# Secondary ITE Subject Studies Curriculum Map 2026/27

## Background and Rationale

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

**National Curriculum in England: science programmes of study, Department for Education, 2013**

The LJMU ITE Science curriculum map provides an outline of the Science curriculum followed by student teachers at LJMU and is intentionally designed as a research-informed, practice-grounded and ambitious curriculum. It has been constructed to align with the Initial Teacher Training and Early Career Framework (ITTECT), with LJMU 'Vision and Values' and with LJMU Phased Expectations for student teachers on the PGCE Secondary program.

The curriculum intent is to develop science teachers whose strong subject, curriculum and pedagogy knowledge enables them to identify essential scientific concepts, grow their substantive and disciplinary knowledge, and structure coherent lessons that promote long-term learning.

Substantive knowledge is framed as the core ideas, models and explanations in biology, chemistry and physics which are carefully sequenced so that pupils build connected schemas rather than isolated facts. Disciplinary knowledge is foregrounded as knowledge of how scientific knowledge is generated, tested and communicated, including working scientifically, data handling, and the nature of evidence.

Fundamental to the curriculum map are three broad themes that act as threads throughout the year; scientific literacy, practical and investigative science and Science Capital and inclusion. Each thread is revisited and deepened as student teachers' expertise grows, resulting in a curriculum which is coherent and cumulative rather than episodic.

Cognitive load theory and explicit, direct instruction underpin the design of both taught sessions and associated school-based tasks. Student teachers learn to reduce extraneous load (e.g. through careful use of demonstration and modelling), to manage intrinsic load (e.g. by sequencing scientific concepts, building prerequisite knowledge and scaffolding experimental work), and to optimise germane load (e.g. through guided practice and structured talk). Direct instruction is presented not as rote teaching but as clear, purposeful explanation that builds on what pupils already know, supported by worked examples, modelling and carefully scaffolded independent practice. Science mentors from partnership schools lead sessions and share best practice.

Student teachers are encouraged to deliver a more representative and socially just science education. For example, by engaging with decolonisation of the secondary science curriculum, challenging Eurocentric narratives and making visible how colonial power shaped what counts as "mainstream" science. This includes student teachers selecting and trialling examples in their lessons and reflecting on impact on pupils' attitudes and engagement.

Knowledge and practice are developed through taught workshops under-pinned with research, student presentation and rehearsal, directed online activities, focused lesson planning and placement observation, fieldwork and targeted reading of research-informed practice.

Through university sessions and assignment planning and completion, student teachers engage critically with science education literature to understand the interplay between conceptual learning and substantive–disciplinary knowledge. Student teachers reflect on how disciplinary practices could support the development of deep conceptual understanding and pupil identity as "science learners".

Student teacher progress is assessed across the curriculum. During each session questioning and discussion work are used extensively to explore individual students' understanding. Each session student teachers are given a specific focus and tasks (linked to session content) to complete during the following week on placement; either through individual activity or by discussion with, or observation of, expert colleagues in their placement setting. Small and whole-group discussion and reflection occur in the following session. Retrieval activity is used in all sessions to explore students' progress in their understanding. For example, the collection of individual data regarding student teachers' existing knowledge and understanding of specific subject content is used by tutors to inform and shape future subject sessions and by student teachers to make task choices. Student teachers complete subject knowledge audits at key phases of their training. These audit points enable student teachers to identify specific areas for development and consider how to address these.

Finally, the curriculum map has been created and iteratively refined in collaboration with science mentors in partnership schools, student cohorts, early career teachers and university colleagues. This collaborative approach ensures that the curriculum remains closely aligned with ITTECT expectations while being responsive to student teacher needs, national research and the evolving discourse in science education about substantive and disciplinary knowledge.

## Curriculum Themes

1. ***Developing disciplinary literacy skills.***

Secure scientific literacy is critical to pupil success. Sessions allow student teachers to review, consolidate and expand their own literacy and explore concrete literacy practices e.g. vocabulary routines, structured talk, scaffolding text.

Oracy is viewed as a central tool for learning science, a key message being the importance of talk in developing pupils' scientific reasoning. Student teachers are supported to plan opportunities for dialogic questioning, structured discussion, explanation and justification, such that pupils rehearse their use of scientific language and refine their communication of scientific ideas. Narrative and storytelling are presented as vehicles to promote deeper connection with science concepts.

LJMU Phased Expectations Q2, Q3, Q4, Q5, Q6 and Q9

***Exploring the use of practical work to realise curriculum goals.***

*"For pupils to achieve well in science, they must not only acquire the necessary knowledge, but also understand its value, enjoy the experience of working scientifically, and sustain their interest in learning it. Pupils in schools need to discover the concepts revealed through observing scientific phenomena and conducting experimental investigations for themselves. Then they are more likely to continue to study science and use that learning for work, for family, and to contribute as informed citizens."* **Maintaining curiosity: A report into science education in schools, Department for Education, 2013**

The curriculum prioritises the inclusion of working scientifically and practical skills in biology, chemistry and physics lessons, emphasising that practical work must have a clear conceptual purpose and take place only when pupils have sufficient prior knowledge to learn from the activity. Student teachers explore the use of practical activity and demonstration to develop pupils' skills in the use of method and collection of data, whilst also securing pupil substantive knowledge and understanding. Interwoven is the requirement for secure scientific literacy and numeracy.

LJMU Phased Expectations Q1, Q4, Q5, Q7, Q8 and Q9

***Building pupils' science capital.***

*"As pupils learn science, they also learn about its uses and significance to society and their own live. This will highlight the significant contribution science has made in the past. For example, by eradicating smallpox and discovering penicillin. But pupils will also learn about the continuing importance of science in solving global challenges such as climate change, food availability, controlling disease and access to water.*

*Science education also provides the foundation for a range of diverse and valuable careers that are crucial for economic, environmental and social development."*

**Research review series: science, Department for Education, 2021**

Science capital provides a means of improving engagement, participation and longer-term STEM trajectories for pupils, especially for those from low socio-economic backgrounds.

Through their own academic studies and experiences, student teachers have in-depth and widely varying individual knowledge of different science disciplines and possess individual science capital themselves. As teachers of science, they need to explore beyond their chosen specialism and areas of interest and be able to confidently plan and teach science lessons that intentionally build all pupils' science capital and sense of identity as "science learners."

Professional organisations and LJMU outreach, including LJMU Absolute Chemistry Research Group, contribute expert input so that student teachers gain knowledge and experience of a wide variety of teaching resources and methodologies which promote a positive sense of science identity for pupils.

Phased Expectations Q1, Q2, Q3, Q5 and Q6

## Adaptive Practice

Science curriculum choices, representation, language and assessment can either widen or narrow gaps in participation and outcomes for pupils.

Inclusive practice and SEND are woven through the curriculum rather than treated as an add-on. Sessions explore adaptive teaching, accessible practical work, literacy development, multimodal representations and use of scaffolds. Expert school and educational practitioners from a variety of educational settings deliver sessions and share their perspective and experience in creating inclusive classrooms.

Adaptive practice is incorporated into taught sessions by student teachers engaging with curriculum themes through the lens of pupil case studies (LJMU Learner Profiles resources), and through sustained focus on the planning and delivery of high-quality teaching for all. How learning can be adapted to meet the needs of the case study pupils is explored; both regarding resource and teacher input.

Given the areas of high socio-economic disadvantage across the Liverpool City Region, Science Capital is promoted as a strategy to connect abstract scientific ideas to pupils' everyday experiences and cultural backgrounds and build pupils' confidence in, and engagement with, science.

