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| **Biology** | **Biology with PE** | **Chemistry** | **Physics** |

SCHOOL OF EDUCATION

PGCE SECONDARY SCIENCE

September 2024

Day 1 - 16th September 2024 in the North Cloisters Labs in St Luke’s (NC07/08)

Building 1 on the map (use the door by the electric bike rack)

MAP <https://www.exeter.ac.uk/visit/directions/stlukesmap/>

PRE-COURSE INFORMATION

AND TASKS

# Welcome to the Exeter PGCE in Secondary Science

The PGCE Secondary Science Tutors welcome you to the PGCE Secondary Science programme and look forward to meeting you in person on the 16th September 2024 in the North Cloister Labs in St Luke’s. This pack contains information about the programme and some tasks that you should carry out before you join us in Exeter.

The University input is at its most intensive in the first term and to prepare you for school-based work in the following terms we have to cover many elements of teaching. It is therefore very important that you begin your studies during this pre-course phase.

### Becoming a science teacher

The Secondary PGCE Science course is designed to help you understand how pupils learn science and how you can teach it effectively, safely and in an interesting way to all the pupils you will meet in schools. Both major course components (the university-based work and the school-based work) are essential to your development as a science teacher. We do a great deal to ensure that the components are inter-related. You have a major role in being analytical, creative and critical by using what you learn in one component to raise questions and generate possible answers about the things you see and do in the other.

Teaching is an exciting and multi-faceted profession with many different elements. This means that teachers need to be able to manage their time well and stay organised. You will need to use similar skills on the PGCE course, and we will, of course, support you to develop them. To start this process, we encourage you to think about how you will organise your time and course materials from the outset.

The PGCE Secondary Science course is exciting, demanding and rewarding. Our aim is to support you to develop into inspiring, effective teachers of science with fantastic potential and the skills you will need to develop throughout your career as a teacher. You will become a teacher who is able to reflect on your teaching and that of others, as well as access, interpret and conduct research to inform and inspire your own teaching. You will be making a difference to young people’s lives from the outset, and we hope you enjoy the PGCE as the start of this professional journey.

### Possible field trip

While most face-to-face teaching occurs in our well-equipped science labs, we hope that one of the sessions will involve a field trip (weather permitting). There is no charge for this, trainees typically share transportation. Details will be given in advance.

### Subject specific tasks

You will get far more out of the course if you arrive with some understanding of the issues and ideas concerning the teaching of science. This booklet comes with details of tasks that we would like you to complete before the Autumn Term begins.

The science specific tasks require you to:

* Reflect on reading about science teaching and learning.
* Begin to develop self-selected aspects of your science subject knowledge.
* Prepare a teaching activity.

Key action points

Before the course starts in September you need to:

1. Carry out the science specific tasks.
2. Carry out the Fundamental Skills audits detailed on the pre-course tasks section of our [offer holders site](https://www.exeter.ac.uk/study/teachertraining/offerholders/pre-courseinformationandtasks/secondarypre-coursetasks/)
3. Keep all correspondence from the University for future reference.
4. Begin to organise paperwork relating to the course.

We will ask you to bring some of your tasks to sessions in the first week.

### Tutor contacts

With best wishes on behalf of the Secondary Science PGCE tutors.

Luke Graham (Science Subject Lead)

[L.Graham@exeter.ac.uk](mailto:L.Graham@exeter.ac.uk) (Telephone: 01392 724789)

If you want more information about the course or about anything in this booklet, please get in touch with Luke Graham (PGCE secondary science subject leader).

# Pre-course tasks

1. Drawing links between readings
2. Developing your subject knowledge
3. Reconstructing misconceptions
4. Preparing for teaching

#### Drawing links between readings

**Purpose**: You are starting on a master’s level PGCE. One of the skills in master’s level writing is analysing and comparing sources and you will need to make links between different pieces of research. In this task you will need to read the following three papers, all of which are available as a PDF on the same website as this document.

* Lemke - Becoming the Village
* Willingham - What Will Improve a Student’s Memory?
* Archer - The Science Capital teaching approach

You might want to think about a note taking method, for example the [Cornell method](https://medium.goodnotes.com/study-with-ease-the-best-way-to-take-notes-2749a3e8297b) for this task.

**Product for Task 1 – You will submit this in week 1 of the course**

When you have read the three papers, identify one point where the three papers agree **OR** one point where they differ. Write a 200 word essay about the agreement or difference. You will need to bring this essay with you to the first session on master’s level writing. It will be an opportunity to get some feedback on your writing, building towards your M-level assignments.

#### Developing your science subject knowledge

You will need to refer to the National Curriculum for science for this task.   
The national curriculum for [Key Stage 3](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239134/SECONDARY_national_curriculum_-_Science.pdf) and [Key Stage 4](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/381380/Science_KS4_PoS_7_November_2014.pdf).

**Purpose**: To familiarise yourself with the National Curriculum for science and begin to develop your knowledge of what students in secondary schools need to learn in science lessons.

Consider how you will revise your own subject knowledge in areas where you identify gaps. People revise in different ways and time spent considering methods that may be most effective is well spent and may help you to support your students in future. You could use:

* student textbooks
* [BBC bitesize science](https://www.bbc.com/education/subjects/zrkw2hv)
* teaching resources (e.g. [STEM learning](https://www.stem.org.uk/secondary/resources/collections/science), [RSC](https://edu.rsc.org/resources/secondary), [IOP](https://www.iop.org/education/support-school-college-physics-teachers))
* Exam board resources for key stage 4 (for example [AQA GCSE science](https://www.aqa.org.uk/subjects/science/gcse/combined-science-trilogy-8464/assessment-resources)) and A-level
* [Seneca Learning](https://senecalearning.com/en-GB/).

People record their developing knowledge in different ways, for instance written notes, mind maps, exam answers, creating lesson plans. Strategies that require you to use or to transform your knowledge are more effective than just reading or copying.

Later in the summer we will send you a subject knowledge audit so you can complete your INITIAL NEEDS ANAYSIS and identify where you need to improve during the Autumn Term – but do start developing your subject knowledge now.

**Product for Task 2: You will discuss this at your first tutorial**

2.1 a completed subject knowledge audit.

* 1. evidence of engagement in subject knowledge development.

#### Reconstructing misconceptions

**Purpose**: To reflect on the nature of science as a discipline and how it is developed and taught through the curriculum from Key Stage 2 to Key Stage 5.

* Identify a common science misconception at Primary level – you can use the eBook Misconceptions in Primary Science by Allen (2019 Ed) from the university on-line library [https://libguides.exeter.ac.uk](https://libguides.exeter.ac.uk/) or use [Best Evidence Science Teaching | STEM](https://www.stem.org.uk/secondary/resources/collections/science/best-evidence-science-teaching?gclid=EAIaIQobChMI1fHoh4WJgAMVRsDVCh0w0wVwEAAYASAAEgJYIvD_BwE)
* Design an activity that you could use with a year 7 class that would identify those pupils who might hold this concept and an activity, demonstration, practical or other resource that would help to challenge those pupils’ ideas and support them in learning the accepted scientific explanation. Use the scaffolded lesson plan at the end of this document to plan your activity.

**Product for Task 3: You will need this for week 2 of the course**

Completed lesson plan and activity or resource

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#### Preparing for teaching

In September (once you are registered) you will be able to access the PGCE science VLE (our website for trainees) called ELE.

**Product for Task 4**

Visited the pre-course tab on ELE

**Useful pre-course reading**

There are many books written about the teaching and learning of science. Many of these are available as e-books through the University of Exeter library for you to access once you are registered on the course. You will be able to buy some at a discounted rate if you join the Association for Science Education. Details of how to do this will be provided during the first week of the taught course.

# We have a science PGCE reading list that we will share with you, but if you are looking to get some reading in before the start of the course we would recommend the newly updated fifth edition (due Summer 2024) Learning to Teach Science in the Secondary School - A Companion to School Experience by [Routledge](https://www.routledge.com/Learning-to-Teach-Science-in-the-Secondary-School-A-Companion-to-School-Experience/Hetherington-Graham-Moore/p/book/9780367626662)

#### Subject specific titles

Reiss, M. and Winterbottom, M. (eds) (2021) Teaching Secondary Biology (3rd ed) London: Hodder Education.

Aston, K. and Kind, V. (eds). (2022) Teaching Secondary Chemistry (3rd ed.) London: Hodder Education.

DeWinter, J. and Hardman, M. (eds) (2021) Teaching Secondary Physics (3rd ed.) London: Hodder Education.

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| **SCAFFOLDED LESSON PLAN** | | | |
| Learning Objective: *What Knowledge, Understanding or Skills are being developed?*  Sequencing: *How does this link to prior / future learning?* | | | |
| Time | Teacher activity | Student activity | AfL: what and how |
|  | *Plan for engagement*  *Link to prior learning*  *Make the learning focus explicit* | *Consider a ‘do now’ task, or response to marking, or a ‘hook’ e.g. image, scenario or big question to consider* | *Draw out prior knowledge and use this to judge the pace and focus of activities in the lesson* |
|  | *Think about how to develop the learning systematically through the lesson* | *Build in tasks which allow for pupil independence – pair/group/individual work* | *You may want mini plenaries, or consider other AfL opportunities* |
|  | *Think about how to consolidate learning from this lesson and point forward to what comes next* | *Can the students reflect on what they’ve learned?* | *Consider using peer/self assessment* |
| **Assessment- What is assessed and How?** *Link to the learning objective: how will you know what the pupils have learned in this lesson?*  **Support and Challenge** *Consider general opportunities for support/challenge for all pupils, AND targeted support/challenge for specific individuals.* | | | |

**Planning prompts:**

* What do you want them to learn?
* How will you know they have learned it?
* Sequencing in relation to past and future learning – what might be recalled, how might it be built on? What is the learning building towards?
* Activities appropriate to the learning objective
* Direct instruction vs exploratory learning – which is more appropriate? How might they be combined?
* Opportunities for application and practise
* Engaging activities or resources
* Balance of teacher-led, group, pair and individual work
* Assessment for learning, including plenaries, peer and self assessment
* Questions and dialogue
* Transitions
* General differentiation – opportunities for support/challenge
* Specific differentiation – personalised support or challenge for targeted individuals