# Primary Initial Teacher Education: Curriculum Plan

## STRAND: Postgraduate Programmes

***NB – this curriculum plan identifies when trainees will ‘meet’ content for the first time – the intention is that at each phase, university and school-based colleagues will support trainees in recalling, refining, applying and discussing content from the previous phases.***

**Curriculum Intent:**

*Through our Initial Teacher Education Curriculum, it is our intention that trainees:*

* *receive sufficient grounding in subject knowledge to be able to teach KS1 and KS2 National Curriculum Computing three strands of Computer Science, Information Technology, Digital Literacy*
* *develop an understanding of why Computing is in the National Curriculum and why it is important to provide this opportunity for children to learn about Computing*
* *apply their subject knowledge to planning, teaching, learning and assessment for classroom practice for training and beyond to ensure appropriate progression.*
* *develop knowledge and understanding of pedagogical approaches for teaching Computing at KS1 and KS2 and adopt a critical approach towards these.*

| **Phase** | **Learn that…** | **Learn how to…** |
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| **Phase 1**  **(University-led)** | **Trainees will know:** | **Trainees will be able to:** |
| * The importance of Computing in society and the opportunities this affords children; their role as teachers, to open these opportunities for all children. | * Read code and predict what it will do using logical reasoning. **(LH4.2, LH4.4, LH4.5, LH4.12, LH4.14)** |
| * The fundamentals of what a computer is, how it works, how it stores, processes and sends information. | * Modify and debug programs **(LH4.2, LH4.4, LH4.5, LH4.12, LH4.14)** |
| * How computational thinking underpins computer science: problem solving, design and implementation of computer systems (virtual and physical devices). | * Use unplugged approaches to teaching computational thinking. (**LH3.5, LH3.6, LH3.7**) |
| * Common input/ output devices. | * Evaluate a Computing lesson sequence which demonstrates progression for all learners. (**LH2.3, LH2.4, LH2.7, LH3.20, LH4.2, LH4.4, LH4.5, LH4.12, LH4.14**) |
| * That binary is used to store, process and send data in a computer system. | * Use software beyond typical office applications which can be used for creative computing, for example: animation, sound editing, digital art, data handling (branching databases, flat file databases, spreadsheets), collaborative tools (Google docs, OneDrive), and their use in the classroom. |
| * The programming concepts sequence, selection, repetition and variables. | * Modify a program independently |
| * Computational thinking includes decomposition, algorithms, pattern recognition, abstraction and logical thinking. |
| **Trainees will understand:** | **Composite knowledge/understanding/skills**  *By the end of this phase trainees will* ***know:***   * how to read code; * how to design and write a program; and * pedagogical strategies for teaching computer science to KS1 and KS2 children * Efficiency and effectiveness are key drivers in Computing (e.g. making programs more efficient, using the correct software / hardware for the task at hand) and hardware and software should be critically evaluated for their usefulness and appropriateness to the task.   *By the end of this phase trainees will* ***understand:***   * Computing is a separate discipline which is still relatively new and developing, although the underlying principles remain the same. * Computational thinking underpins computer science and problem solving within computing (and beyond). * Testing, debugging and collaboration are fundamental aspects of computing. Computing teaches children they cannot always get learning right the first time, so they need resilience, perseverance, creativity and a willingness to collaborate with others. (**LH1.3**) * Cross-curricular contexts are important for teaching the IT strand, yet computing objectives must be planned and met   *By the end of this phase trainees will* ***be able to:***   * plan appropriately to teach Computing * reflect on their subject knowledge development and plan appropriate targets for their future developmental needs.   Formative assessment: Trainees will:   * Modify a programming project (tutor observation); * Complete a subject knowledge audit which reflects their current understanding and sets targets for development. |
| * Programming, and related activities, require resilience, perseverance, risk-taking, innovative-thinking, collaboration and recognition that we will probably not get it right the first time; debugging and testing are essential parts of the process. (**LT4.5, LT7.4**) |
| * Cross-curriculum teaching with technology (TEL) does not meet the National Curriculum for Computing, unless there are specific learning objectives for Computing curriculum included; teachers should exploit cross-curriculum opportunities by planning learning for both subjects. (**LT3.4)** |
| * Computing is integrated into society and there are significant opportunities for those who can work in this field. Computing requires a more diverse workforce. |
| * An understanding of the fundamentals of computing is required to take part, as an informed citizen, in ethical and moral debates about technological issues (e.g. artificial intelligence, driverless vehicles, algorithms used to make decisions on our lives, data collected, held and processed by organisations). |
