# **Primary Initial Teacher Education: Curriculum Plan**

# **Subject Computing Undergraduate Programmes**

# **Links to Practical knowledge, Substantive/theory, Disciplinary**

**Curriculum Vision:**

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 and to form the basis for additional subject knowledge development and enhancement (LH3.1).
* 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, and that children are able to achieve well in 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 1** |
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| **University Based Learning** | **School/Practical Based Learning** |
| **Learn That** | **Learn How** | **Learn That** | **Learn How** |
| **Component Knowledge** | Computing is important in society and provides a range of opportunities to children. Their role as teachers is to open these opportunities for all children. Computing is integrated into society and there are significant opportunities for those who can work in this field. Computing requires a more diverse workforce | Computational thinking can be taught through a range of pedagogical approaches, including unplugged pedagogies, and should become embedded in practice as children design and program their own systems (LH3.5, LH3.6, LH3.7) | *See the separate Primary Initial Teacher Education Foundation Subjects UG School Based Learning Curriculum for details.* | Intent |
| The fundamentals of what a computer is, how it works, how it stores, processes and sends information | Read code and predict what it will do using logical reasoning. (LH4.2, LH4.4, LH4.5, LH4.12, LH4.14) |
| 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 underpins computer science: problem solving, design and implementation of computer systems (virtual and physical devices). CT includes decomposition, algorithms, pattern recognition, abstraction and logical thinking | 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) |
| The programming concepts sequence, selection, repetition and variables. | Use software beyond typical office applications which can be used for creative computing, for example: animation, sound editing, collaborative tools (Google docs, OneDrive). |
| Common input/ output devices. | Lesson Planning takes into consideration children’s current knowledge, understanding and skills of the subject, as well as their emotional and cognitive development, and be adapted accordingly (LT1.3, LT2.2, LT5.1, LT6.6) |
| That binary is used to store, process and send data in a | to plan a lesson breaking down the national curriculum end point to component knowledge which is appropriate to the age phase of the children, using appropriate pedagogical strategies.  |
| 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) |  |
| 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. |  |
| Data packets travel across networks using physical infrastructure and associated knowledge at an appropriate level.  |  |
|  | E-safety education is part of safeguarding expectations and key resources for teaching are available from Project Evolve, ChildNet, ThinkUKnow, UKCCIS, etc. |  |  |
|  | Selecting appropriate pedagogical strategies can aid cognitive load, retrieval and long-term memory, including purposeful practice, spaced learning and scaffolding and fading (LT2.1, LT2.4, LT2.7, LT2.8) |  |  |
| **Assessment** | **Assessment** | **Assessment** |  |
| * Modify a programming project (tutor observation);
* Creating an IT project (tutor observation).
* Participate in group/ class discussions and Q&A
* Complete an end of phase computing test (online formative test)
 | Assessed throughout Professional Practice through lesson observations, weekly development summaries and weekly tasks. Feedback provided by mentor, class teacher, link tutor and other qualified staff. | Impact |
| **Composite Knowledge** | **Composite knowledge/understanding/skills** |
| *By the end of this phase trainees will* ***know:*** | *By the end of this phase trainees will* ***understand:*** | *By the end of this phase trainees will* ***be able to:*** |
| * how to read code;
* how to design and write a program; and
* - pedagogical strategies for teaching computer science to KS1 and KS2 children to avoid overloading working memory.
 | * 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)
* how schools plan and teaching computing
 | * plan appropriately to teach computing
* identify and reflect on appropriate strategies for teaching computing effectively
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| **Research** | **KEY RESEARCH****That Trainees will know that informs teaching and learning in Computing** |
| Bagge, P., 2022. Code-IT [online]. Available from: <http://code-it.co.uk/> Computing at School, 2022. Barefoot Computing [online]. Available from: <https://www.barefootcomputing.org/> Department for Education, 2013. National Curriculum for Computing. London: HMSO. Available at: <https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study> National Centre for Computing Education, 2022. Teach Computing [online]. Available from: <https://teachcomputing.org/> Ofsted, 2022. Research review series: Computing. Ofsted Available at: <https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing> Raspberry Pi Foundation, 2022. Hello World [online]. Available from: <https://helloworld.raspberrypi.org/>  |

