**Primary Curriculum Map (Science)**

***Postgraduate***

|  |
| --- |
| **University Curriculum – Year 1** |
| **Session Sequence** | **Session Content Subject Specific Component/s** | **Learn That****(CCF REFs)** | **Learn How****(CCF REFs)** | **Links to Research and Reading** | **Formative Assessment mode** |
| **Session 1****Seminar-** **The Nature of Primary Science** **2 hours**  | That the science national curriculum provides a programme of study for the knowledge (**physics, chemistry and biology**) and skills (**working scientifically**) which children learn aged 5-11 and that the spiral structure provides a minimum requirement and enables progression of substantive and disciplinary knowledge.Expertise in science is built through developing two forms of knowledge: * Substantive knowledge - Scientific knowledge and conceptual understanding
* Disciplinary knowledge - Working scientifically.

How children learn in science with links to working memory and neuroscienceHow the foundations of science are set in the Early Years Foundation stage and built on through the national curriculum. Modelling good practice in primary science through investigation. Introduction to formative and self-assessment in primary science  | 1.1; 1.22.3; 2.43.1; 3.2. 5.16.17.2 | 1.c2.f | DEPARTMENT of EDUCATION. 2013. The national curriculum in England: key stages 1 and 2 framework document. Available at:  <https://www.gov.uk/government/publications/national-curriculum-in-england-primary-curriculum>  OFSTED 2023. Finding the Optimum. Available from <https://www.gov.uk/government/publications/subject-report-series-science/finding-the-optimum-the-science-subject-report--2>OFSTED, 2021. Research Review Series: Science.GOV.UK [online]. Available from:<https://www.gov.uk/government/publications/research-review-series-science> OFSTED. 2013 Maintaining Curiosity a survey into science education in schools. Department for Education.Peacock, Sharp, Johnsey, Write and Sewell., 2021. Primary Science Knowledge & Understanding. London: Sage Publications Ltd.Rosenshine, B. (2012) Principles of Instruction: Research-based strategies that all teachers should know. American Educator, 12–20.https://doi.org/10.1111/j.1467-8535.2005.00507.Sharp, Peacock, Johnsey, Simon, Smith, Cross and Harris., 2021. Primary Science Theory & Practice. London: Sage Publications Ltd. ASE materials. Available**:** <https://www.ase.org.uk/ase-resource-hub>Plan Resources. Available:<https://www.planassessment.com/>TAPs Resources: Available:<https://pstt.org.uk/unique-resources/taps/> | Biology Subject Knowledge AuditChemistry Subject Knowledge AuditPhysics Subject Knowledge AuditWithin taught university sessions through activities and interactionsKey component progress tracker |
| **Session 2****Lecture -Children’s ideas; challenging misconceptions and conceptual development** **1 hour** | To learn that it is important to identify children’s existing ideas of science concepts in order to develop understanding.To learn how to elicit children’s ideas in order to identify and challenge misconceptions and promote conceptual change through planning and teaching.How research shapes practice in primary science | 2.2; 2.63.4; 3.74.26.4 | 3g6e; 6g |
| **Session 3****Seminar - LOtC****2 hours** | Understand the impact of learning outside the classroom on learners and the key research relating to this.Learning outside the classroom (LOtC) is an important and beneficial part of science education. It can impact on children’s academic attainment but also have impacts on their social skills, wellbeing and mental health. Learn how to use the outdoor environment flexibly to support learning in science.Introduction to the Bucket School approach and critique science outdoor learning episodesAn introduction to risk assessment and the importance of managing risk inside and outside the classroom.Inclusive practice in learning outside the classroom. How to adapt outdoor learning to the needs of pupils with specific educational needs and or disability. | 1.1; 1.2; 1.3; 1.4; 1.5; 1.6;2.13.1; 3.2; 3.74.1; 4.65.1; 5.2;6.2;7.1; 7.7 | 3c5i; 5j7e |
| **Session 4****Seminar – Working Scientifically and types of enquiry****2 hours** | Understand that children are required to build up their knowledge and competence in 5 different types of enquiries in primary science. These are: Observation over time, identifying classifying and grouping, comparative and fair testing, pattern seeking, research using secondary sources. Understand that primary science research indicates best practice to include integration of problem solving in addition to the 5 types of enquiry. Understand how the use of fair testing planning boards can support children in planning and conducting a fair test enquiry.Understand the importance of adapting teaching to the needs of learners. SEND and challenge - adaptive approaches to planning and recording science learning. | 1.62.6; 2.93.2; 3.3; 3.5; 3.6; 3.84.4; 4.5; 4.8; 4.9; 4.105.1; 5.2; 5.3; 5.56.2; 6.3; 6.57.2; 7.4; 7.7 | 2a; 2f3f; 3h; 3n5i |