## Five Essential Readings

1. Subject Guides.
    - Reiss, M. J. and Winterbottom, M. (2021). *Teaching Secondary Biology.* The Association for Science Education. (3rd Edition). London: Hodder Education.
    - Ashton, K. and Kind, V. (2022). *Teaching Secondary Chemistry.* The Association for Science Education. (3rd Edition). London: Hodder Education.
    - De Winter, J. and Hardman, M. (2021). *Teaching Secondary Physics.* The Association for Science Education. (3rd Edition) London: Hodder Education.
2. Archer, L., Moote, J., MacLeod, E., Francis, B., & DeWitt, J. (2020). ASPIRES 2: Young people's science and career aspirations, age 10-19. London: UCL Institute of Education.
3. Black, P.J., Harrison, C. and King's College London (2004) Science inside the black box: assessment for learning in the science classroom. London: GL Assessment.
4. Harlen, W. (Ed.) (2015). Working with big ideas of science education. Association for Science Education.
5. Ofsted (2021) *Research Review Series: Science*. Obtained from: Research review series.

### Pre-reading

1. R. Sharpe & I. Abrahams (2020) *Secondary school students' attitudes to practical work in biology, chemistry and physics in England*. Research in Science & Technological Education, 38:1, 84-104, DOI: 10.1080/02635143.2019.159769.

| | Date | Title and Objectives | Lead | Essential Reading & Student Activity<br>(pre or post session) | Placement Activity/Focus for General Mentor | Phase Expectations Q Links | ITTECF Links |
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| 1 | 7th Sept. AM | Introduction to the course.<br><br>**Science Education and the National Curriculum.**<br>**Pedagogy focus: The inclusive Science Teacher.**<br>**Objectives:**<br>To identify the type of teacher I want to be.<br>To explore what pupils might learn in science.<br>To discuss science capital and why it matters. | KC/HD | Godec, S., King, H. & Archer, L. (2017) The Science Capital Teaching Approach: engaging students with science, promoting social justice. London: University College London.<br>Harlen, W., Bell, D., Deves, R., Dyasi, H., Garza, G., Lena, P., Millar, R., Reiss, M., Rowell, P. & Yu, W. (2015) Working with the Big Ideas of Science Education. Hatfield: Association for Science Education<br><br>Sustainable Development Goals link:<br>https://sdgs.un.org/goals<br>**Post-session task:**<br>Review the National Curriculum for Key Stage 3 Sciences.<br>Link: National curriculum in England: science programmes of study - GOV.UK | | 1, 3, 6, 10 | 1.1, 1.2, 1.5; 1.8; 3.1; 4.1; 5.3; 5.6; 7.6; 7.7; 8.2, 1e; 3a |
| 2 | 11th Sept. AM | ***Assignment 1 Preparation***<br>**Science Practical as a subject specific pedagogy**<br>**Objectives:**<br>To discuss the choice of Science Practical as a subject specific pedagogy.<br>To identify and discuss different types of sources that can be used in a science literature review. | RT | Harlen, W (1999), Effective Teaching of Science: A Review of Research, The Scottish Council for Research in Education.<br>Department for Education (2010), The Importance of Teaching: The Schools White paper 2010, London: The Stationary Office.<br>Osborne, J. (2015) Practical work in science: misunderstood and badly used? *School Science Review*, 96 (357), pp. 16-24.<br>Cavagnetto, A.R. (2010) Argument to foster scientific literacy: a review of argument interventions in K12 science contexts, *Review of Educational Research*, 80(3), pp.336-371.<br>Tynan, R., Jones, R.B., Mallaburn, A. and Clays, K. (2016) Working towards evidence-based practice in science teaching and learning, *School Science Review*, 97 (361), pp. 109-115. | SL ONLY<br>**Observation Focus:**<br>How are pupils learning in lessons? | 9, 10 | 5.7; 8.2; 8.7; 8.9, 8.c; 8d; 8g |

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| | | To discuss and practise using a systematic approach to selecting and analysing sources.<br>To understand how to write a literature review. | | | | | |
| 3 | 11th Sept. PM | **H&S in the Science Laboratory.**<br><br>**Objectives:**<br>To explore how to prepare and teach safely and effectively in a school science laboratory. | KC/HD | **CLEAPSS link:**<br>CLEAPSS Home Page<br>**Post-session task:**<br>Download the:<br>• LJMU risk assessment,<br>• CLEAPSS Haz cards<br>Complete the LJMU risk assessment for a practical activity within your specialism.<br><br>**Subject Knowledge Audit P1** | | 1, 8 | 1.1; 1.2; 1.4; 7.1; 7.2; 7.9<br>1a; 1e; 1f; 7a; 7c; 7e; 7i; 7j; 7q |
| 4 | 18th Sept. AM | **Planning.**<br><br>**Objectives:**<br>To understand how to structure a science lesson. | KC/HD | Education Endowment Foundation (2026). *The EEF Guide to Inclusive Teaching.*<br>Link: Guide to Inclusive Teaching \| EEF<br>Rosenshine, B. (2010) *Principles of Instruction.'* The International Academy of Education (IAE). Educational Practices Series 21.<br>Willingham, D. T. (2021) *Why Don't Students Like School? A Cognitive Scientist Answers Questions about How the Mind Works and What It Means for the Classroom*, John Wiley & Sons, Incorporated,<br>**Pre-session task:**<br>Download the LJMU Lesson Plan document. | **Discuss with your mentor:**<br>*H&S & risk assessment*<br>What is the Science Department's H&S policy?<br>What is the Science Dept's approach to planning?<br>**Activity:**<br>Read the school and departmental H&S policies.<br>**Observation focus:**<br>In practical lessons how does the teacher:<br>• ensure pupil safety,<br>• distribute apparatus? | 2, 3, 5, 6 | 2.2; 3.2; 3.7; 4.2; 4.3; 4.6; 4.8; 5.6: 5.8; 6.3;<br>2a; 2b; 2e; 3a; 3b; 3c; 3d; 3g; 3j; 3k; 4a; 4e; 4f; 4m; 4o; 6a; 6e; 8e; 8o |
| 5 | 18th Sept. PM | **Approximation of practice.**<br><br>**Objectives:**<br>To rehearse how to deliver a learning episode. | KC/HD | | | 3, 5, 10 | |

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| 6 | 25th Sept. AM | **ITAP 1: Behaviour Management.**<br>**Objectives:**<br>*How do I start lessons in a calm and purposeful manner?*<br>To begin to be able to:<br>Start a lesson in a calm and controlled manner.<br>Obtain silence and pupils' attention.<br>Respond effectively to disruption during teacher talk. | HD | Bennett, T. (2020). *Running The Room; The Teachers Guide to Behaviour.* John Catt Education Ltd.<br>Cook, C. R., Fiat, A., Larson, M., Daikos, C., Slemrod, T., Holland, E. A., ... & Renshaw, T. (2018). Positive greetings at the door: Evaluation of a low-cost, high-yield proactive classroom management strategy. Journal of Positive Behavior Interventions, 20(3), 149-159.<br>Koran, S., Koran, E. (2018). Classroom Management and School Science Labs: A Review of Literature on Classroom Management Strategies. *International Journal of Social Sciences & Educational Studies* Vol.5, No.2.<br>Wubbels, T. (2011). An international perspective on classroom management: What should prospective teachers learn? *Teaching Education*, 22(2), 113-131.<br>**Websites**<br>https://thescienceteacher.co.uk/ | **Discuss with your mentor:**<br>*Rules and routines*<br>The school behaviour policy and how it is implemented within the department.<br>**Activity:**<br>ITAP Booklet for detail.<br>**Observation focus:**<br>What lesson start and end routines do Science teachers use?<br>What rules are established in the classroom?<br>How do Science teachers:<br>Start a lesson in a calm a controlled manner?<br>Obtain silence and pupils' attention?<br>Respond effectively to disruption during teacher talk?<br>How Science teachers manage practical work, including:<br>Organise pupils into groups for practical activities.<br>Ensure equipment is efficiently distributed to pupils and collected in after the practical (routines).<br>Manage transition (routines).<br>Manage the time pupils spend working on the practical.<br>**Observation focus:**<br>How do Science teachers organise pupils, practical resources and transitions during practical activity? | 1, 6, 8, 9, 10 | 1.1; 1.2; 1.4; 1.5;<br>1.7; 1.8; 7.1;7.2; 7.3; 7.5; 7.6; 7.7; 7.9; 8.8<br><br>1a; 1e;1f; 1g; 1h; 5p; 7a; 7b; 7c; 7d; 7e; 7f; 7g; 7h; 7i; 7j; 7k; 7p; 7q; 7r; 8a; 8n |

