**Primary Curriculum Map (Science)**

***Year 1 Undergraduate SB***

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| **University Curriculum – Year 1** |
| **Session Sequence****Include details of creative**  | **Session Content** **Subject Specific Components** | **Learn That****(ITTECF reference in numerics e.g. 1.1)** | **Learn How****(ITTECF reference bullets alphabetically e.g. 1c)** | **Links to Research and Reading** | **Formative Assessment mode** |
| **Seminar 1****The Nature of Science Education and the importance of first hand practical approaches** | To know the aims and principles of science educationTo understand that the science national curriculum provides a programme of study for the knowledge and skills which children learn aged 5-11 and that the spiral structure provides a minimum requirement and enables progression of substantive and disciplinary knowledge. To understand that expertise in science is built through developing substantive and disciplinary knowledge. Each should be taught explicitly, in sequence and they should build on prior learning. To know the working scientifically skills and how these support children to find answers to their scientific questions.   | 1.1; 1.22.1; 2.2**3.1**; 3.2; **3.3; 3.5;** 3.74.25.7 | 1c; 1f | 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>Harlen, W. and Qualter, A., 2018. The Teaching of Science in Primary Schools, London: David Fulton Publishers.  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.Serret and Earle. 2018 ASE: Guide to Primary Science, available**:** <https://www.ase.org.uk/resources/education-science/issue-270/new-ase-guide-primary-science-education>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/> | Q and A group task – aims and principles of science Education and Science National CurriculumQuiz – Working scientifically skillsReflection Question: What does it mean to be a scientist and why are working scientifically skills so important? |
| **Seminar 2****The importance of addressing children’s misconceptions** | To understand that expertise in science is built through developing substantive and disciplinary knowledge.  Each should be taught explicitly, in sequence and they should build on prior learning.     To understand that working scientifically is the central spine of the primary science curriculum and covers the understanding of the nature, process and methods of science.  To understand the importance of the scientific skill - observation To understand the importance of first-hand practical experiences to develop substantive knowledge in science.  To understand the importance of eliciting children’s ideas and prior knowledge in science and know how to use a range of strategies to elicit children’s prior knowledge of scientific concepts.To understand that misconceptions are children’s ideas which are based on their experience (and should be pre-empted during the planning process and tackled in lessons).  | 1.1; 1.2; 1.4 1.5; 1.6   2.2; 2.7;    3.1; 3.2; **3.3;** **3.4;** **3.7; 3.8****4.6**; 4.7   5.1; 5.5   **6.1**  7.9  | **2a****2d****2e**4l5b | Retrieval task - working scientifically skills.Group discussion – importance of first -hand practical experience.Reflection Question: How do we establish children’s ideas and why is it important to address their misconceptions directly? |
| **Seminar 3****Importance of Learning Outside the Classroom – Bucket School** | To understand what is meant by Nature deficit disorder and the key research relating to the impact of this on learners.To know that 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. To be able to use the outdoor environment flexibly to support learning in science.To understand the Bucket School approach and critique of 3 science outdoor learning episodesTo understand the importance of risk assessment and of managing risk inside and outside the classroom.To understand the importance of 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; 1.7; 1.8**2.13.1; 3.2; 3.74.1; 4.6; 4.75.1; 5.2;6.2; 6.57.1; 7.4; 7.7 | 1c; 1e 7a; 7d;  | Reflection: Impact of LOtC on diverse range of learners |
| **Seminar 4****The Types of Enquiry** | To understand the Key findings from the Ofsted Research Review: Science document (2021)To 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. To be able to reflect on the experiences of the cohort. What does enquiry look like across schools?To understand that primary science research indicates best practice to include integration of problem solving in addition to the 5 types of enquiry. To understand how the use of fair testing planning boards can support KS1 and KS2 children in planning and conducting a fair test enquiry.To understand the importance of adapting teaching to the needs of learners. SEND and challenge - adaptive approaches to planning and recording science learning. | 2.7 2.103.2; 3.3; 3.5; **3.6**; **3.8****4.3; 4.4;** **4.5**; 4.8; 4.9; 4.105.1; 5.2; 5.3; 5.56.2; 6.3; 7.2; 7.4; 7.7 | 3f; 3h; 3l | Retrieval: Science CapitalCurriculum Scenarios: Type of enquiryReflection: How can we plan for effective integration of the types of enquiry. |
| **Seminar 5****Science Capital** | To know what is meant by Science Capital and understand it’s importance.* What is science capital and how can it be developed?
* How can we support learners to see themselves as scientists and see how science is relevant to them?
* How can the science capital teaching approach be utilised to address inequalities within the classroom I work?
 | **1.1; 1.2; 1.6; 1.8**7.4; 7.5 |  | Reflection: How could the science capital teaching approach support children in my class? |
| **Seminar 6****Science specific pedagogies: first hand practical approaches, models and analogies - Electricity** | To know and be able to apply different pedagogies to support learning in science including first-hand experience; modelling; analogies; and simulations.To understand the 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 know how to develop the subject and curriculum knowledge required to teach electricity effectively. To be able to plan an effective science learning opportunity that integrates substantive and disciplinary knowledge. To understand that formative strategies are crucial to assess learning in science.To be able to apply formative assessment strategies including effective questioning to assess learning in science with peer and tutor support. | 2.2; 2.7; **3.2**; 3.3; **3.4**; 3.7; **4.3;** 4.85.3; 5.56.3; 6.4;  | 2a; 2e; 2g4f; 4h6a, 6e | Critique of science specific pedagogical approaches  |
| **Seminar 7****Use of models to teach abstract concepts - Rocks** | To understand the importance of considering the challenges of teaching abstract aspects of the subject. Understand the value of the use of models when teaching complex and abstract concepts. To know how to develop the subject and curriculum knowledge required to teach rocks effectively. To understand the importance of sequencing learning. To 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; 2.7; 2.103.2; 3.3; 3.5; **4.3; 4.6; 4.7;** 4.9; 4.105.1; 5.4; 5.56.5; 6.7**7.1; 7.2****8.2**; **8.5** | 4b; 4h; 4ij 4l | Paired Lesson Planning Task |

