GRADUATE SCHOOL OF EDUCATION

College of Social Sciences and International Studies

PGCE SECONDARY SCIENCE STUDY GUIDE

ACADEMIC YEAR 2017-2018

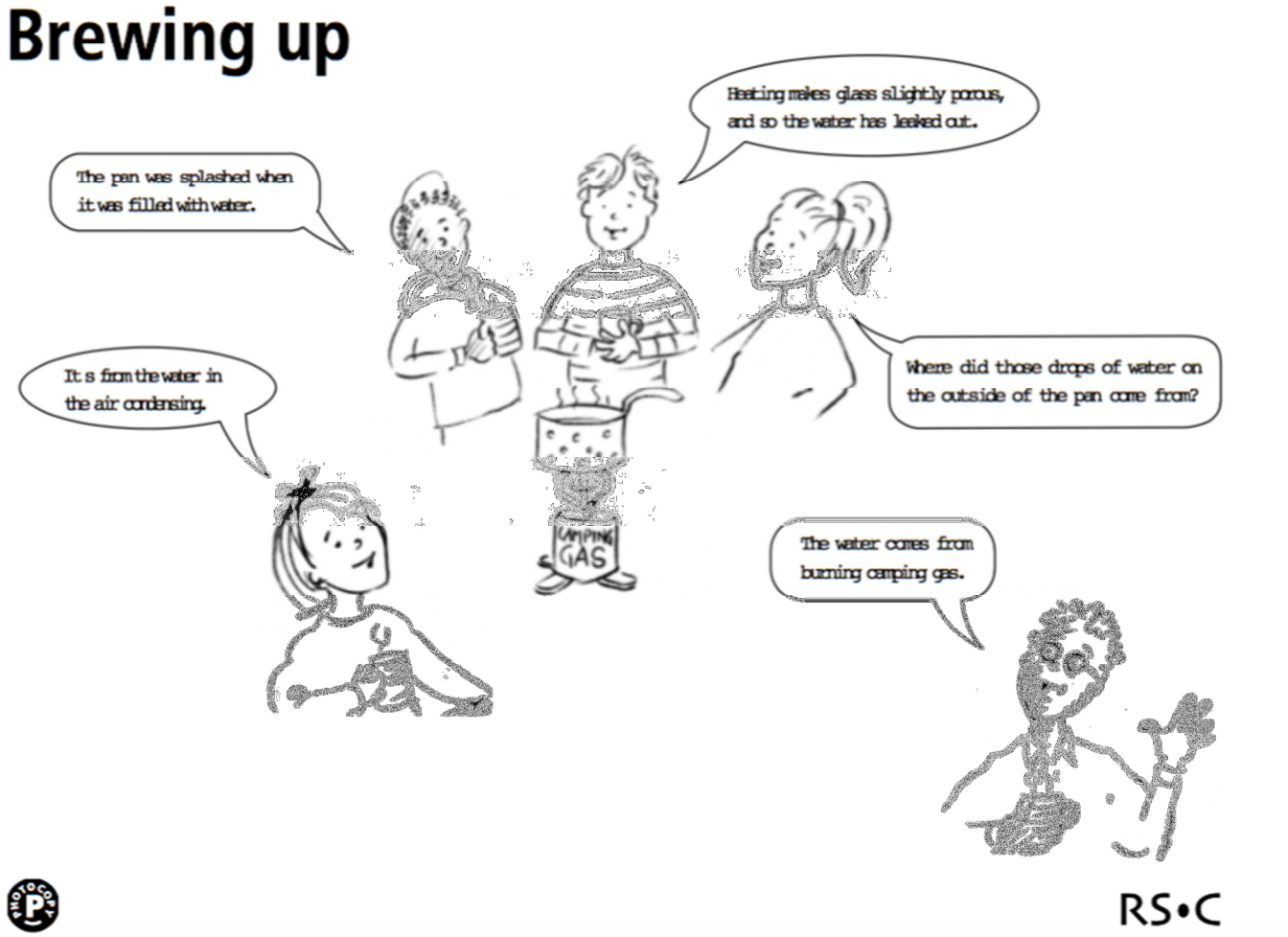

Illustration from 'The Nature of Science: Concept Cartoons' http://www.rsc.org/learn-chemistry/resource/res00001277/concept-cartoons?cmpid=CMP00002676

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WELCOME

Welcome to the PGCE Secondary Science course. We hope you will enjoy what will be a challenging and exciting year. Our aim is to support you in your development as outstanding teachers. The PGCE secondary science course at Exeter is designed to help you to understand how pupils learn science and how you can teach it effectively, safely and in an interesting way to secondary school pupils of all ages and abilities. Both university-based and school-based elements of the course are essential in achieving this aim, and we encourage you to be analytical, creative and critical about what you are learning through both course components and how they relate to each other.

This Study Guide should be read in conjunction with the Secondary PGCE Programme Handbook and the EPS Handbook which contain detailed information about all aspects of your PGCE and information about University of Exeter procedures. Please refer to the Secondary PGCE Programme Handbook for everything other than subject specific guidance and to the Module Descriptors for the module aims and intended learning outcomes.

Education policy changes regularly and rapidly and we aim to prepare you to become adaptable teachers who are able to respond thoughtfully and creatively to such changes. A new national curriculum has recently been introduced alongside changes to GCSEs and A-levels and as new science teachers, you will need to participate in debates about these changes and others, and what they mean for pupils' learning science. Science is a core subject in the curriculum and is seen as being crucial to the UK's economy. However, uptake of Science in post-compulsory education remains problematic. We aim to train science teachers who will inspire all pupils to engage with science, whether they intend to be scientists or not.

The wide variety of taught sessions alongside the range of teachers you work with in schools will ensure you see and experience a range of different approaches to teaching and learning science. Some of these will deliberately model good school classroom practice, whilst others use approaches designed for University study. Please be thoughtful about these experiences and use them to think about *why* the material is being taught in these particular ways. This reflective approach underpins the 'Exeter Model' and we expect you to capitalise on all opportunities to reflect on teaching and learning. Critically reflective thinking to understand not just *how* to teach science, but *why* different approaches are effective, underpinned by research, is fundamental to your development as an independent, innovative science teacher who will continue to learn throughout their career.