| **Phase 2** |
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| **University Based Learning** | **School/Practical Based Learning** |
| **Learn That** | **Learn How** | **Learn That** | **Learn How** |
| **Component Knowledge** | 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. | Plan and design an effective cross-curriculum project for teaching Computing which will enable all children to make progress across a sequence of lessons. ((LT1.3, LT2.2, LT2.6, LT4.4, LT4.6, LT4.7, LT4.8, LT4.9, LT4.10, LT5.1, LT6.6) | *See the separate Primary Initial Teacher Education Foundation Subjects UG School Based Learning Curriculum for details.* | Intent |
| 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. | 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. |
| Data Handling applications encompass flat file databases, spreadsheets, branching databases, online data systems, big data, pictographs and graphing applications | Use and evaluate software appropriate for data handling projects at KS1 and KS2 |
| Data handling enables storage, organisation, search, sort, filter and reporting capabilities of large-scale data | Routines and expectations for using physical computing devices (LH7.4, 7.5, 7.7, 7.9; LT1.1, LH1.6, 1.7. 1.8) |
| A range of pre-made resources and guidance are available from NCCE, Barefoot Computing, Computing at School. (LT8.2; LH8.3, 8.7)  |  |
| **Assessment** | **Assessment** | **Assessment** | Impact |
| * Apply programming concepts to physical computing (tutor observation)
* Creating an IT project (tutor observation).
* Plan a sequence of lessons (tutor observation)
* Participate in group/ class discussions and Q&A
* Complete an end of phase computing test (online formative test)
 | Assessed throughout Professional Practice through lesson observations, weekly development summaries and weekly tasks. Feedback provided by mentor, class teacher, link tutor and other qualified staff. |
| **Composite Knowledge** | **Composite knowledge/understanding/skills** |
| *By the end of this phase trainees will* ***know:*** | *By the end of this phase trainees will* ***understand:*** | *By the end of this phase trainees will* ***be able to:*** |
| * A database organises data logically allowing a computer or human to quickly store, sort, filter, search and report the data.
* That there are a range of tools to monitor progression in computing
 | * That contexts from other subjects provide opportunities for plan effectively in Computing
* progression through the school’s curriculum should be monitored
 | * Identify age-appropriate technologies for data handling and appropriate contexts for teaching data handling across KS1 and KS2.
* plan for progression across a sequence of lessons using appropriate contexts
 |
| **Research** | **KEY RESEARCH****That Trainees will know that informs teaching and learning in Computing** |
| Bagge, P., 2022. Code-IT [online]. Available from: <http://code-it.co.uk/> Computing at School, 2022. Barefoot Computing [online]. Available from: <https://www.barefootcomputing.org/> Department for Education, 2013. National Curriculum for Computing. London: HMSO. Available at: <https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study> Grover, S, 2020. Computer science in K-12: An A-Z handbook on teaching programming. Edfinity: USANational Centre for Computing Education, 2022. Teach Computing [online]. Available from: <https://teachcomputing.org/> Ofsted, 2022. Research review series: Computing. Ofsted Available at: <https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing> Raspberry Pi Foundation, 2022. Hello World [online]. Available from: <https://helloworld.raspberrypi.org/> Sentance, S., Barendsen, E. & Schulte, C., 2018. Computer science education: perspectives on teaching andlearning in school. Bloomsbury: London |

| **Phase 3** |
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| **University Based Learning** | **School/Practical Based Learning** |
| **Learn That** | **Learn How** | **Learn That** | **Learn How** |
| **Component Knowledge** | Online safety education should be tailored to meet the requirements of children at different stages of their development and technology use inside and outside ofschool. | There are different pedagogical approaches for teaching computer science and using physical computing resources allow abstract concepts to become concrete. | *See the separate Primary Initial Teacher Education Foundation Subjects UG School Based Learning Curriculum for details.* | Intent |
| Physical devices, such as robots or microprocessors can be programmed including the use of sensors (input), motors, LEDs, buzzers (outputs), etc (e.g. Ozobots, Codebug, Microbit, Crumble) | The programming concepts apply across different programming languages and in both on-screen and physical programming contexts. |
| The programming concepts sequence, selection, repetition and variables and how they apply in a range of different programming contexts. | It is helpful to practice programming across a range of contexts to embed and deepen knowledge of programming concepts.(LT2.7) |
| Long-term planning should build on prior knowledge and enable children to progress through the curriculum developing their component and composite knowledge, while going beyond the scope of the national curriculum. (LT2.2, 2.6, 2.8, 3.6; LH2.1, 2.4, 2.7 LT3.7, LH6.5) | Routines and expectations for using physical computing devices (LH7.4, 7.5, 7.7, 7.9; LT1.1, LH1.6, 1.7. 1.8) |
|  | NCCE resources should be evaluated and adapted to meet the needs of your class and provide a useful framework for progression through a sample curriculum (LT5.1, 5.3, 5.7 LH3.6, 5.1, 5.5, 5.9) |  |  |  |
| **Assessment** | **Assessment** | **Assessment** | Impact |
| * Apply programming concepts to physical computing (tutor observation)
* Evaluating e-safety resources (tutor observation).
* Contributing to a long-term plan (tutor observation)
* Participate in group/ class discussions and Q&A
* Complete an end of phase computing test (online formative test)
 | Assessed throughout Professional Practice through lesson observations, weekly development summaries and weekly tasks. Feedback provided by mentor, class teacher, link tutor and other qualified staff. |
| **Composite Knowledge** | **Composite knowledge/understanding/skills** |
| *By the end of this phase trainees will* ***know:*** | *By the end of this phase trainees will* ***understand:*** | *By the end of this phase trainees will* ***be able to:*** |
| * Age-related expectations for progression in computing
* A range of resources available for teaching e-safety appropriately to different age groups
 | * that planning for progression across a series of lessons is key to children’s learning
* how programming concepts can be used and consolidated through application to physical computing
 | * Assess children’s progress in computing against the school’s curriculum.
* Evaluate long term plans in computing for progression
 |
| **Research** | **KEY RESEARCH****That Trainees will know that informs teaching and learning in Computing** |
| Bagge, P., 2022. Code-IT [online]. Available from: <http://code-it.co.uk/> Computing at School, 2022. Barefoot Computing [online]. Available from: <https://www.barefootcomputing.org/> Department for Education, 2013. National Curriculum for Computing. London: HMSO. Available at: <https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study> Grover, S, 2020. Computer science in K-12: An A-Z handbook on teaching programming. Edfinity: USANational Centre for Computing Education, 2022. Teach Computing [online]. Available from: <https://teachcomputing.org/> Ofsted, 2022. Research review series: Computing. Ofsted Available at: <https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing> Raspberry Pi Foundation, 2022. Hello World [online]. Available from: <https://helloworld.raspberrypi.org/> Royal Society, 2017. After the Reboot – Computing Education in UK Schools. Royal Society.Sentance, S., Barendsen, E. & Schulte, C., 2018. Computer science education: perspectives on teaching andlearning in school. Bloomsbury: LondonWaite, J. 2017 Pedagogy in teaching Computer Science in schools: A Literature Review. Royal Society |