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| **EDUM037****Biology** | **EDUM 038****Biology/Psychology**  | **EDUM 039****Chemistry** | **EDUM 048** **Physics** |

GRADUATE SCHOOL OF EDUCATION

PGCE SECONDARY SCIENCE

2022-2023

PRE-COURSE INFORMATION

AND TASKS

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PGCE SECONDARY SCIENCE 2022-2023

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. 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

### Some general principles

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 of the major course components (i.e. the university-based work and 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.

 While most face-to-face teaching occurs in our well-equipped science labs, we hope that one seminar day in the Spring or Summer Term will involve a field trip. There is no charge for this, trainees typically share transportation. Details will be given in advance and this is subject to any current or future closures of education providers.

In previous years, an optional component of the course has included an in-person first aid training course leading to a ‘First Aid at Work’ certificate. The cost of this course has been approximately £65. This has typically run in the Autumn Term and therefore will be subject to any restrictions on delivery.

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.

### 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. N.B. these science specific tasks are additional to the generic PGCE Secondary Anticipating Practice tasks that everyone will receive.

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 -
Use this list to check that you have done all you need to do before the course starts in Exeter.

A. Carry out the science specific tasks.

B. Carry out the generic ‘Anticipating Practice’ tasks detailed in the secondary pre-course information that you will receive.

C. Keep all correspondence from the University for future reference.

D. Begin to organise paperwork relating to the course.

On the first day of the course please make sure that you have the products of both the science specific and generic tasks.

### PRE-COURSE CONTACTS

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).

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

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## PGCE SECONDARY SCIENCE PRE-COURSE TASKS

1. Drawing links in reading

2. Developing your subject knowledge

3: Reconstructing misconceptions

4: Preparing for teaching

#### PGCE SECONDARY SCIENCE PRE-COURSE TASKS

#### **1. DRAWING LINKS IN READING**

**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 these three papers. (all available as a PDF on the same website as this document).

Lemke - Becoming the Village from the university library on this link

Willingham - What Will Improve a Student’s Memory? (pdf)

Archer - The Science Capital teaching approach (pdf)

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: by the 1/10/22**

When you have read the three papers produce a 200 word written essay. You need to identify one point where the three papers agree and one point where they differ. You will need to bring this writing 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.

#### **2: DEVELOPING YOUR SCIENCE SUBJECT KNOWLEDGE**

You will need to refer to the National Curriculum for Science for this task. The links below will help you find copies of the national curriculum for Key Stage 3 and Key Stage 4 You can download pdf versions from: [HERE](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239134/SECONDARY_national_curriculum_-_Science.pdf) and [HERE](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.

1. Consider how you will revise your own subject knowledge in areas where you identify gaps. People revise in different ways. Time spent considering methods that may be most effective is well spent. Trainees use resources such as student textbooks, revision aids (e.g. <https://www.bbc.com/education/subjects/zrkw2hv> ), teaching resources (e.g. <https://www.stem.org.uk/secondary-science>) and exam board resources for key stage 4, as well as more recently developed tools like Seneca Learning (see below). People record their developing knowledge in different ways, for instance written notes, mind maps, exam answers, creating lesson plans.

2. 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. Time spent developing your subject knowledge ahead of this is of course a good idea.

3. During the Autumn Term, we will invite you use your University IT account to access Seneca Learning so that course tutors can access results to inform and target their session planning. Seneca is a useful tool that, as you answer questions, ‘learns’ where your strengths and areas for development lie and targets questions to your needs. You can set up to access this independently ahead of the start of the course if you wish. www.senecalearning.com. This is not compulsory, but we recommend it as a useful tool.

**Product for Task 2: by the 1/10/22**

2.1 a completed subject knowledge audit.

2.2 evidence of engagement in subject knowledge development.

#### **3: 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.

1. 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> or find a misconception from other sources (such as the IoP or RSC websites).

1. Design an activity that you can use in class that would identify those pupils who might hold this concept and an activity, demonstration, practical or other resource that would help the pupils
to re-constrict these ideas.

You might want to use the ‘scaffolded lesson plan’ (at the end of this document) to plan your activity.

**Product for Task 3: by the 1/10/22**

Completed (scaffolded) lesson plan (see page 7) and activity / resource

#### **4: Preparing for teaching**

In September you will be able to access the PGCE science VLE. There is a set of tasks to complete before the first taught session in the PRE-COURSE TASKS tab.

**Product for Task 4**

Completion of the VLE tasks

### USEFUL PRE-COURSE READING

There are many books written about the teaching and learning of science. Listed below are a selection of titles recommended by the course tutors. Do not attempt to read them all but choose some that you feel are of particular interest to you in order to begin developing the knowledge and understanding that you will need to become an effective, reflective and critical science teacher. Many of these are available as e-books through the University of Exeter library (marked on the list below with a \*) for you to access once you are registered on the course. You will be able to buy some of the titles listed 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 recommend that you all read:**

Osborne, J. & Dillon, J. (2010) Good practice in science teaching: what research has to say. 2nd Edition. Maidenhead, Open University Press (ISBN 033523858)

*Osborne and Dillon provide a thorough overview of some key topics in science education and explore the research evidence about their significance and impact on teaching and learning.*

Toplis, R. (Ed) (2015) Learning to Teach Science in the Secondary School (4th edition) (London: Routledge)\* *and / or / either of*

Wellington, J. and Ireson, G. (2018) Science Learning, Science Teaching (4th edition) (London: Routledge)\*

Dillon, J., & Watts, M. (eds) (2021). Debates in Science Education (2nd edition). Routledge.

#### Subject specific titles

Biology

Reiss, M. (Ed) (2011) Teaching Secondary Biology (2nd Edition) (London: Hodder Education)

Chemistry

Taber, K. (Ed) (2012) Teaching Secondary Chemistry (2nd Edition) (London: Hodder Education)\*

Physics

Sang, D. (Ed.) (2011) Teaching Secondary Physics (2nd Edition) (London: Hodder Education)

Psychology

Jarvis M (2011) Teaching 14-19 psychology: issues & techniques. (London, Routledge)

#### More generic titles

Alsop S., Bencze L. and Pedretti E. (eds) (2005) Analysing Exemplary Science Teaching. (Maidenhead: Open University Press)

Driver, R. (2014). Making Sense of Secondary Science: Research into children's ideas. (London: Routledge)

Kind, V. and Taber, K. (2005) Science: Teaching School Subjects 11-19. (London: Routledge)

Oversby, J. (Ed) (2012) ASE Guide to Research in Science Education. (Association for Science Education)

Ratcliffe, M. and Grace, M. (2003) Science Education for Citizenship. (Buckingham: Open University Press)\*

Hollins, M. (Ed) (2010) ASE Guide to Secondary Science Education (Hatfield, Association for Science Education)

Reiss, M. (2000) Understanding Science Lessons. (Buckingham, Open University Press)

Sotto, E. (2007) When teaching becomes learning, 2nd Edition. London, Continuum



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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? *(refer to MTP)*
* 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 / 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