We hope you enjoy a varied, interesting and exciting year and wish you luck in your learning.

Darren Moore, Lindsay Hetherington, Luke Graham, Jill Noakes, Jim Lodge, Keith Postlethwaite, Alison Black and Nasser Mansour

PGCE SCIENCE TEAM

The course is taught by a team of experienced University staff, specialising in a wide range of science subjects. The core University team is ably supported by associated University Visiting Tutors who are all experienced teachers of science who led departments in previous roles.

Name	Role	Biography	Contact
Dr Darren Moore (DM)	PGCE Secondary Science Course Leader and Psychology tutor.	Darren taught Psychology at an FE College for 6 years. He joined the PGCE team while completing a PhD in Education at the University of Exeter researching the transitions of hard to reach pupils at the end of Secondary School. Since completing his PhD in 2011 Darren has combined contributing to the PGCE programme with research work at the University of Exeter Medical School and more recently in the Graduate School of Education, primarily researching school mental health.	D.Moore@exeter.ac.uk 01392 727405 NC135
Dr Lindsay Hetherington (LH)	PGCE Secondary Science and Chemistry tutor	Lindsay taught science in state comprehensive schools for 5 years and was Head of Chemistry and Deputy Head of Year, before moving to Exeter University to join the PGCE team and complete a PhD in Education, researching teachers' responses to curriculum change using complexity theory. She is currently researching creativity within Inquiry Based Science Education.	L.Hetherington@exeter.ac.uk 01392 725826 NC124
Luke Graham (LG)	PGCE Secondary Science and Biology tutor	Luke has spent over 20 years working in schools and colleges along the south coast. He has been a science teacher, head of department and deputy head in that time. Luke has worked with the University of Exeter for the last 7 years. He is an associate for the exam board AQA and serves as an appointed member to the National College.	L.Graham@exeter.ac.uk NC125
Jill Noakes (JN)	PGCE Secondary Science and Physics tutor	Jill taught physics and maths for 7 years after completing her PGCE here at Exeter. She began her career at Bodmin College and was a deputy faculty leader at Truro College. She has also worked for the Institute of Physics delivering professional development workshops in schools around Cornwall. She is currently in the second year of her PhD about teachers' and pupils' perspectives on participation in project-based science activities.	J.Noakes@exeter.ac.uk
Jim Lodge (JL)	PGCE Secondary Science and Chemistry tutor	Jim was previously Science Subject Leader at South Dartmoor Community College where he continues to teach alongside his PGCE work. He also completed his PGCE here at Exeter. Jim has also taught in the independent sector and in Ethiopia and Zimbabwe. He also worked in finance and IT as a banker and as a management consultant.	W.Lodge@exeter.ac.uk 07887 867715

Associate Professor Keith Postlethwaite (KP)	PGCE Secondary Science and Physics tutor	Keith taught physics in a very large state comprehensive school for 9 years and was an A-level physics examiner. He then moved to Oxford where he led a research team, helped to develop the Oxford Internship model of teacher education, taught on the PGCE programme and completed a DPhil on teacher based identification of able children. Teacher education posts in Reading and the University of the West of England followed, before his move to Exeter in 1999.	K.C.Postlethwaite@exeter.ac.uk BC06a
Dr Alison Black (AB)	PGCE Secondary Science KS2/3 and SEND	Alison taught Science in both Primary and Secondary phases before completing a PhD at the University of Exeter with a particular interest in supporting pupils with SEND. Her research interests focus on inclusive and special education.	A.E.Black@exeter.ac.uk 01392 724938 NC134
Dr Nasser Mansour (NM)	PGCE Secondary Science tutor; Science, Technology, Engineering and Mathematics (STEM) Research Centre coordinator	Nasser qualified as a teacher in Egypt before going on to study Education at Tanta University, Egypt and at the University of Exeter. His research is focused around Science teachers' beliefs about education and he leads the STEM research group at Exeter.	N.Mansour@exeter.ac.uk 01392 722842 BC108
Mr Chris Smith (CS)	Science Technician	Chris worked at the Central Veterinary Laboratory, Surrey, as an analytical chemist for the Ministry of Agriculture for 17 years as a Scientific Officer. He worked as a school technician for two years, before moving to the University of Exeter to work initially as a chemistry technician then as overall science technician.	C.S.Smith@exeter.ac.uk 01392 724933 NC06D
Simon Beard	University Visiting Tutor	All our associated UVTs have had substantial experience teaching science and leading science departments in the UK. Working to support trainees in schools for between 4 and 10 years, they have a great deal of wisdom to share.	simonbeard@beardsimon.plus.com
Maggie Bointon	University Visiting Tutor		maggie@bointon.com
Lyndsay Chell	University Visiting Tutor		lyndsay@lyndsaychell.co.uk
Andrew Maxwell	University Visiting Tutor		andrewmmaxwell@yahoo.co.uk
Willie Young	University Visiting Tutor		wjyoung56@hotmail.co.uk

COURSE STRUCTURE

The PGCE secondary science course has several distinct but related elements:

Education and Professional Studies Programme (EDUM036).

The Secondary Programme Handbook and Education and Professional Studies Handbook provide details of this module. It includes both university and school-based work. You are asked to engage in self-study by listening to some audio lectures with associated tasks before they are either built upon in science sessions or followed-up in subject support groups. You will need to access these via ELE here http://vle.exeter.ac.uk/course/view.php?id=896#section-31. It is crucial that you engage with the audio lecture and tasks **before** the associated science session. The date by which you should have completed each audio lecture and tasks are shown on page 18.

Secondary Science Subject Knowledge and Pedagogy (EDUM037, EDUM038, EDUM039, EDUM048).