| **Session 5****Seminar – multisensory approaches to learning: Sound****2 hours** | To develop the subject and curriculum knowledge required to teach sound effectively. The importance of supporting children to develop connections between science learning – building mastery of science learning (schema). Planning for the effective use of assessment in science learning. How to use technology to enhance science learning – for example to measure something quantitatively (e.g. sound in decibels) and recognise that this moves children’s learning on from qualitative descriptions. To plan and conduct a pattern seeking enquiry with a sound focus. Strategies to manage behaviour in practical science lessons. Considering inclusive practice: How multisensory approaches to teaching can support all learners including those with SEN/D. Access to the statutory requirements of the science national curriculum for deaf and hearing-impaired students.  | 2.2; 2.6;3.2; 3.3; 3.4; 3.74.3; 4.6; 4.7; 5.3; 5.56.2; 6.37.1 | 3t4b; 4o |
| **Session 6****Seminar - Rocks****2 hours** | To consider the challenges of teaching abstract aspects of the subjectUnderstand the value of using modelling strategies when teaching complex and abstract concepts. To develop the subject and curriculum knowledge required to teach rocks effectively. Consider the point in the learning sequence that modelling or practical activity is planned and the impact of this on children’s learning.To understand that it is important to integrate the work of a diverse range of scientists throughout the curriculum. Including the work of female scientists when teaching about rocks and fossils (Mary Anning)To understand that representing a diverse range of scientists can impact upon learners’ perceptions of science and who science is for, increase aspirations and provide role models.To understand that effective classroom, resource and behaviour management in science helps to ensure that pupils learn safely and make good progress. To understand that engagement is important but learning activities are carefully selected in order to also develop deep understanding of the associated concepts.  | 1.62.2; 2.6; 2.93.2; 3.3; 3.5; 3.64.3; 5.1; 5.4;6.5; 6.77.18.2; 8.5 | 4b; 4i; 4n8d; 8g |
| **Session 7****Seminar – Electricity****2 hours** | To know and be able to apply different pedagogies to support learning in science including first-hand experience; modelling; analogies; and simulations.Use of models and analogies to support children to learn complex and abstract concepts such as electricity.To know some common misconceptions about current electricity and be able to address them through planning and teaching. To develop the subject and curriculum knowledge required to teach electricity effectively. Understand that formative strategies are crucial to assess learning in science.To plan a sequence of learning that considers the order of component knowledge and how these build towards composite outcomes.To be able to apply formative assessment strategies including effective questioning to assess learning in science with peer and tutor support. | 2.2; 2.6; 3.2;3.3; 3.5; 3.7; 4.3; 4.85.3; 5.56.3; 6.4; 6.7 | 2a; 2c; 2e; 2i6a, 6e |
| **Session 8****Seminar – Earth and Space****2 hours** | To develop the subject and curriculum knowledge required to teach space effectively. To use models effectively to teach complex and abstract concepts.To understand that it is important to integrate the work of a diverse range of scientists throughout the curriculum. Including the work of scientists of colour (Katherine Johnson) and those with disabilities (Stephen Hawking)To know about the lives and theories of a diverse range of scientists (*Aristotle*, *Ptolemy, Alhazen and Copernicus, Kepler, Galileo, Neil Armstrong, Katherine Johnson*) and the impact they have had on our understanding of the Earth and its position in space.Disciplinary knowledge encompasses the process by which scientific understanding develops over time with reference to solar system models. | 1.62.2; 2.6; 2.83.2; 3.3; 3.5; 4.3; 5.1; 5.4;6.68.2; 8.5 | 4b; 4i5c;6c; |
| **Session 8****Seminar - Forensics****2 hours** | High quality teaching in science requires strong subject and curriculum knowledge. The subject knowledge required to teach properties of materials with confidence. That new knowledge in science should be connected with what children have previously learned. That pupils should be supported to make connections between different concepts to build connected knowledge of science.To know the importance of language in conceptual development in science including talk for science and the understanding of scientific vocabulary.To understand how talk enables children to share their ideas, progress their scientific vocabulary and develop conceptual understanding.To understand that strategies that support language development will support all children in learning new concepts but particularly those with SEND / EAL.  | 2.2; 2.6; 2.7; 2.8: 2.93.2; 3.4; 3.75.3; 5.5; 5.7 | 2d; 2e3d |
| **Session 9****Online Lecture - Assessment****2 hours** | To know the end of key stage statutory assessment requirements for science.To understand the process used to establish the end of key stage judgements and the contribution of staff beyond Y2 and Y6.To use a range of evidence to make judgements on pupil attainment in science and use the TAPS assessment resources to support this process.To understand the role of moderation in ensuring parity when making summative judgements on pupils’ attainment in science.  | 6.1; 6.3; 6.4; 6.5; 6.6; 6.7 | 6b, 6.c; 6m;  |  |  |

