
- Invisible technology
- Technology enabled learning
- Technology empowered learners
- Personalisation through tech
- Range of tools
- Technology enabled assessment
- Technology enabled parental involvement
- Independent learning
- Collaborative learning
- Exploration in learning
- Dynamic learning
- Thinking skills
- Celebrated achievements
- Data to inform and improve
- Flexible teaching and learning spaces to support flexible approaches to learning experiences
- Clear impact of tech on outcomes
- Vision for lifelong learning journeys
- Tech-captured learning experiences

Design Processes

Comment [AMA1]: Rotated to match previous & improve layout



Learner should use design processes when creating digital artefacts, digital solutions and digital systems.