The sessions in science are designed to help you to teach broad and balanced science in Key Stage 3, your specialist subject and preferably at least one other science in Key Stage 4, and your specialist subject at post-16 level. It has the following elements:

Science Big Theme Workshops	The programme during the Autumn Term includes sessions on general issues in science teaching.
National Curriculum Courses	You will follow a National Curriculum course in each of your non-specialist science subjects. For example, a chemistry specialist will study biology and physics. In these courses, you will have the opportunity to review and refresh your science subject knowledge as well as developing ideas for teaching science to pupils.
Main Subject Sessions	A series of workshops will address issues connected with teaching topics within your own science specialism. In addition to developing your subject knowledge, you will learn about a range of teaching approaches and strategies to use in the classroom to promote effective learning.
Subject Support Groups	Subject support groups will be arranged to consolidate and extend your specialist science subject knowledge through peer teaching some A Level topics, as well as following up some EPS audio lectures.
Peer Teaching	You will begin to familiarise yourself with the Exeter Model of Teacher Education through teaching 10 minute episodes to a group of your peers in which you focus on a particular aspect of teaching using an 'Agenda'
Tutorials	You will meet your personal tutor to discuss your progress three times during the Autumn term and they will support you pastorally throughout the year.
Directed Tasks	There are particular directed study tasks to complete, as well as working on your subject knowledge development and independent study towards the M-level assignments. At the beginning of the PGCE programme you will complete a subject knowledge audit, which you will use to draw up individual action plans for specialist subject knowledge development.
Seminar Days	At intervals during your main blocks of school-based work, you will return to the university for an intensive training day when you will reflect upon your progress and consider developments in your practice as a teacher. It is also a chance for you to share experiences with other members of the secondary science group.

COURSE MATERIALS

Teaching resources

There are a range of teaching resources in the Labs and can be used throughout the Autumn Term – please sign them out with Chris Smith and return them after use. If you need any practical materials for your peer teaching, these can be requested from Chris Smith, with sufficient notice.

The Exeter Learning Environment (ELE)

This is Exeter's Virtual Learning Environment. All course documents and information regarding science taught sessions will be uploaded here http://vle.exeter.ac.uk/course/view.php?id=919. Please get into the habit of checking it regularly and before and after all taught sessions so that you can access preparatory and follow-up materials.

Other useful materials can be found on the following pages:

EPS ELE site http://vle.exeter.ac.uk/course/view.php?id=896

PGCE Primary and Secondary Core Documents http://vle.exeter.ac.uk/course/view.php?id=2516

Various evidence tools and forms (username and password both: exeterpartner
http://socialsciences.exeter.ac.uk/education/partnership/handbooksreportsanddocuments/secondary/

Library resources

See http://libguides.exeter.ac.uk/gettingstarted

THE TAUGHT COURSE

Timetable for first teaching week

Timetable for week 1 - w/b 25/09/17

	9		10		11		12		13		14		15	
Monday	09.00-12.00 Induction Morning (DM) Labs								13.00-14.00 Welcome Talk BC114		14.00-16.00 Preliminary Experience Share + Coachbright (DM/LG) Labs			
Tuesday			09.30-11.00 Knowledge for teaching (KP) Labs				11.30-12.30 Group Tutorial Labs & BC114,BC129		12.30-13.30 SSG Intro (DM) Labs				14.30-16.00 The Nature of Science (LG) Labs	
Wednesday			09.30-11.30 Active Learning - Lynsey Mccahill Labs				12.00-13.30 Lesson Planning (LH) Labs						14.30-16.00 Medium Term Planning (DM) Labs	
Thursday			09.30-11.00 Searching for Literature (DM) Labs				11.30-13.00 Curriculum Change - Mike Morley Labs				14.00-15.30 Science & National Curriculum (LG) Labs			
Friday														

Timetable for weeks 2 – 6 and 9 – 11.

9	10	11	12	13	14	15	16
Monday	09.30-11.00 Science workshops See below SC 3.06		11.30-13.30 Main Subject Physics (JN) - Labs Main Subject Chemistry (JL) - Labs Biology/Biology with Psychology SSG - BC06,07,08,09			14.30-16.00 Big Theme Workshop See below BC114	
Tuesday	09.15-11.15 National Curriculum Physics Group 1 (JN) - Labs National Curriculum Chemistry Group 1(JL) - Labs		11.30-13.00 Big Theme Workshop BC114		14.00-16.00 National Curriculum Physics Group 2 (JN) - Labs National Curriculum Chemistry Group 2 (JL) - Labs		
Wednesday	Various - see below						
Thursday	23/11/17 and 30/11/17 09.15-11.15 Optional Science/PE Cross curricular Upper Gym		11.30-13.30 Main Subject Biology (LG) - Labs Chemistry/Physics SSG - EMS S05,S09,S11, BC201, NC08		14.00-16.00 National Curriculum Biology (LG) - Labs Main Subject Psychology - Labs		
Friday	13/10/17 & 03/11/17 Optional First Aid Course £65 27/10/17 10.30-15.30 Field Trip to Forest School (LG) - Details in Learning Outside the Classroom Workshop						

Science workshops

Mondays 09.30-11.00 - SC3.06

02/10/2017	Creatively consolidating knowledge - Andrew Maxwell
09/10/2017	Science Education Research - Pallavi Banerjee
16/10/2017	Classroom Presence - Liz Jones
23/10/2017	Using Data - Jim Lodge
30/10/2017	Working with your PST - Jon Every
20/11/2017	Royal Society of Chemistry - Kate Whetter
27/11/2017	Action Research - Mel Bourne
04/12/2017	Job applications and Interviews - Andy Pemberton

Big theme Workshops

	Monday	Tuesday
02/10/2017	Misconceptions (KP)	Learning outside the classroom (LG)
09/10/2017	Motivation and Science Attitudes (DM)	Constructivism and Science Teaching (KP)
16/10/2017	Health, safety and wellbeing (JL)	British Values in Science (LG)
23/10/2017	*Science and Literacy (KP)*	Science and Numeracy (LG)
30/10/2017	Practical and IB Science Education (JN)	Behaviour for learning (DM)
20/11/2017	Placement Reflection and Challenging the Gap (DM)	Assessment in Science (LH)
27/11/2017	Argumentation and Dialogue (NM)	Teaching Controversial Issues (LG)
04/12/2017	Differentiation (SEND) (AB)	Resilience (LH)