| * Computational thinking is a way of thinking, specific to computing, to make it easier to solve problems, think through solutions and create systems. |
| * Computational thinking can be taught explicitly through a range of pedagogical approaches and should become embedded in practice as children design and program their own systems. |
| * The input, process, storage and output model. * Recognise the model (opposite), the functions of a computer and be able to explain each element. |
| * There are different pedagogical approaches for teaching computer science |
| * Information Technology should be selected on the basis of the task which is to be performed and different tools (hardware/ software) are suitable for different tasks. Information Technology use (including Internet searching) should be appropriate and efficient. |
| **Phase 2**  **(School-led – Professional Practice 1)**  *\*Trainees will observe, discuss, apply and secure the knowledge, understanding and skills developed at Phase 1 and will add the following…* | **Trainees will know:** | **Trainees will be able to:** |
| * how Computing couldbe covered in a school's curriculum plan | * using the school’s Computing curriculum plan, identify key substantive and disciplinary knowledge with a view to understanding the sequencing of learning |
| * that learning experiences should build upon prior learning by using components which lead to composite knowledge | * identify opportunities for Computing learning from school’s long- and medium-term plans |
| **Trainees will understand:** | **Composite knowledge/understanding/skills**  *By the end of this phase trainees will* ***know:***   * that children’s prior knowledge must be understood before planning and delivering a learning experience   *By the end of this phase trainees will* ***understand:***   * that pupils’ component and composite knowledge must be carefully sequenced when planning a learning experience   *By the end of this phase trainees will be* ***able to:***   * plan, teach and reflect upon a high-quality Computing learning experience if appropriate within the school's planned curriculum **OR** articulate where Computing fits within the school's curriculum   Formative assessment through Weekly Development Summary and discussion with mentor. |
| * how to use school’s medium-term plans to identify opportunities for a high-quality learning experience that builds upon pupils’ prior knowledge |
| * that component and composite knowledge should be well-sequenced across a school’s curriculum plan |
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| **Phase 3**  **(University-led)**  *\*Trainees will review the knowledge, understanding and skills developed at Phases 1 and 2, and will add the following…* | **Trainees will know:** | **Trainees will be able to:** |
| * The programming concepts sequence, selection, repetition and variables and how they apply in different programming contexts. | * Use simulations to explore the use of sensors, input and output within programming environments, including physical computing. |
| * Awareness that physical devices such as robots or microprocessors can be programmed including the use of sensors, motors, LEDs, buzzers, etc (e.g. Ozobots, Codebug, Microbit, Crumble). | * Design and implement a program independently, using a physical computing device. |
| **Trainees will understand:** | **Composite knowledge/understanding/skills**  *By the end of this phase trainees will* ***know:***   * how to design and write a program using a physical computing device   *By the end of this phase trainees will* ***understand:***   * *computers can be programmed to use inputs to determine a course of action (condition & decision) and output*   *By the end of this phase trainees will be* ***able to:***   * *plan for appropriate progression through the computer science strand of the curriculum*   Formative assessment in class through observations of tutors.  Trainees will update their subject knowledge audit. |
| * Programming, and related activities, require resilience, perseverance, risk-taking, innovative-thinking, collaboration and recognition that we will probably not get it right the first time; debugging and testing are essential parts of the process; in physical computing both the program and the physical set-up needs to be tested and debugged. (**LT4.5, LT7.4**) |
| * There are different pedagogical approaches for teaching computer science and using physical computing resources allow abstract concepts to become concrete. |
| * The programming concepts apply across different programming languages and in both on-screen and physical programming contexts. |
| * It is helpful to practice programming across a range of contexts to embed and deepen knowledge of programming concepts**.(LT2.7**) |
| **Phase 4**  **(School-led – Professional Practice 2)**  *\*Trainees will observe, discuss, apply and secure the knowledge, understanding and skills developed at Phases 1, 2 and 3, and will add the following…* | **Trainees will know:** | **Trainees will be able to:** |
| * through conversations with mentors, how to use school’s medium-term plans to support the planning of a sequence of lessons as well as to gain an understanding of what pupil’s prior learning is | * identify component and composite knowledge using school’s medium-term plans |
| * through conversations with mentors, that ongoing formative assessment of pupils understanding is necessary to understand their learning needs | * identify key substantive and disciplinary knowledge using school’s medium-term plans |
| * through conversations with mentors, that schools use varied approaches to assessing children in Computing and that pupils’ progression can be assessed using the guidance in the Teacher’s Guide from NCCE (<https://teachcomputing.org/curriculum/key-stage-1>), the Computing at School’s progression pathways document (<https://community.computingatschool.org.uk/resources/1692/single)>, code-it progression grid (<http://code-it.co.uk/assessment-progression/>) or other appropriate resources. There are no nationally recognised progression frameworks for Computing in England. | * use school’s medium-term plans in order to devise a sequence of Computing lessons **OR** use the school’s medium-term plans to identify the sequence of learning used and how this builds upon prior learning |
| **Trainees will understand:** | **Composite knowledge/understanding/skills**  *By the end of this phase trainees will* ***know:***   * that ongoing formative assessment of pupil’s learning is key to the delivery of a well-sequenced series of lessons   *By the end of this phase trainees will* ***understand:***   * that planning for progression in substantive and disciplinary knowledge across a series of lessons is key to children’s learning   *By the end of this phase trainees will be* ***able to:***   * plan, teach and reflect upon a sequence of Computing lessons if appropriate within the school's planned curriculum **OR** articulate where Computing fits in the school's curriculum and compare with other schools' curricula   Formative assessment through Weekly Development Summary and discussion with mentor. |
| * that medium-term planning is key to identify progression in component and composite knowledge. |
| * that planning for progression in both substantive and disciplinary knowledge is key for pupils’ Computing learning |
| * that medium-term plans can and should be adapted based upon the needs of the children and formative assessment undertaken during lessons |
| **Phase 5**  **(University-led)**  *\*Trainees will review the knowledge, understanding and skills developed at Phases 1, 2, 3 and 4, and will add the following…* | **Trainees will know:** | **Trainees will be able to:** |
| * How information is sent across networks | * Evaluate unplugged approaches to teaching networks to children |
| * Data is split into packets to allow it to be sent across a network. | * Identify key online safety messages for children at different stages of development and children’s own roles in staying safe online and being responsible for their own activities. |
| * Networks use a range of devices, including routers, modems, switches, cabling, wifi, servers. |
| * The Internet is the largest network and is the hardware/ infrastructure which allows us to access the World Wide Web. |
| * Cloud computing refers to large data warehouses which allow us to access and send data, wherever we are, via multiple devices. |
| * The World Wide Web are services which run on the Internet (software), such as email, websites, social networking sites. | **Composite knowledge/understanding/skills**  *By the end of this phase trainees will* ***know:***   * *Appropriate elements of the hard and soft infrastructure which allows data to be sent across the Internet* * *The risks and responsibilities for children when they engage in online activity and how schools can manage this.*   *By the end of this phase trainees will* ***understand:***   * *That data is sent across networks using both physical infrastructure and software* * *That schools have a role in preparing children to be responsible digital citizens.*   *By the end of this phase trainees will be* ***able to:***   * Use unplugged activities to teach children about networks * Access and evaluate resources for teaching children about e-safety   Formative assessment in class through observations of tutors.  Trainees will update their subject knowledge audit. They will upload it to the EPP as part of their evidence base for S3 which may be reviewed as part of their final tutorial/ viva. |
| * Search engines use algorithms which influence the results of our searches and the order in which results are displayed |
| * Searches can be made more efficient by using specific terms, alternative terms, Boolean operators, wild card characters, quotation marks, etc. |
| * Children can use child friendly search engines. |
| * **Trainees will understand:** |
| * That while the terms Internet and World Wide Web are often used interchangeably, that they refer to different aspects of connectivity to online services |
| * How children can stay safe and take age-appropriate responsibility for their online activities |

| Research, literature and resources supporting the curriculum design. | National Centre for Computing Education  Barefoot Computing  Code-IT  Hello World – Raspberry Pi Foundation  Royal Society: After the Reboot – Computing Education in UK Schools  Sentance, S., Waite, J. & Kallia, M., 2019. Teaching computer programming with PRIMM: a sociocultural perspective. *Computer Science Education*, 29(2-3), 136-176.  Waite, J. 2017 Pedagogy in teaching Computer Science in schools: A Literature Review. Royal Society  Grover, S, 2020. Computer science in K-12: An A-Z handbook on teaching programming. Edfinity: USA  Sentance, S., Barendsen, E. & Schulte, C., 2018. Computer science education: perspectives on teaching and learning in school. Bloomsbury: London  Simmons, C. & Hawkins, C., 2015. Teaching Computing. Sage: London |
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