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| 7 | 25th Sept. PM | **ITAP 1: Behaviour Management.**<br>**Objectives:**<br>*How do I start lessons in a calm and purposeful manner?*<br>To begin to be able to:<br>Start a lesson in a calm a controlled manner.<br>Obtain silence and pupils' attention.<br>Respond effectively to disruption during teacher talk. | KC/HD | | | 1, 2, 6, 8, 9, 10 | |
| 8 | 2nd Oct. AM | **ITAP 2: Explanations.**<br>**Objectives:**<br>*How to I model and explain knowledge, processes and skills in my subject?*<br>To begin to be able to:<br>Model and explain one aspect of my subject.<br>Break down complex concepts or skills into bite-size chunks.<br>Practise the 'hand-over' from teacher to pupil activity.<br>**Guest: Kieran O'Callaghan** | KC | Feely, M. and Karlin, B. (2022) *The teaching and learning playbook: examples of excellence in teaching*. Abingdon: Routledge<br>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.x.<br>Sherrington, T. (2022) *Teaching WalkThrus 3: five-step guides to instructional coaching*. London: Hachette UK<br>Sherrington, T. (2019) *Rosenshine's Principles in Action*. John Catt Educational Ltd.<br>Kulgemeyer, C., & Geelan, D. (2024). Towards a constructivist view of instructional explanations as a core practice of science teachers. Science Education, 108, 1034–1050 | **Discuss with your mentor:**<br>*Modelling & Explanations*<br>Recommendations for constructing and delivering explanations and 'thinking aloud' teaching strategies in science lessons.<br>**Activity:**<br>ITAP Booklet for details.<br>**Observation focus:**<br>How do Science teachers scaffold new learning – chunking, narrating, checking, handing over?<br>How do Science teachers organise transition from teacher-led to pupil activity e.g. what language do they use, what formative assessment takes place before hand-over? | 2, 5, 6, 9 | 1.6; 2.1; 2.3; 2.4; 2.5; 2.6; 3.2; 3.7; 4.2 4.3; 4.4; 5.7; 5.8<br>2a; 2b; 2c; 2e; 3c;3g; 3l; 4a; 4e; 4f; 4g; 4h; 4i; 4m; 5a; 5b; 5g; 5m; 6d |

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| 9 | 2nd Oct. PM | **ITAP 2: Checking for understanding.**<br>**Objectives:**<br>*How do I ask and respond to questions in my subject?*<br>To begin to be able to:<br>Ask effective questions to check pupil understanding.<br>Respond effectively to hesitant or incorrect pupil responses.<br>Explore different modes of pupil responses (e.g. written responses). | KC/HD | | | 2, 5, 6, 7, 9 | |
| 10 | 9th Oct. AM | **ITAP 3: Checking for understanding.**<br>**Objectives:**<br>*How do I ask and respond to questions in my subject?*<br>To begin to be able to:<br>Ask effective questions to check pupil understanding.<br>Respond effectively to hesitant or incorrect pupil responses.<br>Explore different modes of pupil responses (e.g. written responses) | KC | Feeley, M. and Karlin, B. (2023) *The Teaching and Learning Playbook*. Abingdon: Routledge.<br>Lemov, D. (2021) *Teach Like A Champion 3.0*. Wiley: Oxford.<br>Sherrington, T. (2019) *Rosenshine's Principles in Action*. John Catt Educational: Melton.<br>Wiliam, D. (2014) 'The Right Questions, The Right Way', *Educational Leadership*. Vol 71(6) pp.16-19<br>Nina Eliasson, Karl Göran Karlsson & Helene Sørensen (2017): The role of questions in the science classroom – how girls and boys respond to teachers' questions, International Journal of Science Education | **Discuss with your mentor:**<br>*Formative assessment*<br>The school's assessment policy.<br>Key formative assessment strategies used routinely within the Science department.<br>**Activity:**<br>ITAP Booklet for details.<br>**Observation focus:**<br>How do Science teachers organise pupil responses e.g. cold calling, hands up, mini white boards?<br>What types of questions do Science teachers ask e.g. closed, open, extended answer? | 2, 5, 6, 7, 9 | 3.3; 4.6; 5.1; 5.8; 6.1; 6.2; 6.3; 6.4; 6.5; 6.7; 8.2<br>3d; 3j; 4m; 4n; 5b; 5n; 6a; 6d; 6e; 6g; 6o; 6p |

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| 11 | 9th Oct. PM | **ITAP 3: Explanations.**<br>**Objectives:**<br>*How to I model and explain knowledge, processes and skills in my subject?*<br>To begin to be able to:<br>Model and explain one aspect of my subject.<br>Break down complex concepts or skills into bite-size chunks.<br>Practise the 'hand-over' from teacher to pupil activity. | KC/HD | | How do Science teachers support pupil responses e.g. extended wait time, 'say it better'? | 2, 5, 6, 9 | |
| 12 | 16th Oct. AM | **ITAP 4: Effective Practical (SKD).**<br>**Objectives:**<br>*How do I deploy a subject-specific pedagogy effectively?*<br>To begin to be able to:<br>Use subject-specific pedagogy to support pupil knowledge, understanding and skills.<br>Promote the use of appropriate subject-specific vocabulary.<br>Recognise and respond to common pupil misconceptions associated with learning my subject. | HD | Abrahams I. and Millar R., (2008), Does Practical Work Really Work? A study of the effectiveness of practical work as a teaching and learning method in school science, *International Journal of Science Education*, 30:14, 1945-1969.<br>Gericke, N., Högström, P. and Wallin, J. (2022) 'A systematic review of research on laboratory work in Secondary School', *Studies in Science Education*, 59(2), pp. 245–285.<br>Oliveira H. and Bonito J. (2023) Practical work in science education: a systematic literature review. *Frontiers in Education* 8<br>Osborne, J. (2015) Practical work in science: misunderstood and badly used? *School Science Review*, 96 (357), pp. 16-24.<br>OFSTED 2021. Research review series: science. OFSTED 2023. Finding the optimum: the science subject report. Research and Analysis.<br>Sharpe R. and Abrahams I. (2020). Secondary school students' attitudes to practical work in biology, chemistry and physics in England. *Research in Science and Technology Education* 38, 84–104. | **Discuss with your mentor;** *Purpose of Practical work*<br>How Science teachers:<br>Use practical work to develop pupils' substantive and/or disciplinary knowledge.<br>Ensure practical work is accessible to all pupils.<br>Evaluate the effectiveness of practical strategies for particular groups of pupils.<br>**Activity:**<br>Organise a lesson observation of a science lesson in which a whole class practical takes place.<br>**Observation focus:**<br>How do Science teachers ensure practical work is accessible to all pupils?<br>How do Science teachers check for understanding? | 1, 2, 3, 5, 6, 9 | 3.2; 3.5; 3.6; 3:10; 4.7; 4.9; 4.10; 5.7; 6.2; 7.2; 8.2; 8.5; 8.9<br>3a; 4k; 4l; 4o; 5a; 5g; 5p; 5q; 7c; 7d; 7h; 8a; 8d; 8i; 8j; 8k |
| 13 | 16th Oct. PM | **ITAP 4: Effective Practical (SKD).**<br>**Objectives:** | KC/HD | | | 1, 2, 3, 5, 6, 9 | |

