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#PrimaryComputing Curriculum An Introductory Practical Guide

Presentation to the PGCE and BA PTE cohort

Oxford Brookes School of Education

Wednesday 21 April 2021

**COMPUTING
AT SCHOOL**
Lead School

bcs
The Chartered
Institute
for IT



THE
ROYAL
SOCIETY

Teach
Computing

Primary Computing Curriculum: An Introductory Practical Guide

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About the speaker



I am the subject lead for Computing at Willow Brook Primary School Academy in Waltham Forest. Since August 2020, I have also been the Community Leader for the Waltham Forest CAS Mixed Community in North East London.

The school I work for is part of the Griffin Schools Multi Academy Trust. The Trust has two other schools in Waltham Forest – Riverley Primary and Lammas School and Sixth Form. The Trust also has a further ten schools, in Kent, the Midlands and Stantonbury International School in Milton Keynes. In my role as subject lead for Computing, since September 2020 I have been tasked with working with three very talented Year 13 Computer Science students who are following the OCR A-Level syllabus at Stantonbury. I completed the NCCE Primary Certificate while #workingfromhome #homeschooling and am currently on the CS Accelerator Programme.

Willow Brook Primary where I am usually based uniquely follows a Secondary model for specialist teachers so I teach Computing from Reception to Year 6. In exchange for having no other class teacher responsibilities, I support the School with an “Intelligent Client” role working with the consultancy which services and maintains the School’s hardware and Information Systems as well as being the main contact point for families to support online #hybridlearning

I qualified to teach Primary in 2012 and have worked with every year group. Before becoming a teacher I worked for the Crown Prosecution Service for almost 24 years. During that time, I saw and supported the technological transformation of the workplace from standalone IBM PC XT's to being involved in the “Digital to Desktop” project at the turn of the century with 8,000+ devices installed to over 100 offices via a secure WAN. Going back even further in time, my very first computer was a Commodore Vic-20 and I upgraded to a BBC Micro Model B.

continued...

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I have been a member of the Computing at Schools Community since 2016 where I registered after completing the Raspberry Pi Certified Educators workshop. That Summer, I also attended the Raspberry Pi Foundation's Skycademy workshop where the team I was with managed to get its payload to an altitude of over 31,000 kilometres. Willow Brook Primary was recognised as a Computing at Schools Lead School that year. I have been the co-host of a very successful and often over-subscribed Code Club since 2016 where I have regularly used micro:bits with learners as young as Year 5 and Raspberry Pis on a Year 3 project. For 2020, as lead host of the school's CodeClub@home I set up an educator profile with almost 500 accounts on scratch.mit.edu

The Griffin Schools Trust has an excellent Professional Development programme for its staff and in 2017 invited me to be part of its Action Research cohort working towards a Masters in Educational Leadership with Manchester Metropolitan University. I am currently (Autumn 2020) at the dissertation resubmission stage where my project focuses on the notion of "science capital" and specifically on bringing equality of engagement and participation to Computing.

It was through this piece of Action Research that I collaborated with Kano who very kindly provided the Code Club I co-hosted with Kano Computer Kits Complete. I reflected on its success in a poster presentation at the inaugural Computing Education Research Centre hosted by Kings College in June 2018. I've also spoken from the Arena Stage on the opening day at BETT 2019 as well as being a workshop panelist at the Primary Science Teaching Trust 2019 Conference and Educational Leadership, Management and Administration Society (BELMAS) 2019 Conference. For this piece of Action Research, the School I work for was one of the first in London to be a recipient of the Gender Action Initiator Award in December 2019.

Kano were featured in a CNN Business video article in 2019 which was filmed at the school I work for. Kano also very kindly invited me to support their launch of the Kano Windows PC at ISTE in Philadelphia where I spoke to delegates from their stand in the Microsoft Village. In March 2021 I secured a donation of a #VexGo kit which would enable robotics to be easily introduced into the Primary Computing Curriculum. To support my School's Staying Safe Online part of the Computing Curriculum, I have signed the school up to the GoogleUK #BeInternetLegends programme as well as Barefoot Computing's #BeCyberSafe initiative which has been resourced in collaboration with the National Crime Agency.

In terms of my personal vision and direction for computing, I am passionate about raising participation rates for Computing in schools especially among those parts of the community which are under-represented, demonstrating that learners as young as those in Early Years will have some abilities to 'code' and ways of raising the profile of Computing as a subject so that it is valued intrinsically rather than some compliment to other parts of the curriculum as some educational settings seem to have adopted.

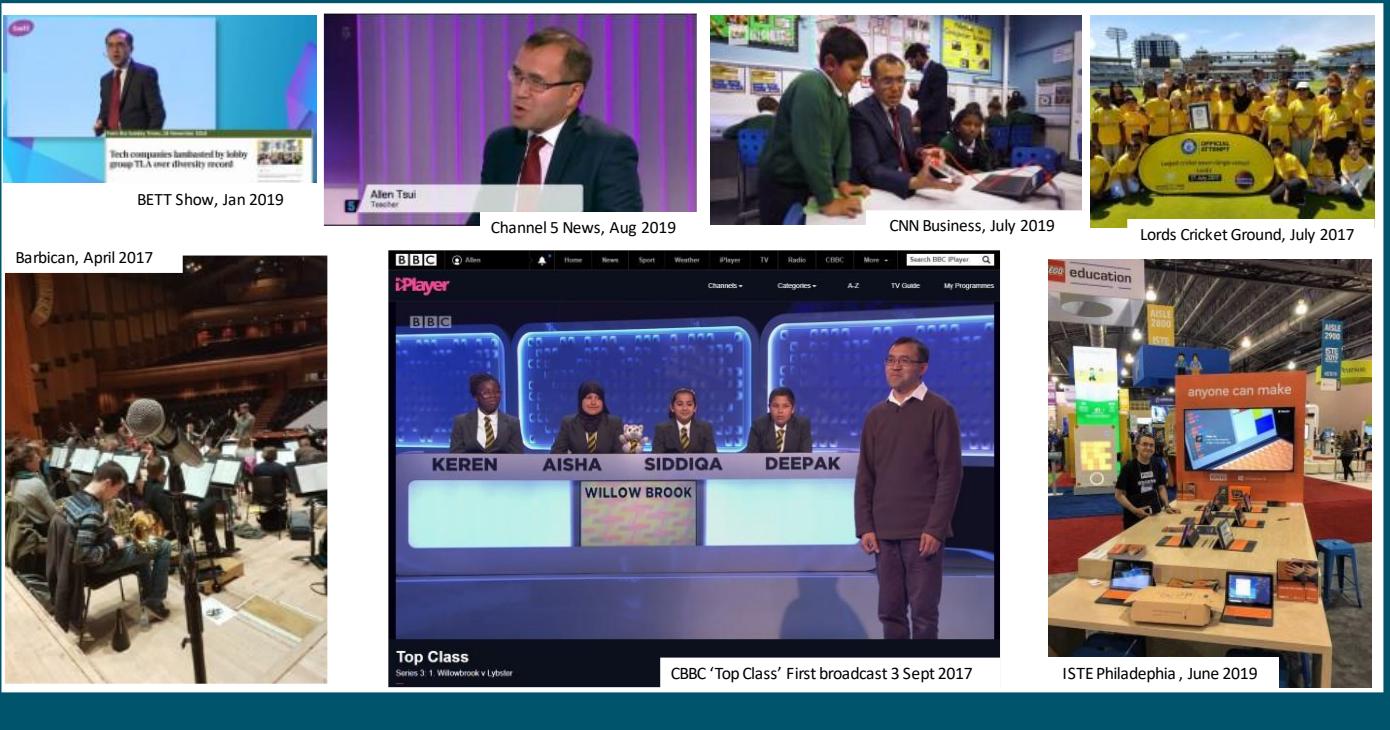
Allen Tsui
Twitter: @TsuiAllen
21 April 2021

[Presentation and speaker notes start on the next page]

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My Primary Teacher milestones in pictures...



Whenever I have the opportunity to reflect on my journey to my present role as subject lead for Computing, I'm never too sure what proportion was by design or unintended circumstance. If I had been told when I left the Civil Service after a career of almost twenty-four years that becoming a Primary School Teacher would mean making three television appearances, become a World Record breaker by playing cricket at Lords, provide backing vocals to an internationally renowned Jazz pianist on stage at the Barbican, share a stage with a Government Minister on the opening day of one of the World's largest Educational Technology Trade Fairs as well as being part of the product launch team exhibiting in the Microsoft Village at a similar event in Philadelphia and be sponsored to study a Masters in Educational Leadership, I would never have believed them. So I'm really pleased and proud to be speaking to you today offering an introductory practical guide to the Primary Computing Curriculum.

[Presentation and speaker notes continue on the next page]

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Teachers' Standards Part One: Sections 1 and 2

Teachers' Standards

PRINCIPLE: Teachers make the education of their pupils their first concern, and are accountable for achieving the highest possible standards in work and conduct. They act with integrity and insight, have strong subject knowledge, keep their knowledge and skills as teachers up-to-date and are self-critical, professional relationships, and work with pupils in the best interests of their pupils.

PRINCIPLE: TEACHING:

1 Set high expectations which inspire, motivate and challenge pupils

- establish a safe and stimulating environment for pupils, rooted in mutual respect
- set grade that stretch and challenge pupils of all backgrounds, abilities and dispositions, and demonstrate consistently the positive attitudes, values and behaviour which are expected of pupils

2 Promote good progress and outcomes by pupils

- use clear objectives for pupils' attainment, progress and outcomes to assess pupils' capabilities and their prior knowledge, and plan teaching to build on these
- guide pupils to reflect on the progress they have made and their emerging needs
- demonstrate knowledge and understanding of how pupils learn and how this impacts on teaching
- reflect systematically on the effectiveness of lessons and approaches to teaching
- if teaching early reading, demonstrate a clear understanding of systematic synthetic phonics
- if teaching early mathematics, demonstrate a clear understanding of appropriate learning strategies

3 Manage behaviour effectively to ensure a good and safe learning environment

- have a secure knowledge of the relevant subject(s) and curriculum areas, foster and maintain pupils' interest in the subject and address relevant barriers to learning
- demonstrate an understanding of developments in the subject and curriculum areas, and promote the value of scholarship
- demonstrate an understanding of the role of literacy, articulacy and correct use of standard English, whatever the teacher's specialist subject
- promote high standards of literacy, articulacy and the correct use of standard English, whatever the teacher's specialist subject
- if teaching early reading, demonstrate a clear understanding of systematic synthetic phonics
- if teaching early mathematics, demonstrate a clear understanding of appropriate learning strategies

4 Plan and teach well structured lessons

- impart knowledge and develop understanding through effective use of lesson time
- promote a love of learning and children's intellectual curiosity
- set homework and plan other out-of-class activities to consolidate and extend the knowledge and understanding pupils have acquired
- reflect systematically on the effectiveness of lessons and approaches to teaching
- contribute to the design and provision of an engaging curriculum within the relevant subject area(s)