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| **School Based Curriculum – Year 1** |
| **Observing:** Observe how expert colleagues plan for the needs of all learners while maintaining high expectations, providing targeted support and promote an inclusive and equitable learning environment.**Planning:** Observe how expert colleagues adapt content, approaches, and environments to support all learners especially those with an additional need, for at least one lesson.**Teaching:** Rehearse and refine approaches to adaptive teaching to meet the needs of all learners. Deliver group/whole class teaching.**Assessment:** Rehearse and refine how to adapt assessment to enable and support children to demonstrate what they know, remember, and understand using a range of assessment strategies.**Subject Knowledge:** Demonstrate the ability to work within the key legislation and policies that underpin adaptive teaching and inclusive practice for all children including those with Special Educational Needs/Disability.Discuss and analyse specific components with expert colleagues. |
| **Subject Specific Components/s (know, understand, can do)** | **Learn That****(ITTECF ref)** | **Learn How****(ITTECF ref)** | **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 effective science lessons integrate substantive and disciplinary knowledge and sequence this clearly for learners.
* To know that science learning needs to be planned in a way that is inclusive and challenges all learners including those with SEN/D, EAL and more able learners.

By the end of this phase trainees **will 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.
* that direct teaching, first-hand practical approaches and use of models are approaches which can be used to support children to understand complex ideas and deepen children’s learning in science.
* how an experienced mentor manages behaviour in practical science lessons through observation and discussion.

To understand the planning decisions made by experienced colleagues to ensure that science learning is specifically tailored to the needs of the placement class. Including those with SEN/D and/ or EAL where appropriate.By the end of this phase trainees **will be able to:*** plan and teach a science lesson that has considered science specific pedagogy, elicits and builds on children’s prior knowledge, pre-empts and addresses misconceptions and covers aspects of both substantive and disciplinary knowledge.
* plan for a range of formative assessment opportunities to establish the learning that has taken place.
* manage behaviour and resources effectively to support children to learn in practical science lessons.
 | 1.1; 1.2; 1.32.2; 2.7 3.2; 3.4; 3.5; 3.64.2; 4.4; 4.6; 4.105.1;5.2; 5.3; 5.56.1; 6.37.1; 7.9   | 1a2a, 2b, 2c, 2d , 2e3e4f, 4l5a, 5b, 5g, 5i, 5l6a, 6e, 6h 7a, 7c,7d, 7h 8e, 8j, 8p   | 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  |

***Year 2 Undergraduate***

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| **University Curriculum – Year 2** |
| **Overview of Content** |
| **Session Sequence**  | **Session Content** **Subject Specific Components/s**  | **Learn That** **(ITTECF reference in numerics e.g. 1.1)** | **Learn How** **(ITTECF reference bullets alphabetically e.g. 1c)** | **Links to Research and Reading** | **Formative Assessment mode**  |
| **Seminar 1** | **Assessment and reporting requirements.** **Assessing working scientifically.** |  |  |  |  |
| **Seminar 2** | **Adapting science to the needs of learners with SEN and EAL** |  |  |  |  |
| **Seminar 3** | **Planning effective sequences of learning and integrating disciplinary knowledge effectively over time** |  |  |  |  |
| **Seminar 4** | **Transition EYFS-KS1; KS1-KS2 and KS2 to 3** |  |  |  |  |
| **Seminar 5** | **Developing science capital teaching approach to fit the needs of the cohort and context** |  |  |  |  |