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| | | *How do I deploy a subject-specific pedagogy effectively?*<br>To begin to be able to:<br>Use subject-specific pedagogy to support pupil knowledge, understanding and skills.<br>Promote the use of appropriate subject-specific vocabulary.<br>Recognise and respond to common pupil misconceptions associated with learning my subject. | | | | | |
| 14 | 23rd Oct. AM | **Physics SKD – Forces & Energy.**<br>**Pedagogy focus - Intro to misconceptions.**<br>**Objectives:**<br>To identify pupil misconceptions in KS3 Forces and Energy.<br>To explore the stores and pathways model for teaching energy at KS3. | KC | Millar, R. (2005). Teaching about energy. York: University of York, Department of Educational Studies. Available at: http://eprints.whiterose.ac.uk/129328/1/2005_Millar_Teaching_about_energy.pdf<br>Tracy, C. (2014). Energy in the new curriculum: an opportunity for change. *School Science Review*, 96(354): 51-61.<br>Suprapto, N. (2020). Do We Experience Misconceptions?: An Ontological Review of Misconceptions in Science. *Studies in Philosophy of Science and Education*, *1*(2), 50-55. https://doi.org/10.46627/sipose.v1i2.24 | **Discuss with your mentor:**<br>*Misconceptions*<br>How do teachers prepare and plan for misconceptions?<br>How do teachers use demonstration, explanation, use of models or practical to address pupils' understanding?<br>*Literacy – key vocabulary*<br>**Activity**<br>Read the school's literacy policy.<br>Plan and trial a couple of strategies to introduce new vocabulary in your own lesson/part-lessons.<br>**Observation focus:**<br>How do Science teachers introduce new vocabulary during lessons? | | 2.2, 2.7, 2.10, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3,<br>2.a, 2.b, 2.c, 2.d, 2.e, 2.f, 2.g, 3.a, 3.b, 3.c, 3.d, 3.e, 3.h, 3.i, 3.m, 4.a, 4.b, 4.d, 4.e, 4.h, 4.l, 5.h, 5.k, |
| 15 | 23rd Oct. PM | **Chemistry SKD - KS3 Rocks.**<br>**Pedagogy focus: Literacy in science.**<br>**Objectives:** | HD | **Rocks:**<br>Jones, S. and Saville, C. (2022) 'Earth Science', in V. Kind and K. Aston (eds), *Teaching Secondary Chemistry*, 3rd edition. Series Editor C. Harrison, Hodder Education, pp. 347-370.<br>**Websites:** | **Discuss with your mentor:**<br>What are the whole school literacy initiatives?<br>How are these initiatives being addressed in the department?<br>**Activity:** | 3, 4, 5, 6, 7 | Literacy<br>3.9; 3.10; 3.12; 5.1; 5.3<br>3p; 3q; 3r; 3s<br>SKD |

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| | | To explore creative approaches in teaching KS3 Rocks.<br><br>To begin to scaffold and support the development of pupils' vocabulary and reading skills. | | Earth Learning Idea - Innovative, Earth-related teaching ideas<br><br>Secondary \| The Geological Society of London<br><br>**Literacy:**<br><br>Education Endowment Foundation (2018) Improving Literacy in Secondary Schools. Link: Improving Literacy in Secondary Schools \| EEF<br><br>Clark, C., Picton, I., Cole, A., & Bonafede, F. (2024). Children and Young People's Writing in 2024. London: National Literacy Trust.<br><br>**Subject Knowledge Audit P2a** | Read the school's literacy policy.<br><br>Observation focus:<br><br>How do teachers develop pupils' literacy during lessons?<br><br>Plan and trial a couple of literacy strategies to deliver in your own lessons/part-lessons. | | 6.1; 6.2<br><br>4l; 6a; 6e; 6g |
| 16 | 6th Nov. AM | **Physics SKD – Simulations.**<br><br>**Pedagogy focus: Working with professional organisations.**<br><br>**IoP - Supporting physics teaching.**<br><br>**Objectives:**<br><br>To explore the use of simulations and games in teaching Physics.<br><br>To review creative approaches to teaching Physics at KS3.<br><br>**Guest: David Harley** | KC | Sheffield, R. S., Koul, R. B., & Sims, C. (2024). Game-based science simulations to support learning and teaching: Science pre-service teachers' perceptions. *Innovation and Education*, *6*(1), 1-29. https://doi.org/10.1163/25248502-bja00003 | **Discuss with your mentor;**<br><br>*Simulations.*<br>How are simulations used to enhance learning in the science classroom?<br><br>**Activity:**<br><br>Identify a simulation on the PhET website (https://phet.colorado.edu/) from a topic that you will be teaching and plan how this simulation could be used in a lesson.<br><br>**Observation focus:**<br><br>How do science teachers use simulations, games or videos in their lessons? | 2, 5 | 3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 5.7, 5.8, 5.9<br><br>3.a, 3.b, 3.c, 3.d, 3.e, 3.f, 3.g, 3.h, 3.i, 3.m, 4.a, 4.b, 4.d, 4.e, 4.f, 4.g, 4.h, 4.k, 4.l, 4.m, 5.h, 5.k, 5.l |

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| 17 | 6th Nov. PM | **Physics SKD - Light & Thermal Physics.**<br>**Pedagogy focus: Kinaesthetic learning activities.**<br>**Objectives:**<br>Consider modelling of light.<br>Apply principle of conservation of energy to heating and cooling.<br>Revisit stores & pathways model. | KC | https://www.stem.org.uk/resources/library/collection/14586/light-waves<br><br>https://www.thenational.academy/teachers/programmes/science-secondary-ks3/units/making-images/lessons/focusing-light | | 2, 5, 6 | 2.1, 2.2, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.7, 4.8, 4.9, 4.10, 5.3, 5.5, 5.6, 5.7, 5.8<br><br>2.e, 2.f, 2.g, 3.f, 3.g, 3.h, 3.i, 3.m, 4.a, 4.b, 4.d, 4.e, 4.h, 4.i, 4.m, 4.o, 5.k, 5.l, 5.m |
| 18 | 13th Nov. AM | **AS2 Briefing**<br><br>**Chemistry SKD - KS4 The Basics.**<br>**Pedagogy focus:**<br>**Objectives:**<br>To identify strategies and techniques to use in developing pupils' basic chemical literacy.<br>To rehearse scaffolding difficult chemical concepts and skills. | HD | Johnstone, A. H. (2000) *Chemistry Education: Research and Practice in Europe*, Vol 1, No. 1, 9-15.<br>Kind, V. (2004). Beyond appearances: Students' misconceptions about basic chemical ideas (2nd ed.). Durham: Durham University.<br>Wong. V. (2022) I 'The Periodic Table' in K. Ashton and V. Kind (eds), *Teaching Secondary Chemistry,* The Association for Science Education. (3rd Edition). London: Hodder Education, pp.89.<br><br>**Websites:**<br>Interactive Periodic Table:<br>Periodic Table – Royal Society of Chemistry Accessed 07.26<br>Introducing Periodic Table:<br>www.stem.org.uk/resources/library/collection/12562/periodic-table Accessed 07.26<br>Atomic Structure:<br>www.stem.org.uk/resources/library/collection/10125/atomic-structure Accessed 07.26 | **Discuss with your mentor:**<br>*Numeracy*<br>How Science teachers prepare for, and deliver, maths content in lessons.<br>**Activity:**<br>Organise a lesson observation within the Maths Department.<br>**Observation focus:**<br>What vocabulary does the teacher emphasise?<br>How does the teacher model – chunking, narrating, checking, handing over? | 2, 3, 4, 5, 6, 7, 9 | 2.1; 2.2; 2.3; 2.4; 2.5; 2.6; 2.7; 2.8; 2.9; 3.3; 3.5; 5.2<br>2e; 2f; 2i; 3a; 3b; 3h; 3k; 3l; 4g; 4h; 5m; 8e |