5 Adapt teaching to respond to the strengths and needs of all pupils

- know when and how to differentiate appropriately, using resources which pupils can be helped by
- foster a secure understanding of how a range of factors can inhibit or encourage pupils' learning, and know how to adapt teaching to support pupils' educational needs
- demonstrate an awareness of the physical, social and emotional development of children, and know how to adapt learning to support pupils' welfare
- foster pupils' sense of responsibility and resilience, and help them to manage risk
- use clear objectives for pupils' attainment, progress and outcomes to assess pupils' capabilities and their prior knowledge, and plan teaching to build on these
- guide pupils to reflect on the progress they have made and their emerging needs
- demonstrate knowledge and understanding of how pupils learn and how this impacts on teaching
- reflect systematically on the effectiveness of lessons and approaches to teaching
- if teaching early reading, demonstrate a clear understanding of systematic synthetic phonics
- if teaching early mathematics, demonstrate a clear understanding of appropriate learning strategies

6 Make accurate and productive use of assessment

- know and understand how to assess the relevant subject and curriculum areas, and promote the value of scholarship
- make use of formative and summative assessment to inform pupils' progression, set targets, and plan subsequent lessons
- use relevant data to monitor progress, set targets, and plan subsequent lessons
- provide pupils with clear feedback, both orally and through accurate marking, and encourage pupils to respond to the feedback

7 Manage behaviour effectively to ensure a good and safe learning environment

- have clear rules and routines for behaviour in classrooms, and take responsibility for promoting good and courteous behaviour both in classrooms and around the school, in accordance with the school's behaviour policy
- have high expectations of behaviour, and establish a framework for discipline which is fair, predictable, consistent and proportionate, reflecting individual needs and circumstances
- manage behaviour effectively, using approaches which are appropriate to pupils' needs in order to involve and include them
- maintain good relationships with pupils, exercise appropriate authority, and act consistently and fairly

PART TWO: PERSONAL AND PROFESSIONAL CONDUCT

A teacher is expected to demonstrate exceptionally high standards of personal and professional conduct. The following material defines the relevant areas of conduct, the following material defines the relevant areas of conduct, and addresses what are the required standards for each throughout a teacher's career.

1 Teach with clarity and precision in the profession and maintain high standards of personal and professional conduct

- Teachers must have a secure knowledge of the relevant subject(s) and curriculum areas, foster and maintain pupils' interest in the subject and address relevant barriers to learning
- Teachers must demonstrate an understanding of developments in the subject and curriculum areas, and promote the value of scholarship
- Teachers must demonstrate an understanding of the role of literacy, articulacy and correct use of standard English, whatever the teacher's specialist subject
- Teachers must promote high standards of literacy, articulacy and the correct use of standard English, whatever the teacher's specialist subject
- If teaching early reading, demonstrate a clear understanding of systematic synthetic phonics
- If teaching early mathematics, demonstrate a clear understanding of appropriate teaching strategies

2 Promote good progress and outcomes by pupils

- be accountable for pupils' attainment, progress and outcomes
- be aware of pupils' capabilities and their prior knowledge, and plan teaching to build on these
- guide pupils to reflect on the progress they have made and their emerging needs
- demonstrate knowledge and understanding of how pupils learn and how this impacts on teaching
- encourage pupils to take a responsible and conscientious attitude to their own work and study

1 Set high expectations which inspire, motivate and challenge pupils

- establish a safe and stimulating environment for pupils, rooted in mutual respect
- set goals that stretch and challenge pupils of all backgrounds, abilities and dispositions
- demonstrate consistently the positive attitudes, values and behaviour which are expected of pupils.

2 Promote good progress and outcomes by pupils

- be accountable for pupils' attainment, progress and outcomes
- be aware of pupils' capabilities and their prior knowledge, and plan teaching to build on these
- guide pupils to reflect on the progress they have made and their emerging needs
- demonstrate knowledge and understanding of how pupils learn and how this impacts on teaching
- encourage pupils to take a responsible and conscientious attitude to their own work and study

Evidence: through lesson plans along with progression tracking or attainment data.

Before I continue, I wanted to recap on the Teachers' Standards and break down what I intend to focus on in this presentation. Taking each Section apart, Sections 1 and 2 of Part One would be evidenced through lesson plans along with progression tracking or attainment data. Sections 3 and 4 (**as shown below**) focus on subject knowledge and the ideas that surround and underpin high quality lesson planning which hopefully I'll show you some examples of later in this presentation.

Teachers' Standards Part One: Sections 3 and 4

Teachers' Standards

PRINCIPLE: Teachers make the education of their pupils their first concern, and are accountable for achieving the highest possible standards in work and conduct. They act with integrity and insight, have strong subject knowledge, keep their knowledge and skills as teachers up-to-date and are self-critical, professional relationships, and work with pupils in the best interests of their pupils.

PRINCIPLE: TEACHING:

1 Set high expectations which inspire, motivate and challenge pupils

- establish a safe and stimulating environment for pupils, rooted in mutual respect
- set grade that stretch and challenge pupils of all backgrounds, abilities and dispositions, and demonstrate consistently the positive attitudes, values and behaviour which are expected of pupils

2 Promote good progress and outcomes by pupils

- use clear objectives for pupils' attainment, progress and outcomes to assess pupils' capabilities and their prior knowledge, and plan teaching to build on these
- guide pupils to reflect on the progress they have made and their emerging needs
- demonstrate knowledge and understanding of how pupils learn and how this impacts on teaching
- reflect systematically on the effectiveness of lessons and approaches to teaching
- encourage pupils to take a responsible and conscientious attitude to their own work and study

3 Demonstrate good subject and curriculum knowledge

- have a secure knowledge of the relevant subject(s) and curriculum areas, foster and maintain pupils' interest in the subject, and address misunderstandings
- demonstrate a critical understanding of developments in the subject and curriculum areas, and promote the value of scholarship
- demonstrate an understanding of and take responsibility for promoting high standards of literacy, articulacy and the correct use of standard English, whatever the teacher's specialist subject
- if teaching early reading, demonstrate a clear understanding of systematic synthetic phonics
- if teaching early mathematics, demonstrate a clear understanding of appropriate teaching strategies.

4 Plan and teach well structured lessons

- impart knowledge and develop understanding through effective use of lesson time
- promote a love of learning and children's intellectual curiosity
- set homework and plan other out-of-class activities to consolidate and extend the knowledge and understanding pupils have acquired
- reflect systematically on the effectiveness of lessons and approaches to teaching
- contribute to the design and provision of an engaging curriculum within the relevant subject area(s).

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Teachers' Standards Part One: Section 5 -Differentiation

The screenshot shows the 'Teachers' Standards' document from the Department of Education. A red box highlights Section 5: 'Adapt teaching to respond to the strengths and needs of all pupils'. This section includes a list of outcomes:

- know when and how to differentiate appropriately, using approaches which enable pupils to be taught effectively
- have a secure understanding of how a range of factors can inhibit pupils' ability to learn, and how best to overcome these
- demonstrate an awareness of the physical, social and intellectual development of children, and know how to adapt teaching to support pupils' education at different stages of development
- have a clear understanding of the needs of all pupils, including those with special educational needs; those of high ability; those with English as an additional language; those with disabilities; and be able to use and evaluate distinctive teaching approaches to engage and support them.

Below this, another red box highlights 'Types of Student Inquiry' by @trev_mackenzie, featuring four categories: Structured Inquiry, Controlled Inquiry, Guided Inquiry, and Free Inquiry.

Section 5 of the Standards clearly refers to differentiation. Taking an 'Inquiry based Learning' approach means differentiating four instead of three ways. For my School, I've adapted the 'Inquiry based Learning' into these standards or competencies given the very predominantly practical nature of Computing.

Inquiry based learning approach example

The diagram illustrates four types of student inquiry:

- Structured Inquiry:** Students follow the lead of the teacher as the entire class engages in one inquiry together.
- Controlled Inquiry:** Teacher chooses topics and identifies the resources students will use to answer questions.
- Guided Inquiry:** Teacher chooses topics/questions and students design products or solutions.
- Free Inquiry:** Students choose their topics without reference to any prescribed outcome.

A table to the right maps these inquiry types to competency-based descriptors:

Tier	Competency based descriptor
Pioneer	is able to demonstrate that they have independently achieved all of the Success Criteria and extension challenges for the session.
Navigator	is able to demonstrate that they have been able to follow the instructions set for the Learning Outcome to the model of the session.
Discoverer	demonstrates that they have partially followed the instruction set for the Learning Outcome to the model of the session.
Explorer	demonstrates an understanding of the Learning Outcome from the session by commenting on what they have learnt from the session through recording "I noticed..."; "I liked..." and "I wonder..." Learning Outcome self-review statements.

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Here's a real example from my Year 5 Class which I taught during British Science Week in March 2021.

Applying Inquiry Based Learning to Computing

Tier	Year 5 Coding micro:bits
Pioneer	is able to independently access the web sites and use the block programming features from that website to make the micro:bit display random numbers. Able to transfer their code to the device as well as save their script.
Navigator (Could)	is able to access the websites with support and use the block programming features to replicate the example code and make the micro:bit display random numbers.
Discoverer (Should)	is able to access the example code that has been given from the website and transfer the code to make the micro:bit display random numbers.
Explorer (Must)	completes the "I noticed..."; "I liked..." and "I wonder..." Learning Outcome selfreview statements from the session.

It would be easy for me to simply say “Please refer to the statutory guidance issued by the Department for Education back in September 2013.” But that would not only be remiss of me given my enthusiasm for the subject but a dereliction of my duties of my wider professional responsibilities as a teacher.

The Primary Computing Curriculum for Schools in England

National curriculum in England: computing programmes of study
Published 11 September 2013

Purpose of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

<https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study/national-curriculum-in-england-computing-programmes-of-study>
(last visited: 9 April 2021)

Computing Statement of Intent

WILLOW BROOK PRIMARY

Computing Statement of Intent

Version: Date: Modified by: Reviewed by:

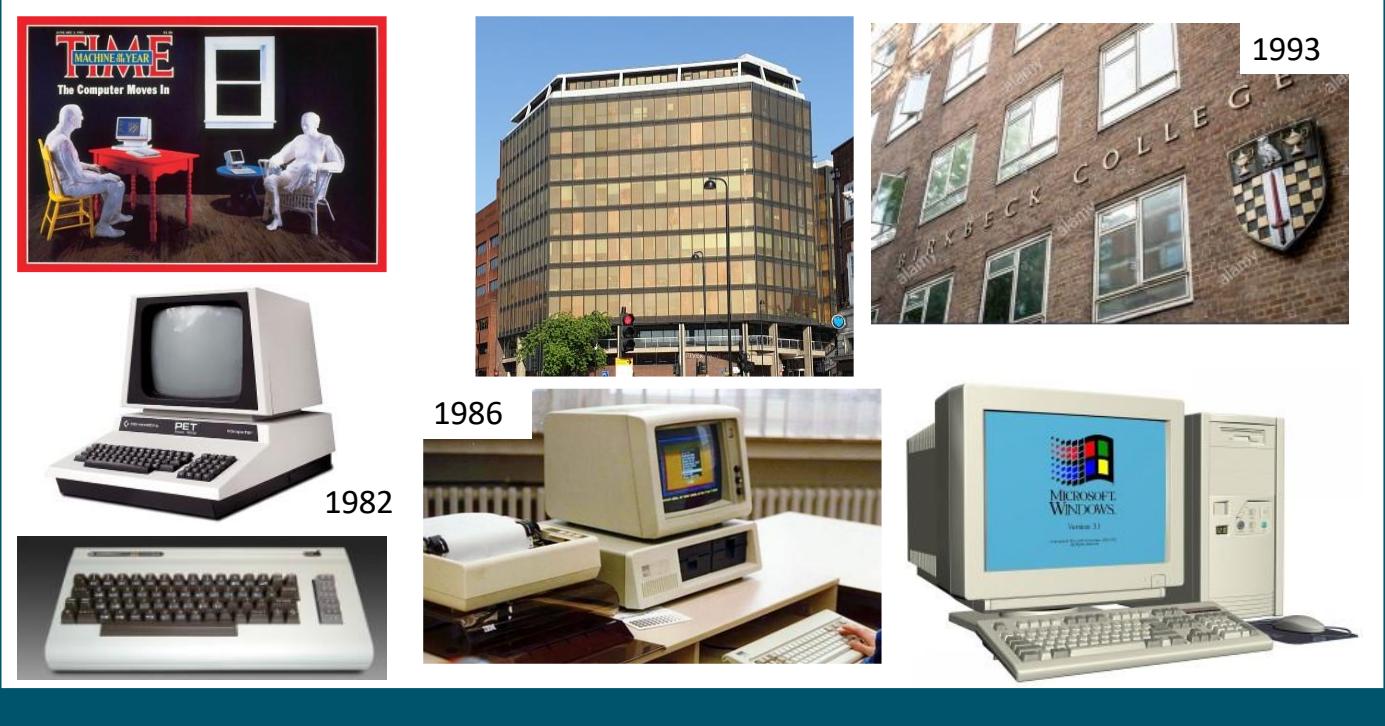
1.0 25 March 2021 A/C (Chair) 25 March 2021

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So let's take an opportunity to go a little cross curricular with the Primary History Curriculum where the statutory guidance stipulates learning about "changes within living memory".

Cross curricular with Primary History: "changes within living memory"



For me, computers or computing became part of my life in 1982 when my parents bought me my first computer. Fast forward almost forty years and the Raspberry Pi 400 has the same or similar physical plug into a TV and start programming or coding properties as the Commodore Vic-20 but at less than a third of the price. I started working in the Civil Service in 1986 where being very keyboard proficient meant that I was delegated the task of being one of the few who got to use the stand alone computer. Because of the noise of the dot matrix printer and the fear of static electricity corrupting the equipment, the computer and printer occupied its very own office space in a room that could comfortably had three or four people working together. My first experience of a computer for educational purposes was in 1993 when I became a student at Birkbeck College. By this time, the Education Reform Act of 1988 which established the National Curriculum included ICT as "compulsory" (source: <https://www.gov.uk/government/publications/ict-in-schools-2008-to-2011>, last visited 10 April 2021).

I worked for the Civil Service for nearly 24 years with three quarters of my time based in offices by St Paul's Cathedral. It was during this time that I saw and was part of a workplace transformation project or scheme where the workplace moved from individual teams have Local Area Networks to by the time I left in 2010 a Wide Area Network system with computers installed on every desktop for 8,000 staff across over 100 offices. Hard to believe that it was only just over twenty years ago that Government Departments were still using dialup modems to connect to the Internet. I was one of the few offices that had such a facility and I remember in September 2001 when people gathered around my computer to read and watch BBC News online as events we will never forget unfolded. As I mentioned, I left the Civil Service in 2010 and began to volunteer in a brilliant Primary School where the Headteacher realised I was quite good at working with Computers and offered me a paid role on a part-time basis as its Technician essentially. During my own PGCE year, I was fortunate enough to complete a placement at the school and got to teach ICT where essentially it was about learning how to use Microsoft Office and other applications or software. I qualified

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in 2012 and joined the amazing School I work for today in 2015. My current Headteacher offered me the role of subject lead for Computing before the start of this current school year although I've been "*thinkering*" (portmanteau courtesy of Professor Danielle George, recipient of the 2018 Michael Faraday Royal Society Prize and Lecture) as it were around technology for teaching and learning since 2016 when I became one of the first wave of Raspberry Pi Certified Educators.

Cross curricular with Primary History: "changes within living memory"



It was the General Election of 2010 and subsequent change of Government which galvanised the Computing at Schools network with support from the National Association for Education Technology (NAACE) to produce this report in 2013 as a commentary of the re-organisation of the National Curriculum especially from ICT to Computing or Computer Science.

The Computing Curriculum: a brief chronology

The timeline highlights two key documents:

- 2013:** The NAACE report "Computing in the national curriculum: A guide for primary teachers". The cover features a colorful abstract design and the NAACE logo.
- 2017:** The Royal Society's report "Education for a Connected World: A framework to equip children and young people for digital life". The report page includes sections on "Why computing?", "Computing for all", and "Supporting children and young people". It features icons representing various digital skills and concepts.
- 2018:** A red box labeled "Start here" points to the Royal Society report.

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[From slide on previous page] The biggest step change was the very clear introduction or expectation that programming or coding would become a more significant element within the topics to be covered. The Computing at Schools report essentially broke down Primary Computing into three elements – Computer Science which covers the coding aspect, Information Technology and Digital Literacy. Similarly, the Royal Society “After the Reboot” review of the 2013 Computing Curriculum highlighted interest in how computer based systems in our every-day lives have facilitated mass data collection opportunities merits Data Science being its own discrete element of the computing curriculum, specifically separate from Digital Literacy or Information Technology. Such an approach would not only enable learning about how such data is used, stored and shared but also encourage philosophical debate (Philosophy for Children or “P4C”) about ethical and moral implications of such technologies. It was also at this time that the UK Council for Child Internet Safety (speaker note: who since July 2018 have become the UK Council for Internet Safety which is a Non-Departmental Public Body comprising of representatives from the Department for Culture Media and Sport and Home Office working with the Department of Education) published its first of these reports to address rising concerns over the safe use of computers as communications devices as well as concerns around how easily accessible inappropriate content was available on the Internet.

In recognition of all of this, the Department for Education in 2018 allocated £84 million to the establishment of the National Centre for Computing Education which was formed by the National STEM Learning Centre alongside the Raspberry Pi Foundation and the BCS, the Chartered Institute for IT.

National Centre for Computing Education, 7 November 2018



The screenshot shows a news article from GOV.UK dated 7 November 2018. The headline is "Tech experts to provide National Centre for Computing Education". The article discusses the new £84 million National Centre for Computing Education, led by British experts, which will work with schools across England to improve teaching and drive participation in computer science. It mentions the involvement of the BCS, STEM Learning, and the Raspberry Pi Foundation. There are quotes from Nick Gibb, Minister for School Standards, and others, along with images of children and teachers using computers.

bcS The Chartered Institute for IT

Raspberry Pi

Teach Computing

bcS The Chartered Institute for IT

STEM LEARNING

National Centre for Computing Education

By following their principles and standards, my bosses are about to sign off on my School's statement of Intent which reads:

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Computing at Willow Brook

Intent

Computing at Willow Brook follows the principles, practices and standards set by the **National Centre for Computing Education**. The School has since 2016 been accredited as a **Centre of Excellence** for teaching Computing by the BCS (the chartered Institute for IT) through its **Computing at Schools** network. By working in collaboration with a number of Universities and other World leading learning institutes ensures that the School's Computing curriculum is continuously connected to the most innovative pedagogical and technological thinking and developments.



Side 1 of 4

Statement of Intent

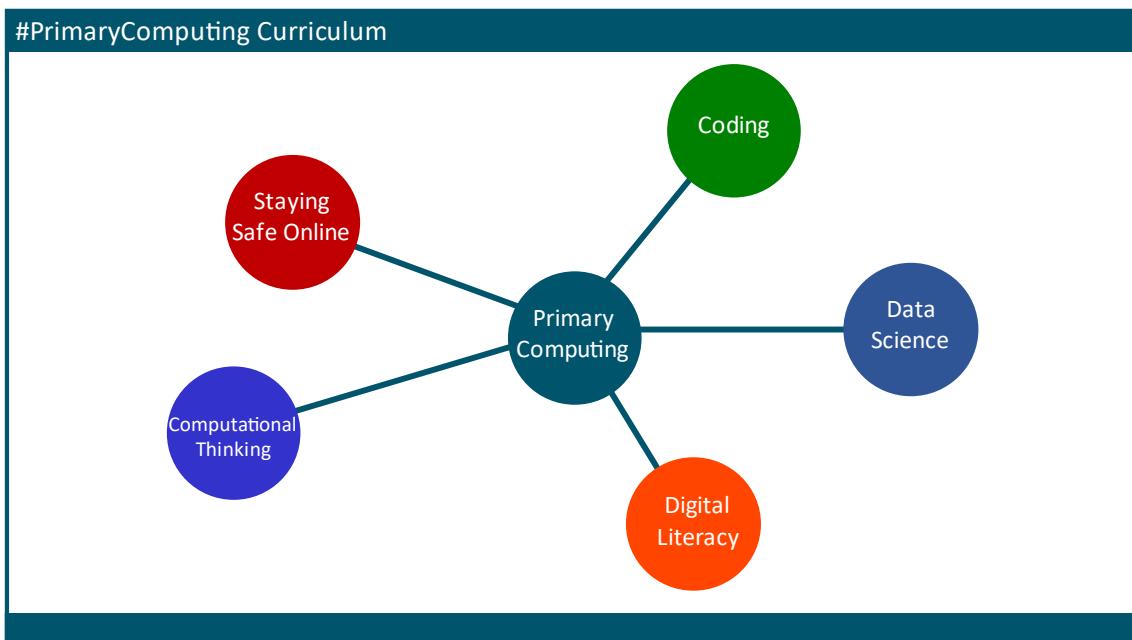
Before I talk on about the design and delivery of the Computing Curriculum at the school I work for, I wanted to mention the Computing at School's network again. Computing at School's is a grassroots network founded in 2008 and supported by the BCS, the Chartered Institute for IT (formerly known as the British Computing Society). You can find out more about the work of the Computing at School's Network and its importance in shaping the landscape of computing in schools by watching the 2020 Kavli medal lecture from one of the network's co-founders, Simon Humphreys.

Computing at Schools Network

A screenshot of the Royal Society Schools Network website. The header is red with the text 'THE ROYAL SOCIETY' and navigation links for Home, Fellows, Events, Grants, Schemes & Awards, Topics & policy, Journals, Collections, About us, and What's new. Below the header, there's a 'Blog' section with a sub-header 'SCHOOLS NETWORK' showing students in a computer lab. To the right, there's a 'Computing at School' section featuring a video player with a thumbnail of Simon Humphreys speaking, and a 'How do you solve a problem like... high quality computing educati...' video summary.