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| **School Based Curriculum – Year 2** |
| **Observing:** Observe how expert colleagues use distributed and spaced learning in at least 4 lessons throughout school.Observe how expert practitioners use motivation and build self-esteem of all learners.**Planning:** Plan for opportunities to increase cultural capital.Plan for the effective use of additional adults Discuss with expert practitioners how they embed adaptive approaches into planning.With the support of expert practitioners, capture and incorporate the voice of the child for example through a one-page profile.**Teaching:** Rehearse and refine chunking, scaffolding, and fading in lesson planning over a sequence of lessons. Plan, teach and evaluate a series of lessons incorporating adaptive approaches to enable all children to access a rich curriculum.**Assessment:** Use peer and self-assessment to aid and support independent learning.**Subject Knowledge:** Discuss and analyse with expert practitioners how to implement and review flexible groupings and use groupings to support learning and promote inclusion. |
| **Subject Specific Components/s (know, understand, can do)** | **Learn That****(ITTECF reference in numerics e.g. 1.1)** | **Learn How****(ITTECF 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.
* 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 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 a range of 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, groupings and resources effectively to support children to learn in practical science lessons. | 1:1; 1:2; 1.82.1; 2.2; 2.7 3.2, 3.4; 3.5, 3.7, 4.2 5.1, 5.2, 5.3, 5.7 6.1, 6.2, 6.3 7.1  | 1b; 2c 2e, 2i, 2h; 2j, 2k3a, 3b, 3e, 3f  4a, 4e 5a, 5b, 5e, 5g, 5h, 5i, 5l 6a, 6b, 6c, 6d, 6f, 6g, 6n, 6q 7p 8b | 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> 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  |

***Year 3 Undergraduate***

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| **University Curriculum – Year 3** |
| **Overview of Content** |
| **Session Sequence**  | **Session Content** **Subject Specific Components/s**  | **Learn That** **(ITTECF reference in numerics e.g. 1.1)** | **Learn How** **(ITTECF reference bullets alphabetically e.g. 1c)** | **Links to Research and Reading** | **Formative Assessment mode**  |
| **Seminar 1** | **Adaptive approaches when LOtC** |  |  |  |  |
| **Seminar 2** | **Evidence based primary science practice and schemes** |  |  |
| **Seminar 3** | **Childrens health and data handling** |  |  |
| **Seminar 4** | **Moderating assessments in primary science** |  |  |  |  |
| **Seminar 5** | **Models of excellence – future of primary science education**  |  |  |  |  |

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| **School Based Curriculum – Year 3** |
| **Observing:** Observe how expert colleagues identify and implement reasonable adjustments for children with identified Special Educational Needs **Planning:** Work closely with other teachers, SENco and members of the staff team to implement reasonable adjustments within and beyond the classroom.Plan for children who may need adaptations beyond the classroom to support their social inclusion.**Teaching:** Observe and implement reasonable adjustments for children with identified special Educational Needs and Disability **Assessment:** Discuss with expert colleagues’ summative assessment, reporting and how data is used.**Subject Knowledge:** Acknowledge and identify when their own social, emotional and mental health needs to be supported.Identify and access sources of support for their own wellbeing where appropriate. |
| **Subject Specific Components/s (know, understand, can do)** | **Learn That****(ITTECF reference in numerics e.g. 1.1)** | **Learn How****(ITTECF 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 bigger picture-issues surrounding primary science education that directly impact on classroom teaching and the role of the science subject leader in ensuring high quality provision.

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.
 | 1:1; 1:2; 1.82. 1; 2.2; 2.7 3.1; 3.2, 3.3, 3.4; 3.5, 3.7, 4.2, 4.8, 4.10 5.1, 5.2, 5.3, 5.7 6.1, 6.2, 6.3, 6.77.1, 7.4  | 1b; 2c 2e, 2i, 2h; 2j, 2k3a, 3b, 3e, 3f  4a, 4e 5a, 5b, 5e, 5g, 5h, 5i, 5l 6a, 6b, 6c, 6d, 6f, 6g, 6n, 6q 7p 8b | 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> Archer 2021. Primary Science Capital Teaching approach materials approach. Available: <https://discovery.ucl.ac.uk/id/eprint/10136335/14/9746%20UCL%20PSCTA%20Teachers%20science%20pack%20Interactive%202022%20AW1.pdf> Bianchi, Whittaker and Poole, 2021. The 10 Key Issues with Children’s Learning in Science. Available: <https://www.scienceacrossthecity.co.uk/wp-content/uploads/2021/03/3634_Childrens_Learning_in_Primary_Science_Report_2020_v8.pdf> Turner, J. Bianchi, L. Earle, S. 2023 [A response to the Ofsted Finding the Optimum report](https://docs.google.com/forms/d/e/1FAIpQLSfC0fdl8An2cjGpeb7wa_friV0hE7_eNQdYYDvAp7Q0bWiDOA/viewform) | Weekly Mentor MeetingsWeekly Development Summary Lesson ObservationsMentor & Link Tutor MeetingsAdditional support for trainee at risk (Cause for Concern) procedures as appropriate  |