|  |
| --- |
| **School Based Curriculum – Placement 1** |
| **Observing:** Observe how expert colleagues use and deconstruct approaches, in this subject, in at least one lesson throughout school.  **Planning:** Observe how expert colleagues break tasks down into constituent components, in this subject, for at least one lesson.  **Teaching:** Rehearse and refine particular approaches in this subject for a group/whole class. Deliver group/whole class teaching.  **Assessment:** Check prior knowledge and understanding during lessons.  **Subject Knowledge:** Discuss and analyse subject specific components with expert colleagues  |
| **Subject Specific Components/s (know, understand, can do)** | **Learn That****(CCF reference)** | **Learn How****(CCF reference)** | **Links to Research and Reading** | **Formative Assessment** |
| By the end of this phase trainees **will know:*** To know that high-quality teaching and learning in science requires strong teacher subject, pedagogical and curriculum knowledge.
* To know that science learning needs to be planned in a way that is inclusive and challenges all learners.

By the end of this phase trainees **will understand:*** To understand that high-quality teaching in science involves breaking down complex ideas into small steps and sequencing these logically to enable children to learn without overloading their working memory.
* To understand that direct teaching, first-hand practical approaches and modelling are approaches which can be used to support children to understand complex ideas and deepen children’s learning in science.
* To understand how an experienced mentor manages behaviour in practical science lessons through observation and discussion.

By the end of this phase trainees **will be able to:*** To be able to plan and teach a science lesson that is appropriate to the needs of all learners, that draws on children’s prior learning to develop subject knowledge and enquiry skills and provides opportunities to assess and act on the learning that has taken place. To be able to manage behaviour and resources in science with mentor support.
 | 3.2, 3.5 4.2 5.1, 5.3, 5.7 6.1, 6.3 7.1, 7.9    | 2a, 2c, 2d 5a, 5e 6a 7b    | OFSTED 2023. Finding the Optimum. Available from <https://www.gov.uk/government/publications/subject-report-series-science/finding-the-optimum-the-science-subject-report--2>OFSTED, 2021. Research Review Series: Science.GOV.UK [online]. Available from:<https://www.gov.uk/government/publications/research-review-series-science> Sharp, Peacock, Johnsey, Simon, Smith, Cross and Harris., 2021. Primary Science Theory & Practice. London: Sage Publications Ltd. Rosenshine, B. (2012) Principles of Instruction: Research-based strategies that all teachers should know. American Educator, 12–20.https://doi.org/10.1111/j.1467-8535.2005.00507. | Weekly Mentor MeetingsWeekly Development Summary Lesson ObservationsMentor & Link Tutor MeetingsAdditional support for trainee at risk (Cause for Concern) procedures as appropriate  |

|  |
| --- |
| **School Based Curriculum – Placement 2** |
| **Observing:**  Observe how expert colleagues use and deconstruct approaches, in this subject, in at least one lesson throughout school.  **Planning:**  Observe how expert colleagues break tasks down into constituent components over a sequence of lessons. Plan, as appropriate,  for a sequence of lessons in all core and selected foundation subjects.  Plan, as appropriate, one lesson / group activity in all remaining subjects.  **Teaching:**  Rehearse and refine particular approaches in all core and selected foundation subjects.   **Assessment:**  Draw conclusions about what pupils have learnt by looking at patterns of performance over a number of assessments with support and scaffolding from expert colleagues  **Subject Knowledge:** Discuss and analyse subject specific components with expert colleagues   |
| **Subject Specific Components/s (know, understand, can do)** | **Learn That****(CCF reference in numerics e.g. 1.1)** | **Learn How****(CCF reference bullets alphabetically e.g. 1c)** | **Links to Research and Reading** | **Formative Assessment** |
| **By the end of this phase trainees will know:*** To know that high-quality teaching and learning in science requires strong teacher subject, pedagogical and curriculum knowledge and where to seek support to develop this further.
* To know that children hold misconceptions about science and that these should be directly addressed through teaching.

**By the end of this phase trainees will understand:*** To understand that substantive and disciplinary elements of science should be connected and ordered over a sequence of science learning.
* To understand how to use medium term plans to sequence science learning over a period of time.

**By the end of this phase trainees will be able to:*** To be able to plan and teach a sequence of science lessons that is appropriate to the needs of all learners, including those with SEN/D, EAL and more able learners.
* To be able to plan a sequence of science lessons that integrates a range of effective pedagogies and approaches to support science learning (approaches might include first hand practical approaches, modelling, analogies, simulations and direct instruction).
* To be able to use formative assessment approaches to identify establish what children have learned and identify misconceptions. To be able to use this information to inform planning and teaching.
* To be able to plan effectively for additional adults within the classroom linked to the needs of the learners within the class and the science content delivered.

To be able to manage behaviour and resources effectively to support children to learn in practical science lessons. | 2. 1 3.2, 3.5, 3.7, 3.9 4.2 5.1, 5.3, 5.7 6.1, 6.3 7.1  | 1 3a, 3b, 3c  4a 5.a, 5.d, 5.e, 5.f 6.a, 6.c, 6.d, 6.f, 6.g, 6.n, 6.p 7.p  | OFSTED 2023. Finding the Optimum. Available from <https://www.gov.uk/government/publications/subject-report-series-science/finding-the-optimum-the-science-subject-report--2>OFSTED, 2021. Research Review Series: Science.GOV.UK [online]. Available from:<https://www.gov.uk/government/publications/research-review-series-science> Sharp, Peacock, Johnsey, Simon, Smith, Cross and Harris., 2021. Primary Science Theory & Practice. London: Sage Publications Ltd. Plan Resources. Available:<https://www.planassessment.com/>TAPs Resources: Available:<https://pstt.org.uk/unique-resources/taps/> | Weekly Mentor MeetingsWeekly Development Summary Lesson ObservationsMentor & Link Tutor MeetingsAdditional support for trainee at risk (Cause for Concern) procedures as appropriate  |

|  |
| --- |
| **School Based Curriculum – Placement 3** |
| **Observing:**  Observe how expert colleagues use and deconstruct approaches, in this subject, in at least one lesson throughout school.  **Planning:**  Plan a sequence of lessons in all core and foundation subjects.  **Teaching:**  Rehearse and refine particular approaches in all core and selected foundation subjects.   **Assessment:**  Discuss with expert colleagues summative assessment, reporting and how data is used.  **Subject Knowledge:** Discuss and analyse subject specific components with expert colleagues.  |
| **Subject Specific Components/s (know, understand, can do)** | **Learn That****(CCF reference in numerics e.g. 1.1)** | **Learn How****(CCF reference bullets alphabetically e.g. 1c)** | **Links to Research and Reading** | **Formative Assessment** |
| By the end of this phase trainees **will know:*** To know the features of effective teaching and learning in science including research informed best practice and how this is translated to different contexts.

By the end of this phase trainees **will understand:*** To understand the impact an additional adult can have on science learning (consider use of additional adults beyond scaffolding children who need additional support)
* To understand that children’s science learning is assessed over a sequence of science lessons and that this knowledge can be used to inform judgements about their attainment.

By the end of this phase trainees **will be able to:*** To be able to plan and teach an effective sequence of science learning which is informed by assessment of prior learning, uses science specific pedagogies to facilitate progression in subject knowledge and enquiry skills, integrates formative assessment and is inclusive, appropriate and flexible to the needs of all learners including those with SEN/D, EAL and talented scientists.
* To be able to assess children’s learning over a sequence of science lessons and use this knowledge to inform judgements about their attainment in relation to expectations with the support of an experienced colleague.
* To be able to draw conclusions about what pupils have learnt by looking at patterns of performance over a number of assessments with support and scaffolding from expert colleagues.
* To take science learning beyond the national curriculum where appropriate.
 | 2.1, 2.2, 2.6  3.1, 3.3, 3.5, 3.7  4.2, 4.8, 4.10  5.2, 5.7  6.1, 6.7  7.1, 7.4  8.5   | 2.a, 2.c, 2.d, 2.e, 2.h  3.a, 3.b, 3.c, 3.d, 3.f, 3.g  4.b 5.a, 5.b, 5.c 6a 7.d, 7.e, 7.g, 7.h  8.l  | OFSTED 2023. Finding the Optimum. Available from <https://www.gov.uk/government/publications/subject-report-series-science/finding-the-optimum-the-science-subject-report--2>OFSTED, 2021. Research Review Series: Science.GOV.UK [online]. Available from:<https://www.gov.uk/government/publications/research-review-series-science> Sharp, Peacock, Johnsey, Simon, Smith, Cross and Harris., 2021. Primary Science Theory & Practice. London: Sage Publications Ltd. Plan Resources. Available:<https://www.planassessment.com/>TAPs Resources: Available:<https://pstt.org.uk/unique-resources/taps/> | Weekly Mentor MeetingsWeekly Development Summary Lesson ObservationsMentor & Link Tutor MeetingsAdditional support for trainee at risk (Cause for Concern) procedures as appropriate  |