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| 19 | 13th Nov. PM | **Chemistry SKD – Calculations.**<br>**Pedagogy focus: Numeracy.**<br>**Objectives:**<br>To identify the key mathematical skills required in chemistry.<br>To rehearse explaining and modelling key mathematical skills required in chemistry. | HD | Boohan, R. & Needham R. (2016) *'The Language of Mathematics in Science – A Guide for Teachers of 11-16 Science.'* Association of Science Education.<br>Boxer, A. (2021) '*Teaching Secondary Science.'* John Catt Educational Ltd.<br>AQA: Maths skills in GCSE sciences<br>GCSE Science 8464 \| Teaching Resources \| AQA Accessed 07.26<br>Edexcel: Guide to Maths for Scientists<br>https://spark.iop.org/sites/default/files/media/documents/Guide-to-Maths-for-Scientists.pdf Accessed 07.26<br>OCR: Mathematics Skills Handbook<br>www.ocr.org.uk/Images/310651-mathematical-skills-handbook.pdf Accessed 07.26 | **Discuss with your mentor:**<br>**Activity:**<br>Organise a lesson observation within the Maths Department.<br>Observation focus:<br>What vocabulary is emphasised?<br>How does the teacher model – chunking, narrating, checking, handing over? | 2, 3, 5, 6, 7, 9 | 2.2; 3.3; 3.5; 3.8; 3.11; 4.3; 4.4; 4.6; 4.8; 5.8<br>2b; 2c; 3a; 3c; 4a; 4b; 4c; 4f; 4i; 5b; 6e; 8e |
| **16th Nov.: AS1 submission** | | | | | | | |
| 20 | 20th Nov. AM | **Physics SKD - Springs & Stretching.**<br>**Pedagogy focus: Numeracy & Graphs.**<br>**Objectives:**<br>To consider the use of applications of materials in the real world to engage pupils and facilitate learning.<br>To explore the use of mathematics in physics with reference to problem solving and data representation. | KC | Hüfner, S. *et al.* (2025) 'Context-based science education to promote diversity-equity-inclusion – a systematic literature review on the understanding of *context* in science education', *Studies in Science Education*, pp. 1–41. doi:10.1080/03057267.2025.2563946. | **Discuss with your mentor:**<br>*Explanations.*<br>How do Science teachers use analogies and contextual examples to enhance their explanations?<br>**Activity:**<br>Observe a science lesson and identify the key elements used by a teacher to produce an effective explanation.<br>**Observation focus:**<br>What are the key elements of a goof explanation? | 2, 3, 5, 6, 7 | 2.10, 3.2, 3.3, 3.5, 3.6, 3.7, 3.11, 4.1, 4.2, 4.3, 4.4, 4.7, 4.8<br>2.b, 3.a, 3.b, 3.g, 3.h, 3.i, 3.m, 4.a, 4.b, 4.d, 4.e, 4.g, 4.h, 4.i, 4.k, 4.m, 4.o |

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| 21 | 20th Nov. PM | **Physics SKD - Electricity.**<br>**Pedagogy focus: Explanations revisited and using models.**<br>**Objectives:**<br>To develop an understanding of basic circuit principles and understand the conceptual challenge for pupils. | KC | J.-P. Burde and T. Wilhelm, Teaching electric circuits with a focus on potential differences, Phys. Rev. Phys. Educ. Res. **16**, 020153 (2020). | | | 2.2, 3.2, 3.3, 3.5, 3.6, 3.7, 4.2, 4.3, 4.4, 4.7, 4.8, 5.5, 5.8<br><br>2.a, 2.b, 3.a, 3.b, 3.c, 3.e, 3.h, 3.i, 3.l, 3.m, 3.p, 3.q, 3.s, 4.a, 4.d, 4.e, 4.f, 4.g, 4.i, 4.k, 5.a, 5.b, 5.g, 5.h, 5.k, 5.l, 5.m |
| 22 | 27th Nov. AM | **Biology SKD - Microscopes.**<br>**Pedagogy focus: Practical work.**<br>**Objectives:**<br>To be able to set up a light microscope.<br>To prepare temporary slides of animal and plant materials.<br>To add risk assessments to your tool kit.<br>To list the advantages and disadvantages of alternatives approaches to using microscopes.<br>To practise methods for measuring the water potential of a plant tissue. | RT | A GCSE Biology Specification:<br>https://www.aqa.org.uk/subjects/biology/gcse/biology-8461/specification/specification-at-a-glance<br><br>An AS/A Level Specification:<br>https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF | **Discuss with your mentor:**<br>*Literacy revisited – key vocabulary*<br>How do Science teachers introduce and consolidate new vocabulary? For example, is new vocabulary pre-taught?<br>*Controversial issues*<br>How do Science teachers plan and prepare for potentially controversial content including practical investigation such as dissection?<br>How do Science teachers respond to differing pupil attitudes towards controversial practical work?<br>**Activity**<br>Plan and trial a couple of literacy strategies (vocabulary or reading) to deliver in your own lesson/part-lessons.<br>**Observation focus:**<br>What strategies and techniques do Science teachers use to reinforce new vocabulary? | 1, 3, 4, 6, 8, 9, 10 | 4.6; 4.7; 6.1; 6.2; 6.3; 6.4; 6.5; 6.6; 6.7; 7.3; 7.5; 7.6<br><br>2a; 2b; 2c; 2d; 2e; 2f; 2g; 3a; 3b; 3c; 3d; 3e; 3f; 3h; 3i; 3p; 3s; 4a; 4b; 4d; 4f; 4g; 4h; 4l; 4m; 8d |

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| 23 | 27th Nov. PM | **Biology SKD – Dissection.**<br>**Pedagogy focus: Ethical practice.**<br>**Objectives:**<br>To discuss the advantages and disadvantages of using animals and animal material in the classroom.<br>To explain a safe set of protocols for conducting dissections.<br>To perform a dissection safely.<br>To discuss ethical ways to organise dissections in classrooms. | RT | A GCSE Biology Specification:<br>https://www.aqa.org.uk/subjects/biology/gcse/biology-8461/specification/specification-at-a-glance<br><br>An AS/A Level Biology Specification:<br>https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF | | 1, 3, 4, 6, 8, 9, 10 | 4.6; 4.7; 6.1; 6.2; 6.3; 6.4; 6.5; 6.6; 6.7; 7.3; 7.5; 7.6<br>2a; 2b; 2c; 2d; 2e; 2f; 2g; 3a; 3b; 3c; 3d; 3e; 3f; 3h; 3i; 3p; 3s; 4a; 4b; 4d; 4f; 4g; 4h; 4l; 4m; 8d |
| 24 | 4th Dec. AM | **Chemistry SKD – Experimentation. Part I: Required Practicals.**<br>**Pedagogy focus: Assessment (AOs).**<br>**Objectives:**<br>To develop disciplinary chemistry skills and consider how these can be used to consolidate pupils' understanding of scientific concepts.<br>**Part II - Demonstration.**<br>**Pedagogy focus – Modelling.**<br>**Objectives:** | HD | A GCSE Chemistry Specification:<br>GCSE Chemistry 8462 \| Specification \| Specification At A Glance \| AQA<br>Ashton, K. and Kind, V. (2022). *Teaching Secondary Chemistry.* The Association for Science Education. (3rd Edition). London: Hodder Education.<br>Chromatography pp. 273-281.<br>Making salts pp.209-214.<br>Rate pp.168-185.<br>Titration pp. 214-220.<br>**Websites:**<br>https://thescienceteacher.co.uk/demonstrations-in-science/<br>https://sciencedemo.org/resources<br>Biology demonstrations:<br>https://www.stem.org.uk/resources/library/collection/stemlist10493/biology-demonstrations-and-practical-work<br>Chemistry demonstrations:<br>https://www.stem.org.uk/resources/library/collection/stemlist10492/chemistry-demonstrations | **Discuss with your mentor:**<br>*Demonstration*<br>How do Science teachers prepare for demonstration? What strategies do they use to ensure pupil engagement and check pupil understanding during the demonstration?<br>**Activity:**<br>Organise a lesson observation in Art and Design or DT.<br>**Observation focus:**<br>What routines are in place when the teacher demonstrates?<br>How does the teacher promote pupil engagement and check understanding?<br>**Activity:**<br>Explore the RSC Seven Simple Rules<br>https://edu.rsc.org/eic/collections/simple-rules<br>Identify an aspect which aligns with a Weekly Meeting Target and set some specific actions. | 2, 3, 5, 6, 7, 8, 9 | 3.1; 4.9; 4.10; 4.11; 5.2; 5.5; 5.7; 5.8<br>4e; 4k; 4m; 5g; 5i; 5q; 6c; 6h; 6k |