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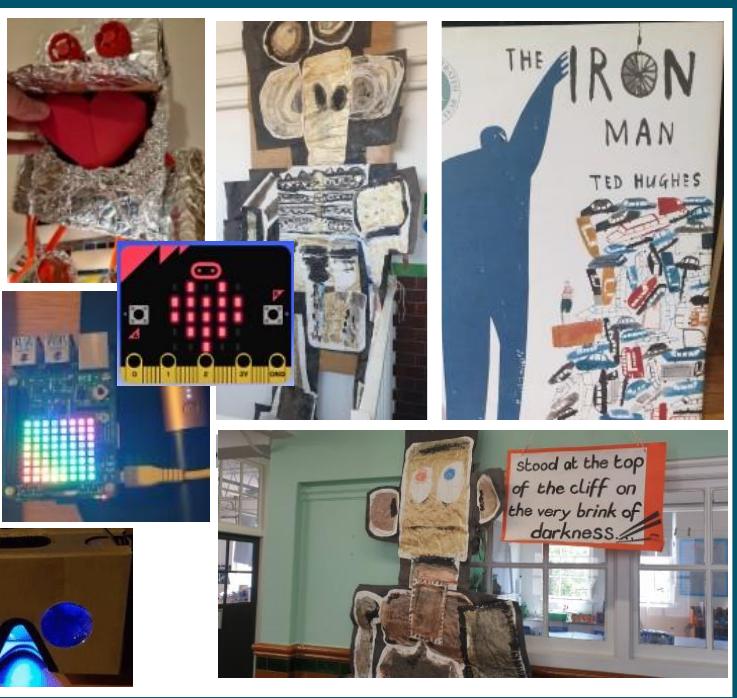


So back to where we are with the way the Primary Computing curriculum might be organised into these five blocks, elements, components – call them whatever you want or will. If we take one of the suggestions or recommendations made by Simon Humphreys from his lecture of offering an hour a week of Computing to every class, you'll soon realise that there isn't enough time to cover the entire Computing curriculum, let alone any of the other subjects which as Primary practitioners we are under statutory obligation to deliver. So, some aspects will need to be covered in other ways – such as keeping the staying safe online as assemblies. Work with colleagues to deliver many of the Digital Literacy aspects through other subjects or alternatively anchoring the Computing lessons around the topics being covered elsewhere in the Curriculum. At this point, let's take one of the questions that were submitted before the today's session from Rebecca H.

Student Question...

Do you have recommendations for joint DT-computing projects? Or any other inter-curricular approaches to teaching computing?

Rebecca H



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The slide on the previous page showed a very cross-curricular approach with Art and English for the Year 3 series of lessons based on “The Iron Man” by Ted Hughes. My wonderful colleague, Mr Sanders who teaches Art had worked with the classes to create these larger than life cardboard models which are hanging outside their classrooms and in the stairwell of the school. By using BBC micro:bits the children were able to build smaller scale models of “The Iron Man” and give their models a beating heart. For the larger models, using a Raspberry Pi sense-hat as previously featured in the International Space Station Astro Pi projects, it was possible to show the children how with a few very simple lines of code it was possible to get the sense-hat device to flash red, white and blue as “The Iron Man” eyes do in the story.

Here's another example. Search for “ActiveLens” from your smartphone's apps store and download the app as listed below. Using the app, watch what happens to the images **shown**. Augmented Reality is a great way of combining digital literacy and computational thinking along with a bit of Data Science and potentially Coding into a lesson from another subject – in this case the History of Ancient Egyptians.

An example of Augmented Reality crosscurricular with Primary History

search: **ActiveLens**

- Romans ActiveLens
Inspyro Ltd. • Education
500+
- LGfL Archaeology ActiveLens
Inspyro Ltd. • Education
Installed
- WW1 ActiveLens
Inspyro Ltd. • Education
4.1 ★ 500+
- LGfL iDig ActiveLens
Inspyro Ltd. • Education
100+
- Explore Geography ActiveLens
Inspyro Ltd. • Education
100+
- LGfL Prehistory ActiveLens
Inspyro Ltd. • Education
2.7 ★ 500+
- Ancient Egypt ActiveLens**
Inspyro Ltd. • Education
Installed
- LGfL WW1 ActiveLens
Inspyro Ltd. • Education
2.6 ★ 500+

The Pharaohs

Ramesses II

Ramesses II was one of the greatest and best known of the pharaohs. He ruled during the nineteenth dynasty (1292 - 1186 BC) and lived into his nineties, fathering at least 85 children with his seven principle wives. He lived so long that twelve of his crown princes died before him and it was his thirteenth son, Merenptah who eventually succeeded him as pharaoh. He had more statues and monuments made to himself than any other ruler. The famous statue in the British Museum is only the upper half. It was carved from a single piece of granite and there are still fragments of paint visible that would have made it an even more impressive sight!

What is a Pharaoh?

A pharaoh is a king or ruler. The word is Greek and is based on an Egyptian word for 'great house'. When it was first used, it referred to the great palace of the king, not the king himself!

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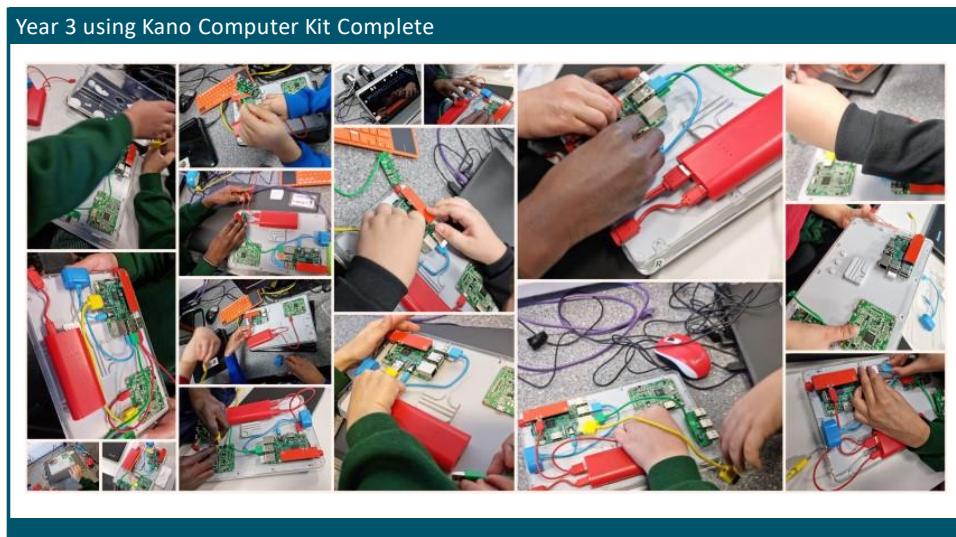
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Primary Computing Schemes of Work

The collage includes:

- Kapow Primary:** A screenshot of the website showing three teachers: Cat Lamin (@CatLamin), Sarah Vaughan (@SarVaughans), and Donna Rawling (@DdR333).
- twinkl:** A logo for twinkl.
- purple mash:** A logo for purple mash, featuring the text "Computing Scheme of Work".
- SWITCHED ON Computing:** A logo for SWITCHED ON Computing.
- Teach Computing Curriculum Journey:** A circular diagram titled "National Centre for Computing Education" and "Raspberry Pi" showing a progression from Year 1 to Year 7 through various computing concepts like "Introduction to programming", "Digital drawing", "Scratch", "Scratch 2D", "Scratch 3D", "Scratch 4D", "Scratch 5D", "Scratch 6D", "Scratch 7D", "Scratch 8D", "Scratch 9D", "Scratch 10D", "Scratch 11D", "Scratch 12D", "Scratch 13D", "Scratch 14D", "Scratch 15D", "Scratch 16D", "Scratch 17D", "Scratch 18D", "Scratch 19D", "Scratch 20D", "Scratch 21D", "Scratch 22D", "Scratch 23D", "Scratch 24D", "Scratch 25D", "Scratch 26D", "Scratch 27D", "Scratch 28D", "Scratch 29D", "Scratch 30D", "Scratch 31D", "Scratch 32D", "Scratch 33D", "Scratch 34D", "Scratch 35D", "Scratch 36D", "Scratch 37D", "Scratch 38D", "Scratch 39D", "Scratch 40D", "Scratch 41D", "Scratch 42D", "Scratch 43D", "Scratch 44D", "Scratch 45D", "Scratch 46D", "Scratch 47D", "Scratch 48D", "Scratch 49D", "Scratch 50D", "Scratch 51D", "Scratch 52D", "Scratch 53D", "Scratch 54D", "Scratch 55D", "Scratch 56D", "Scratch 57D", "Scratch 58D", "Scratch 59D", "Scratch 60D", "Scratch 61D", "Scratch 62D", "Scratch 63D", "Scratch 64D", "Scratch 65D", "Scratch 66D", "Scratch 67D", "Scratch 68D", "Scratch 69D", "Scratch 70D", "Scratch 71D", "Scratch 72D", "Scratch 73D", "Scratch 74D", "Scratch 75D", "Scratch 76D", "Scratch 77D", "Scratch 78D", "Scratch 79D", "Scratch 80D", "Scratch 81D", "Scratch 82D", "Scratch 83D", "Scratch 84D", "Scratch 85D", "Scratch 86D", "Scratch 87D", "Scratch 88D", "Scratch 89D", "Scratch 90D", "Scratch 91D", "Scratch 92D", "Scratch 93D", "Scratch 94D", "Scratch 95D", "Scratch 96D", "Scratch 97D", "Scratch 98D", "Scratch 99D", "Scratch 100D".
- COMPUTING SCIENCE CURRICULUM ROAD MAP:** A diagram titled "LGfL" showing a road map from Y1 to Y6 with various curriculum topics listed along the way.

In terms of the order in which the topics across Computing should be covered, I haven't yet seen or experienced any sort of agreed structure that most Computing teachers follow unlike Maths where there is a logical order of concepts to be covered. Here are a list of some of the Schemes of Work that are available. Some can be purchased as private individuals. Some like Purple Mash are only available through School subscriptions. I personally take a mix of all of these and choose the parts I like the most or think work best in my School, with the learners I'm working with and most importantly with the equipment and software I have available. On that I've been fortunate enough to have the support of the Parent Teacher Association who have previously purchased micro:bit drawing robots for the Schools from funds they have raised. A collaboration with Kano in 2018 resulted in receiving a donation of enough Computer Kits Complete for children to work in teams to build their own computers. I was also recently fortunate enough to receive a VexGo kit and PiTop4 which I will use for the after school clubs I will run to introduce the children to robotics and more physical computing.