Wednesday schedule

04/10/2017	12.00-13.00 Optional Time management and organisation - Labs (DM); 14.00-15.00 Optional Dove self-esteem project: Pupil Wellbeing - NC12
11/10/2017	09.30-12.30 Peer Teach Group 1 - Labs; 13.00 -17.00 Library, Academic Misconduct and e-Safety sessions - NC12
18/10/2017	09.30-10.30 Association for Science Education - Labs; 11.00-14.00 Peer Teach Group 2 - Labs
25/10/2017	09.30-12.30 Peer teach Group 1 - Labs; 13.30-16.30 Teachers and professionalism - Alan Newland - NC12
01/11/2017	09.30-12.30 Peer teach Group 2 - Labs
22/11/2017	12.00-14.00 Creations (LH); 14-15.30 Optional M Level Writing; 15.30-17.00 PST joint session with Heather King
29/11/2017	09.30-15.30 National Space Academy - Labs
06/12/2017	11.00-13.00 EAL Workshop (NM) - Labs; 14.00-16.00 Behaviour Management - Rob Long - NC12

Seminar Days

Five Seminar Days occur on Fridays during your school-based work, where you will return to St Lukes for the day. They provide an opportunity for you to reflect on practice in school with tutors and peers, review taught content in light of working in school, develop understanding of how to conduct school-based research. The content of the seminar days have some flexibility in order to enable us to respond to your developing needs as well as any changes in national education policy and practice. Below is our initial plan for content on each of the seminar days.

Seminar Day	Themes/Sessions
1 19th Jan 2018	Evidence-based Teaching: Doing and using educational research. **(All standards, particularly S3)** *This seminar day will consider the use of research to inform practice, in particular your own research to be undertaken for the EPS Assignment.* ***You will need to bring your draft formative assignment for the EPS Assignment to this session.***
2 2nd Mar 2018	Pupil Progress in Science **(S2, S5)** *This seminar day will consider strategies to ensure all pupils make progress in your lessons, and how you can judge what progress is being made. We will also share progress with the EPS SEN Task.*
3 23rd Mar 2018	High Impact, High Standards **(All Standards)** *This session is focused around an analysis of what makes excellent teaching in Science, drawing on a range of sources to discuss this question. This day will also include sharing of your EPS Assignment research at the annual GSE conference.*
4 25th May 2018	*Mobile and digital technologies in science* **(S4)** Kevin Burden from the University of Hull will join us for part of the day to provide insight into how mobile technologies can change science teaching pedagogy. This seminar day will also include sharing experiences of working with support staff, parents, tutees and EAL students. Recent NQTs will also offer advice for your NQT year.
5 29th Jun 2018	Looking ahead to a Teaching Career/Being an NQT **(All Standards)** *During this final seminar day, we will discuss your individual Career Entry Development Profiles (CEDPs) and consider the support you will need to continue to develop as a teacher during your NQT year.*

Main Subject Sessions

Physics, Chemistry and Biology students attend one Main Subject session per week in their specialism. Biology with Psychology students attend both Main Subject Biology and Main Subject Psychology.

National Curriculum Sessions

You will attend National Curriculum Sessions in your two non-specialist subjects. Physics and Chemistry National Curriculum sessions take place in two separate groups, to which you will have been assigned on Day 1.

Wednesday Peer Teaching

Wednesday peer teaching is the term we use for a 10-minute episode of teaching planned and delivered by you to others in the PGCE science group who act as your students. This is an opportunity to practice some science teaching strategies in front of a sympathetic and supportive group before you try them out in school. Aim to present your episode at a level suitable for a KS3 or KS4 class. The second sessions are attended by your university visiting tutors. They will give you feedback on your teaching and on the learning that took place.

Prepare an Episode Plan and 'Agenda' for each peer teaching session. Guidance for how to do this will be given during the sessions on lesson planning. There is additional guidance about constructing Agendas in both the Programme Handbook and on ELE. Please remember that you are not attempting to give a whole lesson, or need to start at the beginning of a lesson. The idea is to teach a short episode with a particular focus on the aspect of your teaching that you want to improve – see the Programme handbook for a list of possible areas to focus on. Although you will be teaching for only 10 minutes, you should aim for changes of approach and pace during your delivery. It is most important to avoid long monologues, so do not learn from a pre-written script or read from notes. It is essential to work to a 10-minute limit for the peer-teaching episode. Include estimated timings for the various activities of your episode, but remember that these estimates are to give you practice in developing an awareness of pace in a lesson, not a straightjacket to worry about. You will have to stop you after 10 minutes whether or not you have completed your planned delivery. It is best to choose a science topic that you know thoroughly to avoid any anxieties about the adequacy of your subject knowledge. Scripting essential questions is helpful and clear notes of any board work will help the episode to run smoothly. You can use the computer and smartboard and a 'visualiser' will be available in the lab. If you would like to practice writing on the board or to try out the visualiser before your peer teaching session, feel free to do so whenever the laboratories are not in use for teaching – please liaise with Chris Smith, the Science Technician, over this.

If you need any equipment to support your teaching, please talk to Chris Smith. He will do his best to supply any reasonable requests, but do let him know **at least three days** in advance of your session.

Make two copies of your episode plan and Agenda. At the beginning of your session give one copy of your episode plan and Agenda to the person (your UVT in session 2) who will 'annotate' the Agenda. Your second peer teaching session will be recorded using a digital video camera - **please bring a 'memory stick' to this session so that you can take away a copy of this recording**.

You should also complete an agenda evaluation (page 2 of the agenda form) after the episode, you should think about any differences between what you planned to do and what actually happened. The annotated Agenda will be helpful here. The agenda and evaluation for your second Peer Teaching session form one of the course directed tasks.

Subject Support Groups

The subject support group sessions in weeks 2 - 6 and 9 - 11 are set up to provide the opportunity to carry out longer peer teaching focused on A Level content, follow up EPS topics, a BME framework task and share teaching ideas with fellow subject specialists in small groups.

The A Level peer teaching will involve using the lesson plan template in more detail and evaluating the lesson on the form you will use in school. You will select an area of the A Level specification to teach for 30 minutes. The main aims of the teaching session are to increase knowledge amongst the group, practice A Level teaching and to use a suitable activity that can then be shared with the group. As a group you should also take the opportunity to practice using the forms used in school (the rest of the group will need to complete an observation form briefly)

The content and exact focus of the session is up to the teacher.

But your session should:

- Be pitched at A Level (2015 spec)
- Have learning objectives
- Present information designed to increase knowledge of the topic
- Include at least one activity for your "students" to complete
- Check that learning has taken place
- Last for 30 minutes

Week 1 – Subject Support Group Planning session.

For this meeting, you will need to bring:

- Your own KS5 specialist subject knowledge audit and needs analysis (ask Darren if you have misplaced yours since sending).
- A specification for an A Level course (one per group; copies in the labs).
- An A level textbook or revision guide.

The aims of this session are for you to become familiar with the A Level specifications, match your subject knowledge strengths with these specifications and plan to address your subject knowledge needs with support from the group. You will allocate teaching sessions (at least two sessions per person) to take into account individual strengths and the needs of the group and elect a group representative who will keep the course lead informed about the subject support group arrangements.

Everyone should prepare and teach at least two sessions of 30 minutes during the term. For each session, start by telling the group your specific learning objectives (what you hope the group will learn). Use teaching strategies appropriate for a post-16 group - methods of delivery are likely to vary with different presenters. Keep your teaching resources simple. The rooms that you use should have a data projector or OHP available. Please let Darren Moore know if this is not the case. ***Complete the planning sheet during the first session in week 1 and send a copy electronically to Darren.***

Subject Support Group meeting organisation

While you are free to organise the sessions in the way that best suits the group, please bear in mind that the rooms are booked for two hours and must be used. A suggested format is for two topics to be addressed per meeting, each lasting 30 minutes, with a 10-minute discussion after each presentation. You should also plan for the group to give feedback to the 'teacher'.

Feedback from peers

After the session peers will give verbal feedback and complete a lesson observation form.

After the session

The presenter should reflect on the session using a lesson evaluation form. This form is one of the Directed Tasks (see below).

Directed Tasks

You will be set a number of tasks which will help you to further your understanding of issues raised in the taught course sessions or the EPS lectures. Some of these tasks will involve you doing preparatory reading and research for future sessions and could be set within the main subject or national curriculum courses. These tasks are a compulsory part of the course but they are not part of the formal assessment process.

There are six specific PGCE Science directed tasks which are designed to help you make connections between taught content and classroom practice and receive feedback from your personal tutor on key aspects of the Autumn term content. Complete these tasks as appropriate throughout the term.

Task	Requirements
1	**Subject Support Group Teaching:** Complete a lesson evaluation form for the first session that you taught. Use the lesson observation feedback from peers, guidelines about reflective practice on ELE and appropriate aspects of the 'Framework for Dialogue about Teaching' to help you complete this. Email the form to your tutor when complete, for discussion in a tutorial.
2	**Peer Teaching:** Write up your agenda evaluation from your second peer teaching activity. Guidance about reflective practice, evaluating teaching and the use of Agendas can be found on ELE. Email these to your tutor when complete, for discussion in a tutorial.
3	**Behaviour and Class Management:** During week 6 the focus will be on making connections between ideas about behaviour and class management that are presented in SKP and EPS sessions. Complete the Behaviour Management Initial Needs Analysis (see Science ELE) and bring this to the science big theme workshop on Tuesday.
4	**Challenging the Gap Framework for Dialogue:** During your 2 week November placement, as part of the EPS task complete a draft of the Challenging the Gap Framework for Dialogue based on information you find out about the context of your school placement and how they work to support disadvantaged pupils, both generally and in Science. Bring this to the science big theme workshop on Monday 20th November 2017.
5	**Assessment and the Use of Data:** During week 9 the focus will be on making connections between assessment, the use of data and impact on pupil learning in science. Please collect a sample of photocopies of 5 pieces of children's work from one of the classes you met in your November placement with notes and any data the class teacher could give you about these children and the school's marking policy. Bring this **in an anonymised form** to the science big theme workshop on Tuesday 21st November 2017.
6	**Securing Employment:** During Week 11 the focus is on applying for and securing a teaching post. Prepare a personal statement (maximum 2 sides of A4) for an application for a teaching post advertised on TES jobs for a job in the sort of school you are interested in working in. **Bring this to the session on Monday 4th December 2017.**

Electronic copies of tasks 1, 2 and 6 should be sent to your Personal Tutor as soon as they have been completed. During the second tutorial of the term your progress with tasks 1 and 2 will be discussed briefly. The final tutorial of the term will focus in more depth on these tasks.

ASSIGNMENTS

You are required to write two 7500 word assignments. These assignments are assessed at Masters Level and the assessment criteria can be found on pages 60-62 of the Secondary Programme Handbook. A brief outline of each assignment is given below. You will be given detailed guidance about each piece as the course progresses and the guidance will also be uploaded onto ELE. The assignments are intended to blend the theoretical and practical elements of the course.

In the case of both assignments you need to ask yourself what you can draw from the literature, whether it be research, comment or reported good practice. Both assignments require evidence that you have consulted the literature available. Where you refer to books, journals etc. in an assignment you must use the **Harvard system for referencing**. Please see the guide on the Assignment Submission Information section of the Primary and Secondary Core Documents page on ELE (http://vle.exeter.ac.uk/course/view.php?id=2516).

Secondary Science Subject Knowledge and Pedagogy: Design and Critical Analysis of a Scheme of Work (Summative deadline Wednesday 3rd January 2018)

All students will address standards S3, S4 and S6 in this assignment, with further standards addressed depending on choice of focus for Part 2.

The assignment takes place in multiple stages which models a range of different assessment including peer feedback, tutor formative feedback and self-assessment. This means it is crucial to start the assignment early in the term.

1. **With a partner, design a short (6 lesson) scheme of work for KS3 or KS4 on a topic of your choice.** You should use the input from the course to consider how theories of learning and ideas such as misconceptions, motivation, health and safety, differentiation and assessment inform the design of your scheme of work.
2. **Share your scheme of work with two other pairs to gain and offer peer feedback.**
3. **Revise your scheme of work to take account of the feedback and write (1500 words)**
    a. **A short account of how you have used theories of learning in planning your scheme of work, and**
    b. **A reflection on how the designing of the scheme and offering and receiving peer feedback links to the teachers' standards.**

    With a limited word count, we suggest you focus on one key theory of learning and use examples to demonstrate how you have used it to design particular elements of your scheme of work.

    This written account should be emailed to your personal tutor, along with your scheme of work as an appendix, by **Friday 27th October,** for formative feedback.

4. **Summative Assignment (6000 words)**
    a. *(approx. 1000 words)* Describe the sequence of lessons and provide a rationale for the design, drawing on your subject knowledge, your curriculum knowledge, your pedagogical knowledge and your knowledge of likely difficulties in teaching and learning this topic.
    b. *(approx. 4500 words)* Take **one** of the areas below and discuss **in depth** the relationship between the theoretical ideas from the Education and Professional Studies and Subject Knowledge and Pedagogy programmes, your reading of the education research literature and the practical realities of the classroom using your scheme of work to exemplify the points that you make.

        - How you would differentiate the delivery of the scheme of work for different pupils drawing on your knowledge of pupil progression, ability, SEN, and gifted and talented.
        - How you would attend to developing pupils' literacy when delivering the scheme of work.
        - How you would assess learning when delivering the scheme of work.
        - How you would motivate pupils when delivering the scheme of work.

c. *(approx. 500 words)* Provide a short **summary of the implications** of this assignment for your professional development – e.g. a summary of key things that you have learnt and of issues that you feel you now need to address.

Education and Professional Studies (EPS) Assignment: Action Research

Refer to the EPS Handbook for details of this assignment. The EPS research series of audio lectures will also provide useful background.

TUTORING

You will have a **personal tutor** who will meet with you on three occasions in the Autumn term. In the first joint tutorial, you will be introduced to some of the evidence tools and begin to outline an Action Plan, focusing largely on the development of subject knowledge. You will also be able to share any difficulties you may be experiencing on the course. In the second tutorial you will discuss the writing of your Formative Reflection on Achievement and Progress (FRAP) 1: Anticipating Practice. This document needs to be completed (after any revisions) by **Friday 3rd November 2017** so that you can take it with you into your placement school the following week. The final tutorial will be used to follow up any issues that have arisen during school based work.

Please remember that we will be supporting you pastorally as well as academically. Don't hesitate to contact your tutor in between tutorials if you want to discuss anything.

When you move on to school based work you will have a University Visiting Tutor (UVT) as well as your personal tutor. Your UVT will observe you teaching in your placement schools and liaise with the school in connection with your progress whilst you are in school. Your UVT may or may not be your personal tutor – if not, then they will liaise closely to make sure you receive the support you need.

KEY TASK LIST WITH DEADLINES

Some school-based tasks have deadlines given in your quality assurance record.

TASK	DEADLINE
Watch EPS Recordings and complete associated tasks	See Table on next page for dates
Send 'Matching Expectations to Experience' from Science Preliminary Task and General Summary from Generic Preliminary Task and your CV to your Personal Tutor	Friday 29th September
Write up teaching evaluation of SSG peer teach for Directed Task 1	After teaching date agreed with your SSG group. Email form to tutor asap.
Directed Task 2 – agenda and evaluation from second peer teach.	Either after 25/10 or 01/11 depending on group. Email write up to your tutor asap.
Assignment 1 Formative emailed to tutor	By end of 27th October
Directed Task 3 – Behaviour Management	31st October - bring to Big Theme workshop
Send FRAP 1 draft to Personal Tutor	Two days in advance of individual tutorial late October. Final completion of FRAP 1 by 3rd November
Directed Task 4 – Challenge the Gap Framework Task draft (EPS)	20th November – bring to Big Theme session
Directed Task 5 – Assessment	21st November – bring to Big Theme session
Directed Task 6 – Personal Statement draft	4th December – bring to Big Theme session and email to tutor for feedback
Send FRAP 1 draft to mentor in placement 1	In advance of supervisory conference. Final completion of FRAP 2 by 5th January
Assignment 1 Summative – submit to BOTH turnitin AND eBart	**2pm 3rd January 2018**

Table of EPS audio lecture and tasks deadlines

Topic:	To be completed by:	Preparation for
The Curriculum	Thursday 28th September	Science and National Curriculum
Educational Ideology: What is Education for?	Friday 29th September	Knowledge for Teaching
Child and Adolescent Mental Health	Wednesday 4th October	Dove Self-Esteem Project
Critically Engaging with Literature: Topical Research	Monday 9th October	Science Education Research
Theories of Motivation	Monday 9th October	Motivation and Science Attitudes
Theories of Learning	Tuesday 10th October	Constructivism
British Values and the PREVENT strategy	Tuesday 17th October	British Values and Science
Safeguarding and Child Protection	Wednesday 25th October	Teachers and Professionalism
Classroom and Behaviour Management	Tuesday 31st October	Behaviour for Learning
Do you know what they know? Assessment for Learning and the Use of Data	Tuesday 21st November	Assessment
Talk about it: The Role of Talk in Learning	Monday 27th November	Argumentation and Dialogue
SEND 1: Organisation and Policy	Monday 4th December	Differentiation (SEND)
SEND 2: Teaching and Learning	Monday 4th December	Differentiation (SEND)
EAL 1: Understanding Theories of Additional Language Acquisition	Wednesday 6th December	EAL Workshop
EAL 2 : Connecting Theory and Practice	Wednesday 6th December	EAL Workshop
Psychology of Teaching and Learning	As agreed in SSG	Peer led Subject Support Group
Addressing (in) Equalities and Overcoming Potential Barriers: Taking Ethnicity and Sexual Orientation as Examples	As agreed in SSG	Peer led Subject Support Group
Cognitive Neuroscience and Learning	As agreed in SSG	Peer led Subject Support Group
Challenging Notions of Ability, Intelligence and Potential	As agreed in SSG	Peer led Subject Support Group
Evidence in Education: What can RCTs tell you – and what they can't.	As agreed in SSG	Peer led Subject Support Group
Writing a Literature Review	Ahead of EPS assignment in Spring Term	EPS Assignment
Research methods design for teacher research: Action Research	Ahead of EPS assignment in Spring Term	EPS Assignment
Research methods design for teacher research: Case Study	Ahead of EPS assignment in Spring Term	EPS Assignment
Ethics in Educational Research	Ahead of EPS assignment in Spring Term	EPS Assignment

USEFUL REFERENCES AND WEBSITES

This is not a reading list. Titles are given under a range of headings to provide you with an entry into the literature for topics that you may want to follow up. In many of the sessions you will also be provided with references to appropriate journal articles. These provide access to the large amount of education research and specifically science education research that is available. When you are writing assignments it is important to read these journals because they provide details of recent ideas and developments which will not yet be found in books. Some of the journals contain mainly research based reports (e.g. International Journal of Science Education, Research in Science Education) whereas others are more professionally orientated with ideas for use in classroom settings (e.g. School Science Review). Many useful books are available through the library as 'ebooks'.

Some relatively recent titles that are aimed specifically at beginning science teachers that you may find helpful are:

Toplis, R. (Ed) (2015) Learning to Teach Science in the Secondary School (4th edition) (London: Routledge)

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

Bishop, K. & Denley, P. (2007) Learning Science Teaching: Developing a professional knowledge base (Maidenhead, Open University Press).

Liversidge T., Cochrane M., Kerfoot B & Thomas J (2009) Teaching Science: Developing as a Reflective Secondary Teacher (London: SAGE).

Wellington, J. And Ireson, G. (2012) Science Learning, Science Teaching (3rd edition) (London: Routledge).

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

Titles that you will find very useful when writing assignments are:

Bryan H., Carpenter, C and Hoult, S. (2010) Learning and Teaching at M-Level: A Guide for Student Teachers. London, Sage.

Oversby, J. (Editor) (2012) ASE Guide to Research in Science Education, Association for Science Education, Hatfield: John Murray.

Somekh, B. and Lewin, C. (2011) Theory and Methods in Social Research (2nd Edition). London, Sage.

Wilson, E. (2013) School-based Research: A Guide for Education Students (2nd Edition). London, Sage.

https://www.stem.org.uk/secondary-science - this site is building a very large collection of resources for STEM subjects.

http://www.schoolscience.co.uk/ - resources for science teaching put together by the Association for Science Education (ASE)

The CLEAPSS website http://www.cleapss.org.uk/ provides a very useful set of resources with a particular focus on health and safety issues. To login to this resource use the current username: sodium and the password: oil17 These log-in details will remain active until the end of January, 2018.

Professional organisations for science teachers

Association for Science Education (ASE): http://www.ase.org.uk/ "Teachers helping teachers to teach science"

What ASE offers ...

ASE is for teachers, advisers, technicians, industrialists and others contributing to science education. It has a membership of over 24,000.

ASE promotes, supports and develops science education from primary through to tertiary levels.

ASE is independent in its thinking and in its finance. It is a registered charity, financed by members' contributions and receives no government funding.

ASE provides a forum for the views of members on science education issues through its regional and national committee structures.

ASE is frequently and regularly consulted by those in authority and in government, industry and LEAs.

ASE offers support, advice and information for individual teachers, schools and local colleges.

ASE offers support, advice and information to those involved in industry and commerce.

ASE offers support, advice and information to other societies and associations with similar aims.

ASE provides many links with industry and arranges teacher secondments, visits to industrial sites, and it supports relevant curriculum support materials.

ASE provides its members with free journals, discount on books, and indemnity insurance.

ASE offers a special discounted membership scheme for trainee teachers. You will be given details and application forms early in the term.

Other Professional Bodies you might be interested in joining – all provide useful resources and journals for science teachers.

- The Royal Society of Biology: https://www.rsb.org.uk/teachers
- The Royal Society of Chemistry (RSC): http://www.rsc.org/learn-chemistry/
- The Institute of Physics (IoP): http://www.iop.org/education/teacher/index.html
- The Association for the Teaching of Psychology: http://theatp.org/

GLOSSARY OF TERMS

ACTION PLAN A specific plan of action to solve a problem, address a need, etc.

ACTION RESEARCH Research into your own practice, on the basis of which you plan for improvement.

AGENDA A detailed statement of intended and observable actions during an episode or the whole course of a lesson. The sequence of events expected to take place is written out on the left-hand side of a sheet of A4 paper. An observer records non-evaluative annotations of what actually happens on the right-hand side of the sheet. The annotated agenda is then discussed by the trainee and the observer.

AIMS involve general statements about learning outcomes and are usually less detailed than objectives. An overall aim for a lesson is often expressed as an enquiry question.

ANNOTATE To write notes on an agenda – see AGENDA. The aim of an annotation is to establish an objective record for later discussion rather than to pass judgements.

ASSESSMENT The attempt to analyse what learning has taken place.

- **Formative Assessment**
  informs the pupils about the standard of their work as it unfolds; it is diagnostic and informs the work as it progresses. Assessment for Learning (AfL) is a widespread and important, evidence-based approach to the use of formative assessment in schools.

- **Criteria-Referenced Assessment**
  makes the criteria by which pupils will be judged explicit; goes hand-in-hand with formative assessment and enables the pupil to be judged against objective standards.

- **Norm-Referenced Assessment**
  is a form of assessment which relates a pupil's performance in a comparative way to other pupils in the group; the opposite of criteria-referenced assessment.

- **Summative Assessment**
  is carried out at the end of a course or scheme of work; it sums up the achievement of the pupil.

CLASSROOM MANAGEMENT The way a teacher manages the transactions and activities of a class.

COGNITION A general term covering all aspects and modes of knowledge; the process of knowing.

COGNITIVE MODELLING is used to describe the creation of a mental model of a situation that they can then use to explain that situation. In teaching it enables the teacher to understand what is involved in a teaching strategy, and then adapt that model to his or her own teaching circumstances.

COGNITIVE PROCESSES The synthesis of cognitive resources and strategies which enables individuals to situate their cognition to solve a variety of problems.

CONSTRUCTIVISM The school of thought that believes that human understanding is built or constructed through cognitive processes. Social constructivists add the all-important social dimension to this process.

CURRICULUM A course of study.

DIFFERENTIATION describes the method of teaching for the needs of different pupils by modifying learning outcomes for different groups or individuals; can be thought of as judging what must be learned, what should be learned, and what can be learned. Differentiation is usually achieved by task, outcome, support (both teacher and peer) and extension.

EPISODE refers to a part of a lesson.

EVALUATION The process by which someone reflects on their performance - teachers evaluate lessons; pupils evaluate their performance on a scheme of work - should not be confused with assessment.

EVIDENCE BUNDLE is a bundle of evidence that you are having an impact on pupil learning, taken from your IDP and Teaching files in relation to one class you are teaching, which you bring to UVT meetings and Supervisory Conferences as directed by your UVT and Mentor.

FRAP Formative Reflection on Achievement and Progress.

INDIVIDUAL DEVELOPMENT PORTFOLIO (IDP) This file shows both trainee progress and attainment. It is central to identifying and meeting individual training needs and in assessing progress against the Teachers' Standards.

ITE Initial Teacher Education.

ITEC The Initial Teacher Education Co-ordinator oversees all aspects of trainees' work in schools.

KEY STAGE The term used to describe an age group in the National Curriculum: **Key Stage 1** 5-7 years, **Key Stage 2** 7-11 years, **Key Stage 3** 11-14 years, **Key Stage 4** 14-16 years, **Key Stage** 5 16-18 years.

LEARNING HOW TO LEARN involves methods of teaching that put the highest priority on developing meta-cognitive skills in pupils; good teaching methodology should lead to learning how to learn - autonomy.

LEARNING OUTCOME A planned outcome for a course of learning; the expected change in a person's skills, knowledge and understanding that a scheme of work or taught course might bring about.

LEARNING STYLES The variety of styles by which people learn.

LEARNING TARGETS Negotiated and recorded by pupils on the basis of evaluating existing performance.

MENTOR AND MENTORING [TUTORING] Within the Exeter Model, a mentor is the teacher who carries out supervisory conferences and maintains an overview of a trainee's professional development. Mentors have a vital role to play in the induction, supervision and assessment of school-based work.

META-COGNITION Can be simply put as thinking about one's own thinking. Meta-cognition refers to the processes used to plan, monitor, and assess one's understanding and performance. Meta-cognitive skills increase students' abilities to transfer or adapt their learning to new contexts

METHODOLOGY A set or system of methods, principles and rules for regulating a given discipline (e.g. research methodology; teaching methodology).

NCTL National College for Teaching and Leadership. Government agency responsible for ITE (formerly the Teaching Agency).

NVC [Non Verbal Communication] The channel of inter-personal communication that depends upon body language: facial expression, gaze, gesture, posture, smell, spatial relationship.

OBJECTIVE A description of the intended outcome of a lesson; usually short term and a much more detailed statement of intent than an aim.

OFSTED Office for Standards in Education; the current form of inspection of schools.

PEDAGOGY The study of teaching and learning methods.

PROGRAMME OF STUDY The overall programme of study for a Key Stage.

PST The principal subject tutor (PST) looks after the trainee's day to day development within the subject area during school based work.

QUALITY ASSURANCE A term used to refer to the process of monitoring, maintaining and improving the overall quality of a programme of study.

QA RECORD The sheet that the trainee uses to monitor the completion of programme elements.

RESOURCES A term used to describe all the components and equipment needed for teaching and learning.

SCHEME OF WORK a planned course of work to include attainment targets, lesson plans, assessment outcomes, and other components.

SCHOOL BASED WORK This refers to a trainee's work in school. It is defined by the location of the work, not by its nature or function. Thus, school-based work can and does involve more than simply teaching practice.

SEND Special Educational Needs and Disability.

SPIRAL CURRICULUM A way of planning learning so that concepts and skills are re-visited and reinforced; particularly useful for less able pupils, but important for all learning.

SUBJECT SPECIFICATIONS The knowledge, understanding, skills and assessment objectives in a given subject.

SUPERVISORY CONFERENCE A planned meeting between a trainee teacher and either a mentor or a university tutor at which the trainee's progress is discussed. In general, one or more annotated agendas will provide material for discussion and the participants will try to reach agreement on the trainee's current levels of attainment and about the next steps to be taken.

SYLLABUS A list of the contents of a teaching programme, usually of a subject.

TARGET SETTING Identifying specific individual goals for pupils - with a clear indication of how they can achieve their targets.

TEACHERS' STANDARDS The Government's requirements for all teachers.

UVT is a University Visiting Tutor. The UVT oversees the trainee's progress during their School Based Work. The UVT monitors the training provided by the school and works to support the trainee where appropriate.

ZONE OF PROXIMAL DEVELOPMENT Term used by Lev Vygotsky to describe the new learning territory that the teacher should be scaffolding so that pupils can develop new understanding and knowledge.