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| | | To evaluate advantages and disadvantages of teacher demonstration.<br><br>To gain confidence in conducting key chemistry demonstrations. | | https://www.stem.org.uk/resources/library/collection/stemlist15582/hidden-gems-practical-chemistry<br><br>Physics demonstrations:<br><br>https://www.stem.org.uk/resources/library/collection/10479/physics-demonstrations | | | |
| 25 | 4th Dec. PM | **Chemistry SKD.**<br><br>**Pedagogy focus: Working with professional organisations.**<br><br>**RSC - Supporting Chemistry.**<br><br>**Objectives:**<br><br>To work with professional organisations to enhance resourcing and delivery of chemistry lessons.<br><br>**Guest: Kat Presland** | HD | Royal Society of Chemistry (RSC)<br><br>Link: The Royal Society of Chemistry<br><br>https://edu.rsc.org/eic/collections/simple-rules<br><br>Archer, L., Moote, J., MacLeod, E., Francis, B., & DeWitt, J. (2020). ASPIRES 2: Young people's science and career aspirations, age 10-19. London: UCL Institute of Education.<br><br>Archer, L., DeWitt, J., Godec, S., Henderson, M., Holmegaard, H., Liu, Q., MacLeod, E., Mendick, H., Moote, J. and Watson E. (2023). *ASPIRES3 Summary Report: Chemistry.* London, UCL.<br><br>ASPIRES3 Chemistry.pdf | | 2, 3, 9, 10 | 1.1; 1.2; 1.8; 5.3; 8.1; 8.3; 8.7<br><br>8a; 8b; 8d; 8o |
| 26 | 18th Dec. AM | **Museum Trip.**<br><br>**Pedagogy focus: Inclusive Science Curriculum.**<br><br>**Objectives:**<br><br>To identify and discuss opportunities to address inequality and lack of representation in science lessons.<br><br>To consider the role of museums in creating a more inclusive and critically engaged science education. | KC/HD | Gandolfi, H. E. (2021) Decolonising the science curriculum in England: Bringing decolonial science and technology studies to secondary education. *The Curriculum Journal,* 32, 510–532.<br><br>Archer, L., DeWitt, J., Godec, S., Henderson, M., Holmegaard, H., Liu, Q., MacLeod, E., Mendick, H., Moote, J. and Watson E. (2023). *ASPIRES3 Summary Report: Chemistry.* London, UCL.<br><br>The importance of equality, diversity and inclusion in physics - IoP<br><br>Websites:<br><br>https://www.linnean.org/learning/who-was-linnaeus/linnaeus-and-race<br><br>www.iop.org/sites/default/files/2021-01/IOP-10-inclusive-tips-for-teachers.pdf<br><br>**Subject Knowledge Audit P2b** | **Activity:**<br><br>Review the examples of inclusive science delivered by LJMU ITT student teachers in 2025-26 (preparation for your delivery in phase 2b/3). | 3, 6, 9, 10 | 1.1; 1.2; 3.1; 4.1; 4.9; 4.10; 4.11; 5.3;<br><br>3c; 5k; 8o |

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| 27 | 18th Dec. PM | **Practical work – Required Practical presentations.**<br>**Objectives:** | KC/HD | | | 3, 6, 9, 10 | |
| 28 | 26th Feb AM | **Biology SKD**<br>**Pedagogy focus: Science Practical Work and Modelling.**<br>**Objectives:**<br>To discuss a range of models used in school science.<br>To identify the features of good models for use in school science.<br>To be aware of free sources for science models and add them to your toolkit. | RT | Harlen, W (1999), Effective Teaching of Science: A Review of Research, The Scottish Council for Research in Education.<br>Department for Education (2010), The Importance of Teaching: The Schools White paper 2010, London: The Stationary Office.<br>Osborne, J. (2015) Practical work in science: misunderstood and badly used? *School Science Review*, 96 (357), pp. 16-24.<br>Cavagnetto, A.R. (2010) Argument to foster scientific literacy: a review of argument interventions in K12 science contexts, *Review of Educational Research*, 80(3), pp.336-371.<br>Tynan, R., Jones, R.B., Mallaburn, A. and Clays, K. (2016) Working towards evidence-based practice in science teaching and learning, *School Science Review*, 97 (361), pp. 109-115. | **Discuss with your mentor:**<br>*Practical work and modelling*<br>The role and approach to science practical work and explaining complex science concepts in your school's science area.<br>**Observation focus:**<br>Arrange an observation to focus on the teacher's demonstration or use of models. | 1, 2, 3, 4, 6, 8, 9, 10 | 1.1; 1.2; 2.1; 2.2; 2.3; 2.4; 2.5; 2.6; 2.8; 2.9; 3.1; 3.2; 3.3; 3.4; 3.5; 3.6; 3.7; 3.8; 4.3; 8.2<br>2a; 2b; 2c; 2h; 2i; 2j; 2k; 3g; 3h; 3i, 3j; 3k; 3m; 8d |
| 29 | 26th Feb PM | **Pedagogy focus 1: Misconceptions revisited.**<br>**Pedagogy focus 2:**<br>**Teaching controversial Issues.**<br>**Objectives:**<br>To use a range of strategies to address pupil misconceptions.<br>To develop a pedagogical toolset to aid the decision-making process when teaching controversial issues.<br>**Guest: Marc Crehan** | HD/MC | EEF resources for addressing misconceptions<br>https://educationendowmentfoundation.org.uk/news/eef-blog-introducing-new-resources-for-sorting-out-scientific-misconceptions<br>Bezalel, G.Y. (2023) *Teaching Classroom Controversies: Navigating Complex Teaching Issues in the Age of Fake News and Alternative Facts*. Taylor & Francis.<br>Britt, M.A., Richter, T. and Rouet, J.-F. (2014) 'Scientific Literacy: The Role of Goal-Directed Reading and Evaluation in Understanding Scientific Information', *Educational Psychologist*, 49(2), pp. 104–122. Available at: https://doi.org/10.1080/00461520.2014.916217. | **Discuss with your mentor:**<br>How they prepare to address common misconceptions.<br>Controversial Issues.<br>How they plan and prepare for potentially controversial practical investigation such as dissection.<br>How they respond to differing pupil attitudes towards controversial practical work. | 2, 3, 5, 6 | 2.7; 3.1; 3.4; 3.6; 4.1; 4.7; 7.8<br>3e; 4l; 7g; 7n; 7q |

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| | | | | Claire, H. (2001) 'Dealing with controversial issues with primary teacher trainees as part of citizenship education'.<br><br>Department for Education (2022) *Political impartiality in schools*, *GOV.UK*. Available at: https://www.gov.uk/government/publications/political-impartiality-in-schools/political-impartiality-in-schools (Accessed: 30 April 2023).<br><br>García-Carmona, A. (2023) 'Scientific Thinking and Critical Thinking in Science Education', *Science & Education* [Preprint]. Available at: https://doi.org/10.1007/s11191-023-00460-5.<br><br>Garrecht, C. *et al.* (2022) '"Should We Be Doing It, Should We Not Be Doing It, Who Could Be Harmed?" Addressing Ethical Issues in Science Education', *Science & Education*, pp. 1–33.<br><br>**Subject Knowledge Audit P3a** | | | |
| **1st March: AS2 submission** | | | | | | | |
| 30 | 5th Mar. AM | **Biology SKD - Food Tests & Enzymes.**<br>**Pedagogy focus: Practical work**<br>**Objectives:**<br>To perform food tests.<br>To see positive and negative results of food tests for major food macromolecules and glucose | RT | A GCSE Biology Specification:<br>https://www.aqa.org.uk/subjects/biology/gcse/biology-8461/specification/specification-at-a-glance | **Discuss with your mentor:**<br>The importance of enzyme mediated reactions in the metabolism and ways to counter the misconception that enzymes are only important in the process of digestion.<br>Ways of making botany more attractive to school aged learners.<br>**Activity:**<br>Construct and trial an investigation into the optimum temperature and pH for a biological detergent and compare with advertising claims.<br>**Observation focus:** | 1, 3, 4, 6, 8, 9, 10 | 4.6; 4.7; 6.1; 6.2; 6.3; 6.4; 6.5; 6.6; 6.7; 7.3; 7.5; 7.6<br>2a; 2b; 2c; 2d; 2e; 2f; 2g; 3a; 3b; 3c; 3d; 3e; 3f; 3h; 3i; 3p; 3s; 4a; 4b; 4d; 4f; 4g; 4h; 4l; 4m; 8d |