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Student Questions: #PrimaryComputing Curriculum “I can” statements

Year 3	Year 4	Year 5	Year 6
Digital Literacy			
I can create different effects with different technology tools.	TT4.1 I can use images, video and sound to create an atmosphere when presenting to different audiences.	I can use text, images, sound and video editing tools to refine my work.	I can talk about audience, atmosphere and structures when planning a particular outcome.
Computational Thinking			
I can combine a mixture of text, graphics and sound to share my ideas and learning.	I can save and review work on the internet, the school network or my own device.	I can tell you whether a resource I am using is on the Internet, the school network or my own device.	TT4.1 I can describe different parts of the internet.
I can evaluate my work and improve its effectiveness.	TT3.1 I can talk about the parts of a computer system.	Year 3	Year 4
I can share an appropriate tool to show my work online.	TT3.4 I can talk about what makes a password secure and why they are important.	TT4.2 I choose a secure password when I am using a website.	Year 5
TT3.5 I can make choices on which program is best for the task I am carrying out.	TT3.4 I can describe the World Wide Web as part of the Internet that contains websites.	TT4.3 I can protect my personal information when I do different things online.	Year 6
I can evaluate my work and improve its effectiveness.	TT3.8 I can use search tools to find and use an appropriate website.	TT5.1 I can use the safety features of websites as well as reporting concerns to an adult.	Starting at
I can tell you ways to communicate with others online.	TT3.9 I can describe why I think the information from some websites are better than others.	TT5.2 I can recognise website and games appropriate for my age.	
TT3.10 I can describe why I think the information from some websites are better than others.	TT3.7 I can make good choices about how long I spend online.	TT5.3 I can break an open ended problem into smaller parts.	
I can share an adult before downloading files and games from the Internet.	TT3.8 I can ask an adult before downloading files and games from the Internet.	TT5.4 I can use logical thinking to solve an open ended problem by breaking it up into smaller parts.	
TT3.9 I can post positive comments online.	TT3.10 I can use repeat commands.	TT5.5 I can decompose a problem into smaller parts to help me solve it.	
	TT3.11 I can identify what makes a procedure efficient.	TT5.6 I can follow a procedure using repeat commands to improve a program.	
	TT3.12 I can use a sensor to detect a change which can select an action within my program.	TT5.7 I can use a variable to increase programming possibilities.	
	TT3.13 I can talk about the different ways data will need for a simple task.	TT5.8 I can evaluate the effectiveness and efficiency of my algorithm while I continually test the programming of that algorithm.	
	TT3.14 I can deduce a problem in an algorithm which could result in unsuccessful programming.	Year 3	Year 4
		Information Science	Year 5
		I can talk about the different ways data can be organised.	Year 6
		I can organise data in different ways.	
		I can use a spreadsheet and database to collect and record data.	
		I can select the most effective tool to collect data for my investigation.	
		I can plan the process needed to investigate the World around us.	
		I can search a ready-made database to answer questions.	
		I can collect data and identify where it could be inaccurate.	
		I can choose an appropriate tool to help me collect data.	
		I can check the data I collect for accuracy and plausibility.	
		I can collect data to help me answer a question.	
		I can plan, create and search a database to answer questions.	
		I can present data in an appropriate way.	
		I can interpret the data I collect.	
		I can add to a database.	
		I can choose the best way to present data to my friends.	
		I can search a database using different operations to refine any search.	
		I can make a branching database.	
		I can use a data logging device to record and store readings with my friends.	
		I can talk about anomalies in data and suggest how it could be checked.	
		I can present data in an appropriate way.	
		I can use a data logging device to monitor and collate the information collected.	
		I can use the data I have developed to interrogate a database.	
		TT6.1 I can use software to help me analyse and present data and information.	

How do you assess children's progress and understanding of computing?

Sophie K

How do computing lessons differ by year group?

Rebecca H

In terms of the planning or implementation process, starting with the “I can” statements, break them down into Success Criteria and organise them into hour long learning sessions. I’ve said that very carefully and deliberately as the last twelve months have highlighted a number of issues specific I think to how Computing is taught. Firstly, irrespective of all the efforts of everyone with trying to ensure that every family has had access to the Internet and a device for home-learning since March 2020, there are those families who are more digitally literate and those families who for whatever remain on the other side of the digital divide. The implication on our classrooms when teaching Computing is that those who are digitally literate have potentially become more so and those who have struggled over the last year will require even more support with skills like using a keyboard or mouse. On a positive note, “lost learning time” for those who have had regular access to Internet connected devices has been negligible to the point that actually some are even showing skills significantly above Age Related Expectations. It brings me to my second observation that home or hybrid learning opportunities over the last year has meant that some families can and have chosen to be learning at Age Related Expectations that is more personalised.

For a pdf copy of the Primary Computing Progression Map (including Reception and KS1) as featured on the slide shown on this page, please use the QR code on the right.

The Progression Map was adapted from the version produced by Somerset e-Learning and Information Management Service where their version is available to download from the National STEM Learning Centre.



[Presentation and speaker notes continue on the next page]

Primary Computing Curriculum: An Introductory Practical Guide

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Example of cross curricular home or hybrid learning activity

Self Portrait in the style of Julian Opie

Time required: Between 2 and 3 hours. You can spend more time if you want or need to.

Equipment needed:

Other equipment:

Minimum suggested

Introduction: Although this is a cross-curricular activity, it is a Computing curriculum. The target audience is Year 5 and 6.

Slide 1 of 20

Slide 2 of 20

Slide 3 of 20

Self Portrait in the style of Julian Opie

Band 1	Band 2	Band 3	Band 4	Band 5	Band 6
I can use art to share my ideas.	I can make sensible choices about what to do next.	I can talk about famous artists and their work.	I can use skills I have been shown to adapt and improve my work.	I can develop different ideas which can be used and explain my choices.	I can select ideas based on first hand observations.

Self Portrait in the style of Julian Opie

Band 1 Band 2 Band 3 Band 4 Band 5 Band 6

13. Have a go yourself

Use the "save as" function of the presentation software you are using to "export" the page of your final version into either a "Joint Experts Photographic Group" (jpg) or "Portable Network Graphics" (png) format.

You can then adjust or crop the image you have created to get rid of any information around the outside edge of the image that you do not want.

Share and celebrate your work by uploading it to the online learning platform used by your school like purplemash.com or Google Classroom.

If you complete this activity before the end of this month (January 2021), your image could be included in the gallery that will be shared on the school website.



By way of specific example, I prepared this home learning digital art activity with Learning Outcomes relevant to every year group for both Computing and Art.

A pdf copy of this activity pack and teaching notes is available to download by using this QR code.



This highlights a point as a personal observation, rather than be restricted to the pressures of "Age Related Expectations", if we as teachers were able to provide every learner with a highly personalised pathway and approach learning as a continuous journey from Reception through to post 16, the experience of school for learners might become more rewarding. This is certainly the approach I've observed from my colleagues who teach PE where their learning outcomes are based on personal achievements rather than age related "must", "should" and "could" ideals. Hopefully, this answers Rebecca's question about how computing lessons differ by year group.

Marshalling all of these ideas together, and thinking from a School Senior Leader perspective, colleagues at my current school have expected to be presented with a Curriculum Map at the beginning of the school year which looks like this [Slide on the next page]. Essentially it sets out the half termly blocks of learning that are expected to be delivered. And it's beyond that point that as teachers we drill down into the detail of each lesson plan.

[Presentation and speaker notes continue on the next page]

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Primary Computing Curriculum Map Overview – Topic Blocks

30-40 sessions pa	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Reception	All about Instructions (5 sessions)	Programming Bee-Bots (5 sessions)	Exploring Hardware (5 sessions)	Using a Computer (5 sessions)	Introduction to Data (5 sessions)	Introduction to Media (5 sessions)
Year 1	Technology Around Us: Intro to Computing (6 sessions)	Creating Media 1: Digital Painting (6 sessions)	Creating Media 2: Digital Writing (6 sessions)	Coding: Moving a robot (6 sessions)	Creating Media Y1 Project (6 sessions)	Coding: Make Art Digital Artists (6 sessions)
Year 2	Introduction to Computational Thinking (6 sessions)	Creating Media 3: Photography (6 sessions)	Creating Media 4: Music (6 sessions)	Information Science: Using and making pictograms (6 sessions)	Coding: Robot Algorithms (6 sessions)	Coding: Kano Digital Artists (6 sessions)
Year 3	Digital Technologies Around Us (6 sessions)	Animation: (6 sessions)	Desktop Publishing (6 sessions)	Coding: Music Sequencing (6 sessions)	Coding: Introduction to Robotics (6 sessions)	Coding: Kano Digital Artists (6 sessions)
Year 4	Understanding the Internet (6 sessions)	Creating Media 5: Audio editing (6 sessions)	Creating Media 6: Photograph editing (6 sessions)	Coding: Code Club Certificate (6 sessions)	Coding: Introduction to Robotics (6 sessions)	Creating Media Y4 Project (6 sessions)
Year 5	Introduction to Information Science (6 sessions)	Creating Media 7: Vector drawing (6 sessions)	Creating Media 8: Video editing (6 sessions)	Information Science: Flat database (6 sessions)	Coding: Kano (6 sessions)	Coding: Kano Digital Artists (6 sessions)
Year 6	Technology as a Communications Tool (6 sessions)	Creating Media 9 3D-Modelling (6 sessions)	Creating Media 10: Publishing a simple website (6 sessions)	Information Science: Plotting shapes, charts and graphs (6 sessions)	Coding: Python (6 sessions)	Coding: Hackerthon Challenge and iDEA (6 weeks)

I'm sure you've had many opportunities to work with the lesson planning format of the schools that you have experienced so far. At this point, Computing or Computer Science is no different from any other subject. Set out your Learning Intention or Outcome, break it down into Success Criteria with a model that the children can follow. This is where an Inquiry based approach works really well. Following the question that Jemima asked let me use and example of a Reception class lesson where I was introducing them to some concepts in coding.

Student Question...

How would you practically teach an Early Years class of 30 computing?

Jemima S

This week I introduced coding skills to Reception Classes by playing "Get Teddy to Bed" game on their classroom carpet spaces. The aim of the game was:

to give instructions to a friend (using forward, backward and turn) and physically follow their instructions.

According to the Primary Computing Progression Framework distributed by the National Centre for Computing Education (copy downloaded in Summer 2020), this Learning Outcome is an Age Related Expectation for the end of Year 2.

The children followed the PRIMM computing model so had to predict how many pieces of fruit Teddy would eat on his journey to bed where Teddy's starting point as his finishing point would be randomly chosen by the children. The children then took it in turns to run their algorithm by moving Teddy from his starting point, one piece of fruit at a time until he arrived at the piece of fruit where Teddy's bed was. The children then investigated how many different routes there could have been by thinking about and listing the order that the fruit was eaten by Teddy. The children also modified their plans by comparing the routes that Teddy could have taken. For their next lesson, the children will be encouraged to make or plot the routes that Teddy followed by drawing them. The children could also be shown and expected to program a device like a Beebot or other motorised device that can be instructed to follow a sequence of simple instructions to replicate the routes.

This model or lesson can also be used to teach the following Year 3 end of year Age Related Expectations using Scratch:

- I can break an open ended problem into smaller parts;
 - I can put programming commands into a sequence to achieve a specific outcome;
 - I keep testing my program and can recognise when I need to debug it;
 - I can use repeat commands;
 - I can describe the algorithm I will need for a simple task;
 - I can deduct a problem in an algorithm which could result in unsuccessful programming.
- (Statements in bold are key performance Learning Outcomes for the end of Year 3).

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The PRIMM model in Inquiry Based Learning

Introduction to Coding in Reception Class

Computing > Reception > Session 5 of 16 > Coding > Introduction to Coding: Teddy Bear's Picnic

Learning Outcome: "We are learning about..."

...simple instructions.

Success Criteria:

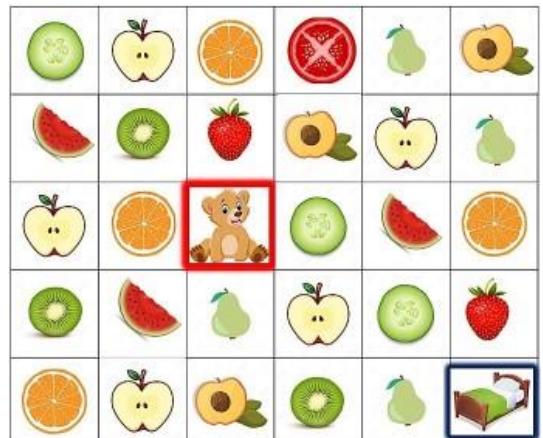
I can say what I see is happening.

I can give instructions to my friend using the words "up", "down", "left" and "right".

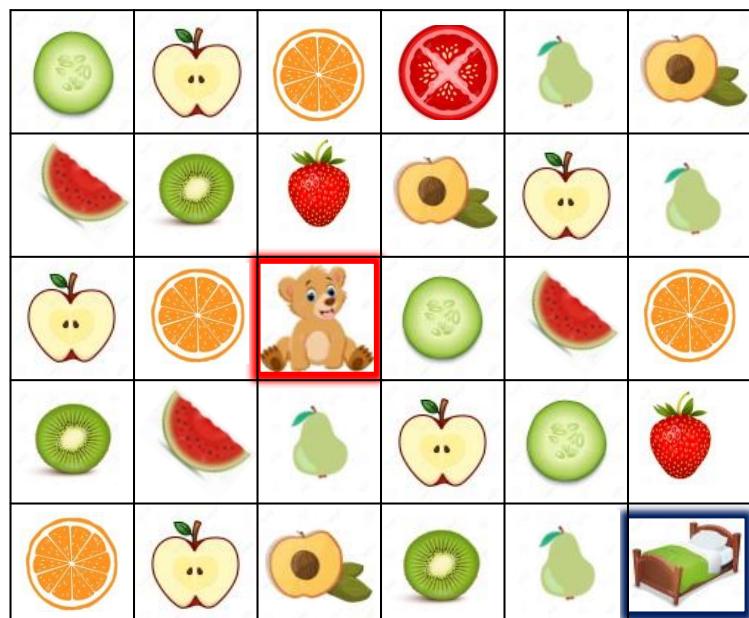
I can make a map that shows my instructions.

Predict (10 mins)

When I saw you last time, we played a game where we put teddy in bed. Today we're going to play that game again but in a different way. Today we are going to use your teacher's computer to do the same thing. What pieces of fruit will Teddy eat before it goes to bed? Is there another way? Can we find one more way?



Introduction to Coding in Reception Class



The Prediction Phase

What pieces of fruit will



before it can get to



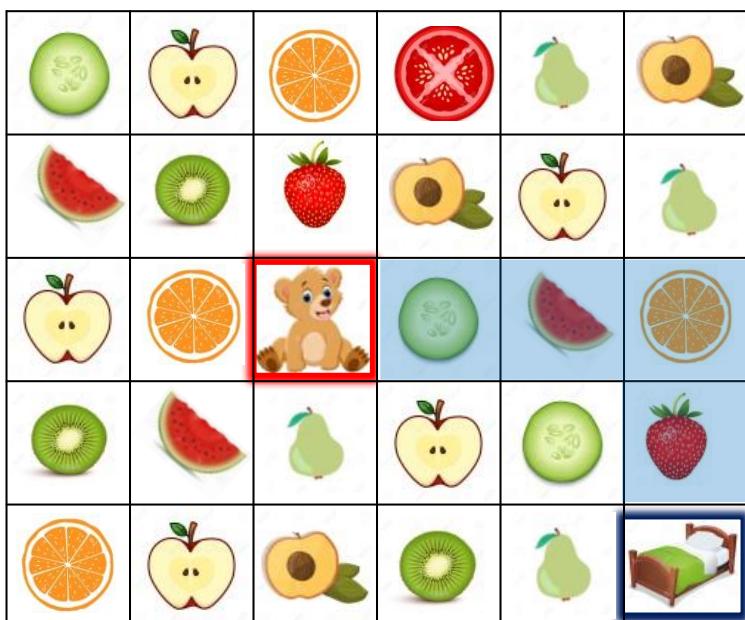
Can only move in these ways



The Prediction Phase

[Presentation and speaker notes continue on the next page]

Introduction to Coding in Reception Class



The Run Phase

What pieces of fruit will



before it can get to



Can only move in these ways

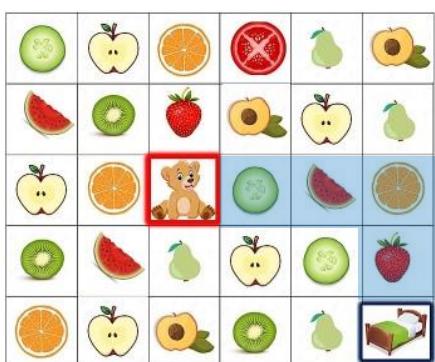


The Run Phase

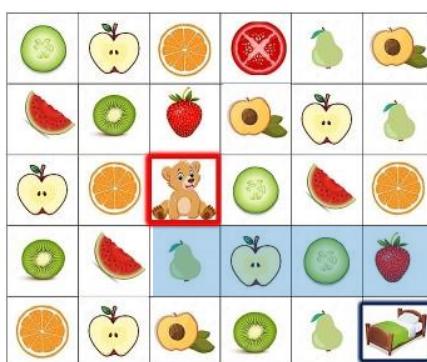
Introduction to Coding in Reception Class

The Investigation Phase

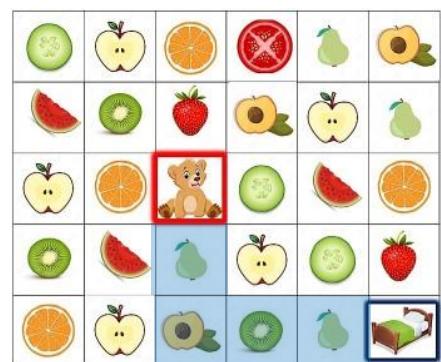
Which one is better? Why?



Route A



Route B



Route C

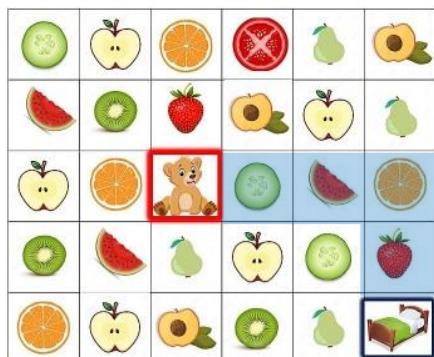
The Investigation Phase which for this lesson has actually been broken up into two parts.

[Presentation and speaker notes continue on the next page]

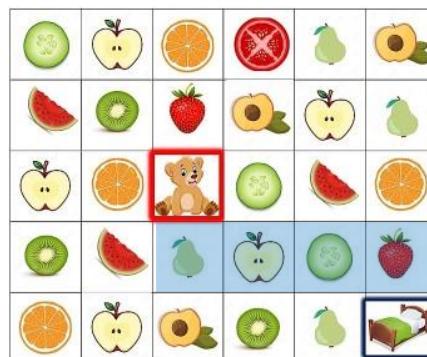
Introduction to Coding in Reception Class

The Investigation Phase

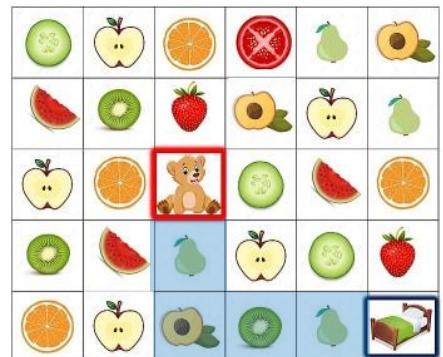
Which route does the code match?



Route A



Route B



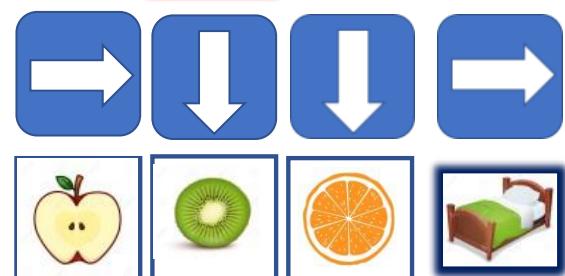
Route C

Introduction to Coding in Reception Class

The Modify Phase

Where is hiding if it does this

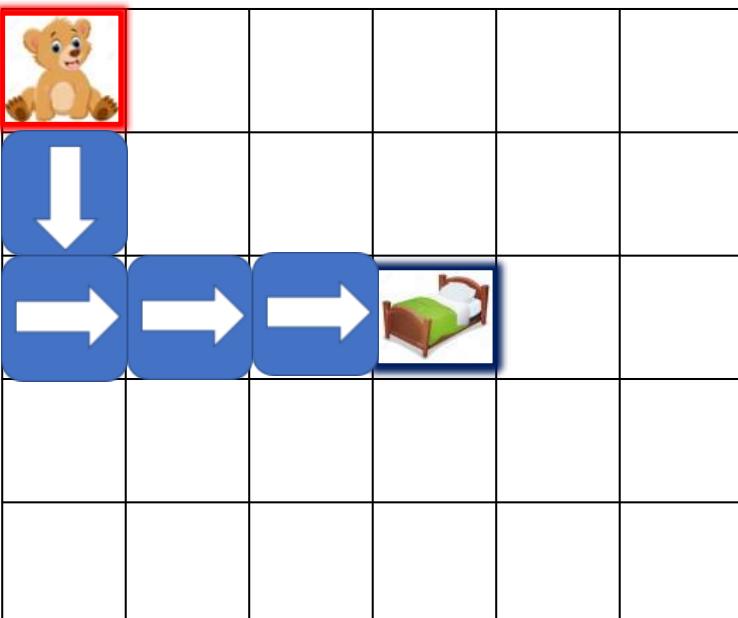
A					C
B					D



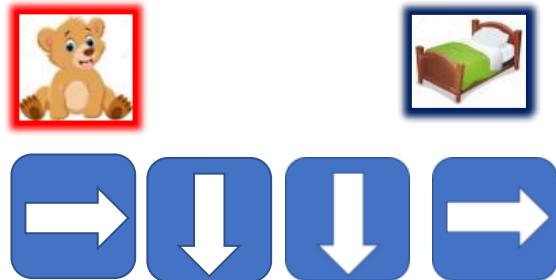
The Modify Phase where the original coding challenge is presented in a slightly different way but still following the same principles.

[Presentation and speaker notes continue on the next page]

Introduction to Coding in Reception Class



The Make Phase



Leading into the next session...



The Make Phase where the learners are expected to apply what they have been shown.

Before I finish, in terms of the nuts and bolts of actually teaching Computing, I wanted to share some of the resources that I would rate and recommend. Most of these are currently available to access for free although you might need to jump through a few administrative hoops to get there. Some will have a fee. I've chosen to buy into them because I think they're good value. I kind of see it a bit like buying a textbook. If you like it and have enjoyed using it, then why not. And just to be absolutely clear, apart from Team Kano and Vex Robotics, I have not received anything from these organisations I'm about to mention.

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KANO
anyone can make

vEX.go

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Staying Safe Online

The slide displays a central collage of resources for staying safe online. On the left, there are two main documents from the Department for Education: 'Keeping children safe in education (2020)' and 'Relationships Education, Relationships and Sex Education (RSE) and Health Education'. Below these is the UKCCIS logo. To the right of the documents is a screenshot of the CyberSmart website, featuring a girl looking at a smartphone with the hashtag #BECYBERSMART. Above the CyberSmart site are logos for various organizations: insafe, Parent Zone, Internet Watch Foundation, National Online Safety, NSPCC, UK Safer Internet Centre, and SWGfL.

Focusing on Staying Safe Online, you will or should be familiar with the “Keeping Children Safe in Education” Statutory Guidance. When you join your schools, the first INSET of the school year will or should always include a review of this document as it underpins all of our safeguarding obligations and responsibilities as teachers. Since 2019 there have been two other pieces of statutory guidance which specifically impact on Computing. The main one is “Teaching online Safety in School”. The other is the guidance on “Relationships and Sex Education” which really is a subject in itself but again has some overlap with the Staying Safe Online parts of the Primary Computing Curriculum. The good news is that there is a plethora of organisations who exist to support the teaching of Staying Safe Online. Two of the leading initiatives currently are the GoogleUK backed #BeInternetLegends and the BT backed with support from the National Crime Agency #BeCyberSafe from Barefoot Computing. All of the insignias I’ve included on this slide have also done incredible work to support Schools, families and children to ensure that they are Staying Safe Online.

Similarly, so many organisations have devised resources to support teaching Coding. Gone are the days from my youth when what was initially expected was copy-typing in lines of alpha-numeric characters to make a white square blink a trail across on a dark background. The generic term for the type of computer programming that is expected to be covered at Primary level is block coding. The ones I’m listing here [Slide on the next page] are all currently free to access. The ones that charge will link to peripherals of rover like vehicles. Many of them will have quiz type challenges or project ideas for learners to follow. For those who think that their learners particularly in Years 5 and 6 might be able to progress onto text based coding, some of the block coding platforms offer a very transparent switching service to reveal the text based equivalent from the blocks. What I have done here is applied a “RAG” or Red-Amber-Green rating to these apps or websites. I’m obviously not going to waste anybody’s time talking about the reds. The amber rated ones are those which I’ve had experience of using in the classroom and either for technical reasons or cost grounds have not been able to rate them more highly. The middle column are all apps that I currently use in my teaching practice. Scratch I’ve shown as Amber-Green as I have a virtual Code Club with over 500 children

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set up with individual accounts. However, the web site is one I would like to see significantly improved as it really is more suited to classroom use rather than independently learning how to code.

Apps and websites for learning programming or coding

 Root Coding	 Tynker <small>common sense selection LEARNING</small>	 Light-bot <small>common sense selection LEARNING</small>
 Kodeable	 Microsoft Make Code <small>common sense selection LEARNING</small>	 Scratch Jr <small>common sense selection LEARNING</small>
 code.org	 Google CS First <small>common sense selection LEARNING</small>	 Scratch <small>common sense selection LEARNING</small>
 Spritebox	 microbit.org	 Sam Labs
 Code for Life	 Unity	 Wonder Dash
 Sphero Edu	 codecademy	 Lego WeDo

source: Common Sense Education <https://www.commonsense.org/education/top-picks/best-apps-and-websites-for-learning-programming-and-coding> (last visited 16 April 2021)

Student Question...

To what extent should you be teaching children to use software in computing and what types of software should you be teaching?

Rebecca H

Google Workspace for Education



Office 365 Education

Enhancing collaboration and productivity



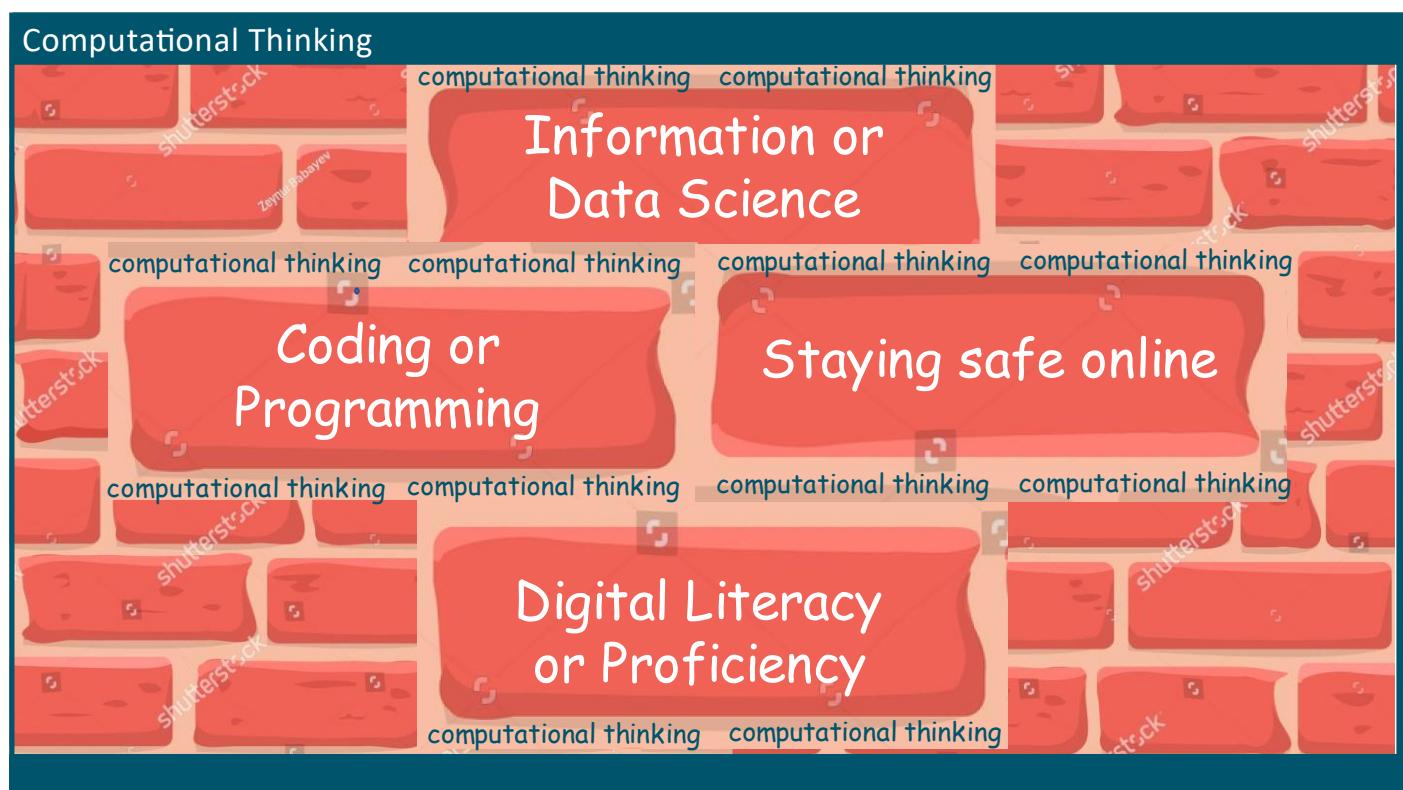
Rebecca's question is a brilliant one to lead me onto talking about the digital literacy aspects. Depending on the schools you work in, they may have chosen to either use Google for Education or Microsoft 365. I'm really pleased that my school have decided to go with both with the wonderful support from the partnership with the company that has provided the school with hardware and software technical support since 2016.

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Given every school's reliance on computing from the teacher's device in the classroom to the systems supporting the running of the school let alone the devices used for teaching and learning, I would strongly recommend that if you do find yourselves in a position where you are either offered or appointed the subject lead role for Computing and there isn't a technical support capacity in place already, speak to your bosses about either having an on-site Computing technician or a contract with a company that can provide the school with the level of technical support that every school needs to keep its hardware and computer systems running efficiently and effectively.

Before we close with looking at the others really thought provoking questions I received, using the metaphor of a learning wall, if Primary Computing were to be organised into these four teaching blocks of Information or Data Science which essentially is a cross over with Maths, Coding, Staying Safe online and Digital Literacy, then computational thinking would form the mortar which joins all of the main blocks together.



Student Question...

What is the best way of introducing a new piece of software/integrated development environment (including Scratch)?
Rebecca H

What are your thoughts on just letting the children experiment for the first lesson?
Rebecca H

Google Workspace for Education



Office 365 Education
Enhancing collaboration and productivity



So to the rest of the questions that came in. Thank you to Rebecca for sending in these great questions. What is the best way of introducing a new piece of software / integrated development environment (including Scratch)? I would say slowly over a sequence of lessons and introduce the software with a couple of functions at a time.

What are your thoughts on just letting the children experiment for the first lesson? Yes, definitely especially with the older year groups. There does need to be some structure with showing “what a good one looks like” but beyond that, there is no reason why as I’ve suggested, the most able learners as young as Reception could be pioneers, working independently. That’s the great feature of learning computing – that it is mostly if not completely experiential.

Student Question...

What have been the most successful approaches to teaching computing you have seen?

Rebecca H



What were the biggest flops?

Rebecca H



By far the best teaching is when lessons are so highly structured, well planned and resourced that as a teacher you are proud to be invited to show and share how great the learning is to policy makers. Here were a group children I was tasked to work with in 2017 when we were invited to meet with Vicky Ford MP at the Houses of Parliament. At the time, the current Under Secretary of State at the Department for Education was on the Parliamentary Select Committee for Science and Technology. At her address to the group, she spoke of how impressed she was and unable to distinguish between those children in the group who had special learning needs to the others as everybody was working collaboratively and able to demonstrate what they had been learning to an exceptionally high standard. As for the epic fails, it will not surprise anybody that it is when the technology does not work and there is no off-line back up plan. I experienced this first hand when my very first lesson as subject lead for Computing I thought I would take laptops into the classroom. What I didn't realise was that the laptops hadn't been charged. I hadn't checked which were working adequately. The wifi was intermittent. It took a third of the session to get everybody onto a logged in device at which point the devices began to fall and fail like dominos. By agreeing a priority programme of repairs and servicing for a class set of devices and wiring them for permanent use in a dedicated suite prevents such experiences ever recurring. When technology fails, it is infuriatingly frustrating and highlights the importance of having a great working relationship with a excellent technical support partner as well as senior colleagues in being able to have a strategic plan in place to avoid such “must never happen” incidents.

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Student Question...

Do you have any advice for setting up a computing club?

Rebecca H

The screenshot shows a web browser window with the URL <https://codeclub.org.uk/start-a-code-club>. The page has a green header with the 'code club' logo. Below the header, there's a message about the impact of the coronavirus pandemic on clubs. A large green banner in the center says 'Start a Code Club at your school' with the subtext 'Any teacher can set up and run a Code Club, whether they are familiar with coding or completely new to it.' At the bottom of the page, there's a link 'Setting up a club'.



Advice on setting up a computing club. Definitely sign to Code Club as it has great resources and is very well structured to support an after school or off-timetable programme. Plan the sessions as though they were in-timetable sessions. There's nothing worse I've found in the five years I've been supporting Code Club at my school than just allowing participants to do as they please when actually it is just as valuable teaching and learning time although it's not to be too formal about it. Would also say give the Club a big target to aim for too. For example, I run my club meetings so that the participants meet the criteria to be awarded the British Science Association CREST Awards or Arts Council England Arts Award. The QR code has a link to a blog I wrote for Code Club in September 2020.

Student Question...

What should children know / what skills should they have to prepare them for secondary school?

Rebecca H

Primary Computing > End of year Age Related Expectations > Year 6

e-Safety	Coding	Information Science	Digital Literacy	Computational Thinking
I can protect my password and other personal information.	I can deconstruct a problem into smaller steps, recognising similarities to solutions used before. TT6.11	I can plan the process needed to investigate the World around me.	I can talk about audience, atmosphere and structure when planning a particular outcome.	I can tell you the Internet services I need to use for different purposes.
I can explain the consequences of sharing too much about myself online.	I can explain and program each of the steps in my algorithm.	I can select the most effective tool to collect data for my investigation.	I can confidently identify the potential of unfamiliar technology to increase my creativity.	I can describe how information is transported on the Internet. TT6.1
I support my friends to protect themselves and make good choices online, including reporting concerns to an adult, inside or outside school. TT6.7	I can evaluate the effectiveness and efficiency of my algorithm while I continually test the programming of that algorithm. TT6.10	I can check the data I collect for accuracy and plausibility.	I can combine a range of media, recognising the contribution of each to achieve a particular outcome.	I can select an appropriate tool to communicate and collaborate online. TT6.2
I can explain the consequences of spending too much time online or on a game.	I can recognise when I need to use a variable to achieve a required output. TT6.12	I can interpret the data I collect.	I can tell you why I select a particular digital tool for a specific purpose. TT6.3	I can talk about the way search results are selected and ranked. TT6.9
I can explain the consequences to myself and others of not communicating kindly and respectfully.	I can use a variable and operators to stop a program. TT6.13	I can present the data I collect in an appropriate way.	I can be digitally discerning when evaluating the effectiveness of my own work and the work of others.	I can check the reliability of a website. TT6.8
I protect my computer or device from harm on the Internet. TT6.6	I can use different inputs (including sensors) to control a device or onscreen action and predict what will happen. TT6.14	I use the skills I have developed to interrogate a database.		I can tell you about copyright and acknowledge the sources of information that I find online.
	I can use logical reasoning to detect and correct errors in algorithms and programs.	TT6.5 I can use software to help me analyse and present data and information.		TT6.4 I can create an 'app', website or digital resource for a specified audience.



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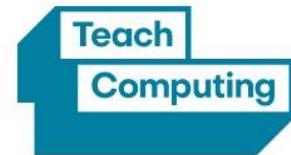
In terms of transition or getting ready for Secondary School, my ideal would be that by the end of Year 6, the CREST and Arts Awards certification are an externally validated recognition of these skills along with children starting their journeys on the iDEA programme which is the Inspiring Digital Enterprise Award – the digital equivalent of the Duke of Edinburgh's Award scheme. I would also want or expect children by the end of Year 6 to be keyboard proficient with a speed of between 10 and 20 words per minute and accuracy of above 60 percent. I base these ideas on the notion that this would perfectly prepare them to seriously consider electing Computing at GCSE based on my experiences this year of teaching A-Level Computer Science.

Student Question...

what apps/software is recommended for teaching? if a school say they want a teacher with good knowledge of technology, what would this entail?

Rhi H

- **01 | What is computing?** - You will understand the aims of the key stage 1 computing National Curriculum. You'll consider the range of modern computing devices and the terminology that applies to the subject. You'll also explore some effective teaching approaches.
- **02 | Progression planning** - Consider a range of approaches to sequencing computing lessons to support progression.
- **03 | Programming and algorithms** - You'll be introduced to computational thinking, and key underpinning ideas including logic, pattern recognition, and problem solving with algorithms. You'll develop knowledge of unplugged computing teaching away from a computer, and using programmable toys that make programming fun.
- **04 | Understanding data** - In this unit you'll consider data; how it can be collected and processed, and its meaning communicated through pictograms and charts. You'll also put learning of into context in a range of computing applications and careers.
- **05 | Handling and structuring data** - You'll consider the steps in collecting and handling data that children take in projects. You'll also learn about structured data using a simple branching database.
- **01 | How computers work** - Develop your knowledge of the breadth and depth of computing in upper primary. Recognise computing devices, the hardware from which they are made and how software processes data to make computers useful.
- **02 | Understanding and using networks** - Improve your knowledge of curriculum content and what children should know about computer networks, the internet and safely navigating the associated risks. Learn about how data is transmitted between computers and how web services work, such as search engines and the World Wide Web.
- **03 | How search works** - Find out how search engines help us find information on the web, and consider how this can be taught in your school.
- **04 | Using technology safely and responsibly** - Help children to improve their awareness of privacy and online safety, and ensure they know how to handle content and the conduct of other people they encounter online.
- **05 | Online safety and the computing curriculum** - Consider how computing, as part of a whole school coordinated approach, can help children to be safe and confident users of the web.
- **06 | Digital and media literacy** - Support children to be more discerning in their consumption and creation of digital content.
- **01 | Understanding and using multimedia** - Confidently develop appropriate skills using digital devices and applications, enabling children to create and develop a range of digital content and multimedia.
- **02 | Skills and progression** - Evaluate a selection of creative tools for use with young people. Match key computing skills to different groups of children to ensure challenge and progress.
- **03 | Using data** - Understand the relation between data and information, and how data collection can be planned and implemented.
- **04 | Data skills** - Become confident in presenting data and information, making use of database and spreadsheet software and online services to create a combined project.



For those who are either interested in taking on or been invited to the role of Computing Lead, the National Centre for Computing Education as well as the Computing at Schools Network have a wealth of resources as well as training or CPD support. For those already working in Schools, that training has been (2020 and 2021) funded through bursaries and your Schools may also qualify for funds to cover your absences to attend. For those who might not have that aspiration, the training offered is I think still invaluable to ensure all teachers have a secure subject knowledge.

[Presentation and speaker notes continue on the next page]

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Finally to say, From my time working in schools I know first-hand that there will be experiences which may frustrate you. However, I know too that these will be outweighed by the pure joy and exhilaration as you take the learners you are tasked to work with on a life-long journey of light bulb moments where they become encouraged and inspired by everything you teach them. I for one am really excited that you are my future colleagues with some becoming sufficiently senior and potentially becoming my direct or indirect boss. You never know. Hopefully we will continue to remain in contact through social media or get to meet each other again through the various professional networks that exist in the real World. I wish you all the very best for the rest of your professional journeys that you have embarked on. Thank you for reading.

...continue the conversation...



@WillowBrookGST



@TsuiAllen



Centre image thanks to @jonwitts and @QueenMargarets

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All Internet references last accessed: 29 April 2021

Micro:bit Educational Foundation

<https://microbit.org/>

National Curriculum in England: computing programmes of study

<https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study/national-curriculum-in-england-computing-programmes-of-study>

Computing at Schools Network

<https://www.computingatschool.org.uk/>

National Association of Advisers for Computing in Education

<https://www.naace.co.uk/>

Royal Society Schools Network

<https://royalsociety.org/topics-policy/education-skills/teacher-resources-and-opportunities/schools-network/>

UK Council for Internet Safety

<https://www.gov.uk/government/organisations/uk-council-for-internet-safety>

National Centre for Computing Education

<https://teachcomputing.org/>

BCS: The Chartered Institute for IT

<https://www.bcs.org/>

National STEM Learning Centre

<https://www.stem.org.uk/>

Raspberry Pi Foundation

<https://www.raspberrypi.org/>

Gender Action

<https://www.genderaction.co.uk/>

Schemes of Work suggestions

Kapow Primary (available for individuals to purchase subscriptions)

<https://www.kapowprimary.com/>

iLearn2 (available for individuals to purchase subscriptions)

<https://www.ilearn2.co.uk/>

Twinkl (not Computing specific. Resources are useful)

<https://www.twinkl.co.uk/>

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PurpleMash (subscription only available through Schools)

<https://www.purplemash.com/login/>

Switched On Computing by Miles Berry (Twitter: @mberry)

<https://www.risingstars-uk.com/series/switched-on-computing>

London Grid for Learning Computing Resource Centre

<https://www.lgfl.net/learning-resources/computing-resource-centre/default.aspx>

Just2Easy

<https://www.j2e.com/>

Kano

<https://kano.me/uk>

Vex Go

<https://www.vexrobotics.com/go>

Barefoot Computing

<https://www.barefootcomputing.org/primary-computing-resources>

Staying Safe Online recommendations

Better Internet for Kids

<https://www.betterinternetforkids.eu>

Childnet International

<https://www.childnet.com/>

Internet Matters

<https://www.internetmatters.org/>

Internet Watch Foundation

<https://www.iwf.org.uk/>

National Online Safety

<https://nationalonlinesafety.com/>

Parent LGfL Online Safety

<https://www.lgfl.net/onlinestaying safe online/resource-centre?s=16>

Parent Zone

<https://parentzone.org.uk/>

South West Grid for Learning

<https://swgfl.org.uk/>

Think U Know

<https://www.thinkuknow.co.uk/>

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UK Safer Internet Centre

<https://www.saferinternet.org.uk/>

SafeToNet

<https://safetonet.com/en-gb/>

#BeInternetLegends with GoogleUK

<https://safetonet.com/en-gb/>

#Becybersmart: A collaboraton established in 2021 between BT, Barefoot Computing, Computing at Schools Network with the National Crime Agency

<https://safetonet.com/en-gb/>

NSPCC Keeping Children Safe online safety

<https://www.nspcc.org.uk/keeping-children-safe/online-safety/>

Coding or Programming apps and website suggestions taken from this short-list

<https://www.commonsense.org/education/top-picks/best-apps-and-websites-for-learning-programming-and-coding>

Root Coding

<https://edu.irobot.com/>

Kodeable

<https://www.kodable.com/>

code.org

<https://code.org/>

Spritebox

<https://spritebox.com/>

Code for Life

<https://www.codeforlife.education/>

Sphero Edu

<https://sphero.com/>

Tynker

<https://www.tynker.com/>

Microsoft Make Code which includes **micro:bit** and **Minecraft Education**

<https://www.microsoft.com/en-us/makecode>

Google CS First

<https://csfirst.withgoogle.com/s/en/home>

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Unity (for those who are working at an advanced level and ready to be coding to a commercial standard with a good gaming storyline idea)

<https://learn.unity.com/>

Codecademy (for those who are ready to move from block coding to text based programming)

<https://www.codecademy.com/>

Lightbot

<https://lightbot.com/>

Scratch Jr (free but only available as an app from Google Playstore or Apple Apps Store)

<https://www.scratchjr.org/>

Scratch

<https://scratch.mit.edu/>

Sam Labs

<https://samlabs.com/uk/>

Wonder Dash

<https://uk.makewonder.com/dash>

Lego WeDo

<https://education.lego.com/en-gb/products/lego-education-wedo-2-0-core-set/45300#wedo-20-core-set>

The most expensive but one of the best products for teaching physical computing.

Code Club

<https://codeclub.org/en/>

Externally validated certification schemes with direct links to Primary Computing

British Science Association CREST Awards

<https://bsa.fluidreview.com/>

Arts Award

<https://www.artaward.org.uk/site/?id=64>

inspiring Digital Enterprise Awards

<https://idea.org.uk/>