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| | | To compare suggested approach for enzyme required practical and alternative enzyme rate of reaction methods. | | | Organise an observation linked to your weekly targets. | | |
| 31 | 5th Mar. PM | **Biology SKD – Plants.**<br>**Pedagogy focus: Practical work**<br>**Objectives:**<br>To practise a range of plant related practical studies. | RT | A GCSE Biology Specification:<br>https://www.aqa.org.uk/subjects/biology/gcse/biology-8461/specification/specification-at-a-glance | | | 4.6; 4.7; 6.1; 6.2; 6.3; 6.4; 6.5; 6.6; 6.7; 7.3; 7.5; 7.6<br>2a; 2b; 2c; 2d; 2e; 2f; 2g; 3a; 3b; 3c; 3d; 3e; 3f; 3h; 3i; 3p; 3s; 4a; 4b; 4d; 4f; 4g; 4h; 4l; 4m; 8d |
| 32 | 12th Mar. AM | **Chemistry SKD - Ions in Context.**<br>**Pedagogy focus: Assessment & literacy (pupil writing).**<br>**Objectives:**<br>To consider how to organise, resource and facilitate practical work to develop pupils' disciplinary knowledge for the chemistry ionic bonding topic.<br>To explore how to scaffold and support the development of pupils' writing skills, including for assessment.<br>**Guest: Menna Goodwin** | HD/MG | A GCSE Chemistry Specification:<br>GCSE Chemistry 8462 \| Specification \| Specification At A Glance \| AQA<br>**Pre-session reading**:<br>https://www.ljmu.ac.uk/research/centres-and-institutes/the-liverpool-institute-for-research-in-education/expertise/the-absolute-chemistry-research-group<br>**Pre-Session Task:**<br>Watch the Electrolysis videos:<br>GCSE Chemistry Revision "Introducing Electrolysis"<br>https://youtu.be/AhTRiL6xjBA?si=Pu0S3Yt_WU32YbBvLinks to an external site.<br>Ashton, K. and Kind, V. (2022). *Teaching Secondary Chemistry.* The Association for Science Education. (3rd Edition). London: Hodder Education. | **Discuss with your mentor:**<br>Literacy – writing<br>How are pupils writing skills developed over time?<br>What strategies are used to support pupils in producing extended written answers?<br>How are pupils supported for writing in GCSE examinations?<br>**Activity:**<br>Work through examples of pupils' work to explore how the extended answers are level marked.<br>**Observation focus:**<br>Organise an observation linked to your weekly targets. | 1, 2, 3, 4, 5, 6, 7 | SKD<br>1.3; 3.4; 3.5; 3.6; 4.2<br>2f; 3a; 3d<br>Literacy<br>3.3; 3.10; 4.3; 4.5; 4.8; 6.1; 6.4; 6.5; 6.7; 8.2<br>1b;1c; 2j; 3p; 3q; 3t; 4b; 4g; 4h; 4i; 5k; 6c; 6e; 6f; 6i; 6p; 6q; 6r |

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| 33 | 12th Mar. PM | **Chemistry SKD – Enthalpy.**<br>**Pedagogy focus: Sequencing the curriculum.**<br>**Objectives:**<br>To explore key practical activity from the chemical energy changes topic.<br>To develop understanding of the features of midterm planning for the chemical energy changes topic. | HD | Childs, A. & Dixon, N., (2022) Energetics, rate and extent of chemical change in K. Ashton, and V. Kind, (eds), Teaching *Secondary Chemistry* (3rd Edition), Association for Science Education, Hodder Education pp. 152 –168. | | 2, 3, 4, 5, 6 | 1.3; 2.2; 4.10<br>2e; 2f; 3b; 3h; 5l |
| 34 | 19th Mar. AM | **Physics SKD - Density & viscosity**<br>**Pedagogy focus: Narrative approaches**<br>**Objectives:**<br>Practise standard experimental techniques and evaluate data.<br>Link practical work to substantive knowledge. | KC | Clough, M. (2011). The story behind the science: Bringing science and scientists to life in post-secondary science education. Science & Education, 7, 701–717.<br>Website:<br>https://www.storybehindthescience.org/ | **Discuss with your mentor:**<br>*Narrative approaches.*<br>How do Science teachers use stories to add interest and link ideas together?<br>How do Science teachers use context to add relevance to science content?<br>**Activity:**<br>Visit https://www.storybehindthescience.org/ and choose one story to use in a lesson.<br>**Observation focus:**<br>Organise an observation linked to your weekly targets. | 4, 5, 6 | 3.2, 3.3, 3.7, 3.10, 3.12, 4.2, 4.7, 4.8, 4.9, 4.10, 5.5, 5.6, 5.8<br>3.a, 3.b, 3.h, 3.l, 3.m, 3.p, 3.q, 3.r, 3.s, 4.a, 4.b, 4.f, 4.h, 4.l, 4.m, 4.o |
| 35 | 19th Mar. PM | **Physics SKD – Moments.**<br>**Pedagogy focus: Inclusion.**<br>**Objectives:**<br>Practise standard experimental techniques and evaluate experimental data. | KC/VE | Essex, Jane. (2023). Inclusive and Accessible Secondary Science: How to Teach Science Effectively to Students with Additional or Special Needs.<br>Website:<br>https://whiteroseeducation.com/latest-news/inclusion-by-design-in-the-science-classroom | | | 2.6, 3.5, 3.7, 3.12, 4.2, 4.8, 4.9, 4.10, 5.1, 5.2, 5.3, 5.4, 5.5, 5.7, 5.8, 5.9, 8.6, 8.8<br>2.a, 2.b, 2.c, 2.g, 3.m, 4.h, 4.l, 4.m, 4.o, 5.a, 5.b, 5.c, |

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| | | Explore strategies to support pupils when carrying out practical work. | | | | | 5.e, 5.i, 5.k, 5.l, 5.m, 8.j |
| 36 | 16th Apr. AM | **Pedagogy focus: Cross curricular working - Biology/Geography Field Trip.**<br>**Objectives:**<br>To visit to a field site within easy reach of Merseyside schools and complete Required Practical work that can be completed within a school day.<br>To discuss amenity, use and reserve management.<br>To demonstrate seral stages.<br>To use the unique attributes of Sand Dunes, | RT | A GCSE Biology Specification:<br>https://www.aqa.org.uk/subjects/biology/gcse/biology-8461/specification/specification-at-a-glance<br>An AS/A Level Specification:<br>https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF<br>Extensive range of materials available on Canvas including:<br>Tynan, R. (2023) The importance of ecology fieldwork in English secondary school curricula, EDULEARN23 Proceedings, pp. 2789-2797<br>Tynan, R. (20240 Using the school playing field to meet the practical requirements associated with ecology substantive knowledge in current biology examination specifications in England, INTED2024 Proceedings, pp, 705-414<br>https://www.field-studies-council.org/ | **Discuss with your mentor:**<br>*Learning Outside the Classroom*<br>How does the school support KS4 fieldwork and what fieldwork days do they complete?<br>The role of green issues and sustainability in school curricula including citizenship.<br>Local and national nature reserves and the conservation of amenity areas.<br>How do we meet the needs of the more able pupil?<br>**Activity:**<br>Follow up data analyses and upload to Canvas.<br>Present findings on Canvas.<br>**Observation focus:**<br>Organise an observation linked to your weekly targets. | | 4.6; 4.7; 6.1; 6.2; 6.3; 6.4; 6.5; 6.6; 6.7; 7.3; 7.5; 7.6<br>2a; 2b; 2c; 2d; 2e; 2f; 2g; 3a; 3b; 3c; 3d; 3e; 3f; 3h; 3i; 3p; 3s; 4a; 4b; 4d; 4f; 4g; 4h; 4l; 4m; 8d |
| 37 | 16th Apr. PM | **Pedagogy focus: Cross curricular working - Biology/Geography Field Trip.**<br>**Objectives:**<br>To visit to a field site within easy reach of Merseyside schools and discuss amenity, use and reserve management.<br>To demonstrate seral stages.<br>To use the unique attributes of Sand Dunes. | RT | | | | |

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| 38 | 23rd Apr. AM | **Teaching A level Sciences.**<br>**Pedagogy focus: KS4 to KS5 Transition.**<br>**Objectives:**<br>**Biology**<br>To experience Required Practicals and develop biology substantive knowledge.<br>To explore the AQA AS/A Biology specification requirement for statistical analysis.<br>**Chemistry**<br>To experience Required Practicals and develop chemistry substantive knowledge.<br>To explore the AQA AS/A Chemistry specification requirements for assessment of Required Practical activity.<br>**Physics**<br>To experience Required Practicals and develop physics substantive knowledge.<br>To explore the GCE Physics core and consider the required practical activities. | KC/HD/RT | **Biology**<br>Extensive range of materials provided on Canvas including:<br>Tynan, R. (2023) Learning, teaching, and assessing challenging biology concepts and processes using teacher constructed PowerPoint animations,<br>Proceedings of ICERI2023 Conference, ISBN: 978-84-09-55942-82868<br>Tynan, R. (2024) Statistical analysis in Advanced Special and Advanced Level Biology in England, Proceedings of EDULEARN24 Conference, ISBN: 978-84-09-62938-1<br>**Chemistry**<br>An AS/A Level Chemistry Specification:<br>A-level Chemistry 7405 \| Specification \| Specification At A Glance \| AQA<br>Bromfield Lee, D. C., Beggs G. A. (2021) 'Tactile Models for the Visualization,<br>Conceptualization, and Review of Intermolecular Forces in the College Chemistry<br>Classroom', *Journal of Chemical Education*, 98(4), pp.1328-133<br>**Physics**<br>GCE Science Core Material:<br>https://www.gov.uk/government/publications/gce-subject-level-conditions-and-requirements-for-science | **Discuss with your mentor:**<br>*Curriculum delivery and pupil tracking*<br>Does the curriculum develop and challenge pupils?<br>Can specific skills be developed year to year, stage to stage?<br>Are pupils prepared for key stage transitions e.g. KS3 to KS4, KS4 to KS5?<br>Is pupil and class progress monitored over time?<br>**Activity:**<br>Identify and implement strategies to track class and pupil progress over a sequence of lessons. Select and use feedback techniques.<br>**Observation focus:**<br>Organise an observation linked to your weekly targets. | 2, 3, 5, 7 | 3.2; 3.3; 3.5; 3.6; 3.7; 4.1; 4.2; 4.6; 4.7; 4.8; 4.9; 4.10<br>2e; 2f; 2g; 3a; 3b; 3d; 3f; 3h; 3s; 4d; 4e; 4f; 4l; 4m; 4o; 8o |
| 39 | 23rd Apr. PM | **Teaching A level Sciences.**<br>**Pedagogy focus: Transition.**<br>**Objectives:**<br>**Biology** | KC/HD/RT | **Biology**<br>Extensive range of materials provided on Canvas including:<br>Tynan, R. (2023) Learning, teaching, and assessing challenging biology concepts and | | 2, 3, 5, 7 | 3.2; 3.3; 3.5; 3.6; 3.7; 4.1; 4.2; 4.6; 4.7; 4.8; 4.9; 4.10<br>2e; 2f; 2g; 3a; 3b; 3d; 3f; 3h; 3s; 4d; |

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| | | To experience Required Practical and develop biology substantive knowledge.<br>To share A-Level resources.<br>**Chemistry**<br>To experience Required Practical and develop chemistry substantive knowledge.<br>To explore the AQA AS/A Chemistry specification for assessment of Required Practical.<br>**Physics**<br>To experience Required Practical and develop physics substantive knowledge. | | processes using teacher constructed PowerPoint animations,<br>Proceedings of ICERI2023 Conference, ISBN: 978-84-09-55942-82868<br>Tynan, R. (2024) Statistical analysis in Advanced Special and Advanced Level Biology in England, Proceedings of EDULEARN24 Conference, ISBN: 978-84-09-62938-1<br>**Chemistry**<br>Bromfield Lee, D. C., Beggs G. A. (2021) 'Tactile Models for the Visualization, Conceptualization, and Review of Intermolecular Forces in the College Chemistry Classroom', Journal of Chemical Education, 98(4), pp.1328-133<br>**Physics**<br>Pocket Guide to 'A' level Physics:<br>https://www.iop.org/sites/default/files/2021-01/IOP-Education-Pocket-Physics-2021.pdf | | | 4f; 4l; 4m; 4o; 8g; 8o |
| 40 | 30th Apr. AM | **Physics SKD – Space.**<br>**Pedagogy focus: Creativity.**<br>**Objectives:**<br>To introduce ideas of scale and variety in the universe.<br>Explore creative ways of teaching using drama and role play. | KC | Thomas, J.P., 2025. Is there enough space in the curriculum?. School Science Review, 106(393), pp.48-55.<br>Abrahams, I. and Braund, M. eds., 2012. *Performing science: Teaching chemistry, physics and biology through drama*. A&C Black. | **Discuss with your mentor:**<br>*Continuing Professional Development (CPD)*<br>What types of subject specific CPD are offered to teachers?<br>How can barriers to accessing CPD be overcome?<br>How do teachers access external organisations to develop their practice?<br>**Observation focus:**<br>Organise an observation linked to your weekly targets. | 2, 3, 4, 5, 6, 9, 10 | 2.2, 3.2, 3.3, 3.5, 3.6, 3.7, 4.2, 4.3, 4.4, 4.7, 4.8, 5.5, 5.8, 5.9<br>2.a, 2.b, 2.f, 2.g, 3.a, 3.b, 3.c, 3.e, 3.g, 3.h, 3.i, 3.l, 3.m, 3.p, 3.q, 3.s, 4.a, 4.b, 4.d, 4.e, 4.f, 4.g, 4.h, 4.i, 4.k, 5.a, 5.b, 5.g, 5.h, 5.k, 5.l, 5.m |

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| 41 | 30th Apr. PM | **Teach meet.**<br>**Objectives:**<br>Sharing good practice. | KC/HD | https://www.ed.events/post/a-guide-to-teachmeets<br>**Subject Knowledge Audit P3b** | | 3, 5, 6, 9, 10 | 3.2, 4.1, 8.1, 8.2<br>3.c, 3.e, 8.a, 8.b, 8.o |

**Suggested activities and discussion for Phase 3**

1. Shadow marking and internal moderation of GCSE coursework and exams.
2. A level progression.
3. Learning outside of the classroom – organising and leading trips and visits.
4. Enrichment and the role of the subject club.
5. Careers in the subject.
6. Beyond A level to university.

**SKD Sessions:** Biology – 9; Chemistry – 9; Physics - 10

## Phase Expectation Links (PE Links)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
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| High expectations/ safe & inclusive classroom (Q1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effective learning/ applying evidence (Q2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop strong SK/ deliver coherent sequenced curriculum (Q3) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evidence based practice/ literacy & oracy (Q4) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plan & teach well-structured lessons/ model, explain & question (Q5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adapt teaching to meet diverse needs (Q6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Use assessment effectively/ understand learning, provide feedback & inform practice (Q7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Establish & maintain effective behaviour management/ positive learning culture (Q8) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop as an evidence-informed practioner (Q9) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Demonstrate professional knowledge & behaviour/ collaborate (Q10) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## ITTECF Links

| | Learn That | | | | | | | | | | | | Learn How | | | | | | | | | | | | | | | | | | | | | |
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| | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 | .10 | .11 | .12 | .a | .b | .c | .d | .e | .f | .g | .h | .i | .j | .k | .l | .m | .n | .o | .p | .q | .r | .s | .t | .u |
| ITECCF 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITECCF 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |