



UNIVERSITY OF
LEICESTER

PGCE Secondary Course Science Subject Guide 2023-2024



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Welcome

We welcome you very warmly to our PGCE Science Programme at Leicester. We look forward to supporting you over the year and guiding your preparation for an exciting and challenging new role as a science teacher in secondary schools. We aim to get each of you into the 'driving seat' very promptly, and to help you negotiate and navigate through some challenging territory with great success. Be prepared to take charge of your own learning from Day 1, and tutors, both at the university and in school, will do their best to support you.

To help you develop your skills and understanding and meet the aims of the course, the PGCE Science course focuses on a number of important areas:

1. Subject knowledge understanding
2. Pedagogy
3. Classroom Practice
4. Professional Development through reflection

Aims

The aims of our science programme are to:

- Introduce you to current theories and practice in science teaching and integrate these with the PGCE Professional and Academic Course and the Core Content Framework for Initial Teacher Education
- Help develop your academic and critical thinking skills to bring about effective science teaching and learning in schools
- Help you know more about the qualities of a 'good' science teacher
- Help you understand what contribution science education can make to the wider education of young people
- Equip you with the skills needed to deliver an effective, safe and engaging classroom experience for learners

Outcomes

By the end of the PGCE year in science you will have:

- Considered the place of science education in the secondary curriculum
- Been introduced to the main theories about how pupils learn science
- Developed your understanding of pupils' prior and subsequent learning in science
- Begun to appreciate the importance of active and enquiry-based learning in science
- Gained knowledge about legal and practical issues of health and safety in science teaching
- Assisted in the planning, preparation, teaching and assessment of pupils' work in science
- Considered how to support language, numeracy and ICT skills in science
- Developed your understanding and practice of using ICT and e-learning in science
- Discovered more about your own misconceptions, and those of your pupils, in science
- Used assessment in a variety of ways to support pupils' learning
- Developed strategies for handling sensitive or controversial issues
- Learnt more about identifying and supporting the needs of all pupils in science lessons
- Begun to make links between science teaching and other areas of the whole curriculum

- Explored a range of strategies for managing behaviour in a laboratory context

Overview of the year

An overview of proposed sessions and learning objectives can be found on the course Blackboard site. There, you see how course content links to and develops ideas contained within the **Core Content Framework** for Initial Teacher Education.

Qualification

You can qualify for either a Professional Certificate of Education (Level 6) or a Postgraduate Certificate of Education (Level 7 or 'M' level). The majority of Science PGCE student teachers complete the course at M-level as well as gaining Qualified Teacher Status (QTS). Success on the M-level route means you can carry up to 90 credits towards the completion of a full Master's degree in Education at a later date.

In order to qualify for the Postgraduate award, you will complete the first two university assignments (UA1 and UA2) at level 7. Completion of UA3 at this level can earn you an additional 30 credits – see assignment handbook for more detail. Level 7 work is characterised by critical understanding of pedagogical theory, robust professional enquiry and a clear ability to reflect on the implications for your own teaching practice.

All PGCE students attempt UA1 at M level.

In addition to the 3 graded University Assignments, passing the course depends on your ability to consistently meet all the National Teachers' Standards for QTS by the end of your second school placement.

The Year in a Nutshell

A detailed and up-to-date schedule of activity can be found on the Science Blackboard site and should be used in conjunction with the main PGCE Secondary calendar.

Week 1-6	Phase A1 – University sessions and induction to Phase A school placement (Week 4 ITAP)
Week 7	Study week
Week 8 - 16	Phase A2 – Phase A school placement
Week 17	Study day and Primary Experience days
Week 19-23	Phase B1 – University sessions
Week 24-42	Phase B2 placement
Week 25*	Study week (*during school half term)
Week 30 or 31	1 day return to university (tbc)
Week 39	University subject day during half term week
Week 43	Internal and External examination, subject sessions and valedictory

Responsibilities

As a student teacher, you are expected to take responsibility for your own learning, which involves planning ahead and building up records of what you have achieved. You should assemble evidence of what you have done from day 1, and you will be demonstrating essential and important organisational skills by collecting evidence of your progress against the QTS Standards (see Course Handbook for more about these). It is essential you are organised in your planning and record keeping at all stages of the course.

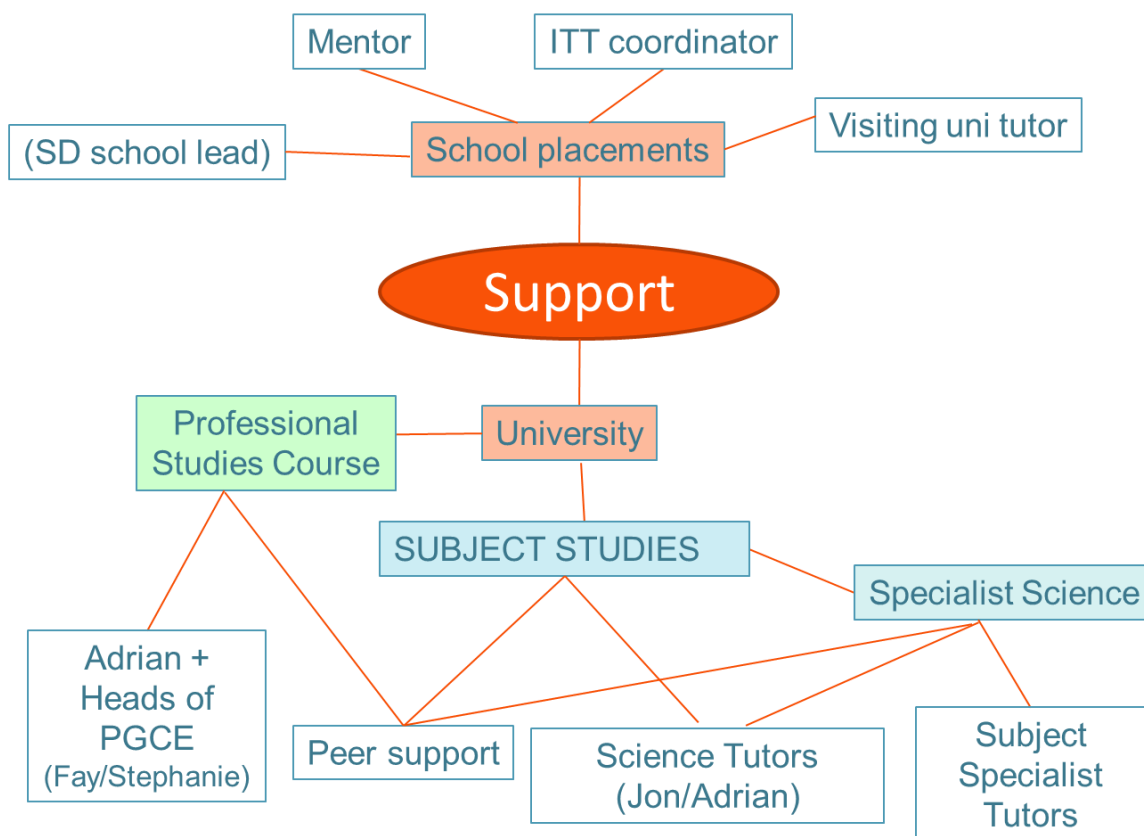
PGCE is a tough year. Be prepared for a ‘bumpy ride’ at times – you will often learn by making mistakes. Some ideas you try out will not work, but others will and you are expected to make progress in a planned and rational way. Always **reflect** on what worked and what didn’t work so well. By asking ‘Why?’ you will learn more about what to do the next time.

Professional Conduct. We expect you to attend and to be punctual for **all** sessions at the University, online and in school. If for any good reason you cannot attend, or will arrive late, you **must** let the relevant tutors know of your absence with a brief explanation and, if in school, follow the school policy. Attendance is logged for all taught sessions at the University and reflected in references. In school, you are expected to attend the school day fully as a regular teacher and to participate in pre/after school meetings or events as required.

Use of mobile devices. You can access Eduroam wifi across the university. Some schools may have a ‘no phones’ policy for students so you will need to think about what constitutes appropriate use of mobile phones in front of students. During university taught sessions, please ensure that only appropriate, courteous and professional use of mobile phones is made.

Support

The diagram gives an overview of the different forms of support you can expect during your PGCE year.



Science Tutors (University). Science tutors are responsible for ensuring continuity and coverage in your work. They support your plans and consider the materials you make or write, responding with guidance, suggestions and practical help at each stage. The tutors assess your written work, provide individual tutorial support and help you navigate your way through the demands of the course. They can also advise on career options and will provide your reference for teaching posts.

Your **Science Team** is a group of graduates of several different science specialisms. In this team, you can share expertise and knowledge and, for example, explain the ideas within your own subject specialism and more unfamiliar areas of science to a supportive but demanding audience. The Science Team is the basic administrative unit for the year but we also refer to the '**Science Superteam**' – meaning a combination of students from all Teams if we have more than one.

Science Cotutor in the partnership school. Your cotutor has responsibility for integrating you into the work of the school Science department (and Mathematics department if required) and familiarising you with the specifications and Schemes of Work that the department uses. He/she:

- arranges occasions for you to help and observe;
- plans a timetable for you;
- supports your lesson planning;
- reviews your progress with you through weekly review meetings and more formal action planning if required;
- completes staged reports for each Phase of the course to assess your progress against the Standards.

A second Cotutor supports and assesses your second block placement in a different school. He/she will help you build on your progress and agree with you your priorities for the B2 weeks.

You will meet with your cotutor weekly whilst on placement and are expected to prepare for these meetings thoroughly. These meetings should have a developmental focus, where your progress is reviewed and targets are revised. Please try to ensure that they do not get hijacked by an exclusive focus on planning upcoming lessons.

While in school, you will build up your teaching resources folder in your e-portfolio which should contain all evidence relevant to your teaching - your timetable, class/pupil information, lesson plans, resources, evaluations.

Initial Teacher Education (ITE) Co-ordinator in the Partnership school. This is a senior teacher in the school who oversees the Initial Teacher Education (ITE) programme for student teachers in the school. He/she helps with your preparatory work in school on general professional topics, provides tutorial guidance, supports and assesses your progress on a range of tasks and/or your reflective journal as they relate to the whole school.

You should also be aware that the ITE Co-ordinator supports the Mentors in their school, overseeing their assessment of your progress both in practical teaching and on wider aspects of being a professional teacher. They have an important moderation role in the assembly of the grades for your end of phase report.

The ITT Co-ordinator acts as the main 'conduit' of information between the PGCE administration at the university and the mentors (and student teachers) in their school.

School Direct. If you are a School Direct trainee, you will also have a tutor from your SD lead school who should be your next port of call for issues in school if your cotutor/ITE coordinator cannot resolve issues.

Peer support. Throughout the year you will support each other, in particular with regard to writing assignments and development of subject knowledge. Peer support is a valuable part of your PGCE year both at the university and in school. You will find your 'critical friends' an important asset.

Seeking help. Where possible try to seek solutions to minor problems yourself or by talking with your peers in the university or school. The student handbook and the Blackboard course site offer much support and should be your first points of reference. In school, turn to your mentor for advice if another opinion is needed or, for more serious matters, turn to the ITE Co-ordinator in school for support as well. Always keep your university Team Tutor informed, even if you have managed to solve a problem without their help. Early intervention is often critical to success.

How you will learn

(1) Team sessions: Teaching skills. Pedagogic Theory and Practice. ('Knowing', 'Doing')

Phase A1 focuses on providing and deepening your knowledge and theoretical understanding of educational processes. Your Team provides the opportunity for peer support and the security of working in a smaller group.

You learn about the basic communication, interpersonal and management skills required for teaching. To practise these skills, there are numerous opportunities for taking a lead, and the Team provides a supportive environment for gaining ideas and evaluating your development, as well as learning more about unfamiliar

areas of science. You will also get some experience in the classroom on the three Friday afternoons in September.

In the spring term (B1 weeks) the emphasis of university-based work moves from immediate classroom skills and practice towards a development in your awareness and knowledge of the wider aspects of life as a science teacher ('Doing', 'Being'). You engage with tutors and your peers in professional debates surrounding these. Student teachers take an increasing lead in preparing and contributing to these sessions.

(2) Superteam sessions: Curriculum, concepts and workshops

Subject Workshops: Tutors select National Curriculum (NC) science topics at key stages 3 and 4 for discussion and practical activity. Student teachers may assist with parts of these workshops and share their particular expertise. The workshops focus on developing your pedagogical skills (i.e. how to teach and facilitate learning), knowledge, and your overall confidence and skills in key areas by providing, through a variety of teaching and learning styles, many practical activities to promote your learning.

These sessions also contribute to your subject knowledge development and support subject audit work undertaken at points throughout the year.

(3) Subject specialist groups

Subject tutors and associate tutors lead these full-day sessions on four Fridays (two at the start of phase A, two at the start of phase B). You work with graduates who have a similar degree background to yours and may be able to contribute to the choice of focus for the programme for these sessions. Sessions incorporate an in-depth focus on KS4 and post-16 work, and provide opportunity for personal, as well as group, practical work. All student teachers are expected to take a lead in their specialist area by helping to teach other student teachers during the Superteam KS3 and KS4 workshops.

Learning Outside the Classroom:

As part of the subject specialism component and also during Superteam sessions, you will be able to consider aspects of learning outside the classroom. All student Science teachers will have opportunities to explore the benefits of providing learning opportunities at venues outside school.

Building up your evidence

Your stock of personal work increases during the year, partly from contributions you make during the workshop sessions, partly from contributions to your Team sessions, and partly from work within your subject specialist sessions.

Each week we recommend the following:

- In addition to tasks set out in the reflective journal, we expect you to keep a record of the key points you are learning in science sessions and from your wider reading.
- Update your e-portfolio

Considering Safety

Your personal safety and that of others, including pupils in your care, is clearly of paramount importance. Science teachers bear a particular responsibility to ensure that the level of safety is as high as possible in an environment which contains many potential hazards. A list of the types of **hazard** present may seem daunting (poisons, fire, electricity, gas etc.) but in reality, although the range may be broader, the types of **risk** are not greatly different from those found in the home. The key to safety is a disciplined approach to the use of the

devices and materials which are to be handled. The successful learning and the self-confidence of pupils depends on their being given freedom to use the practical facilities of the laboratory, but this must at all times be within the bounds of safe practice for the age and competence of the particular group. If they are to enjoy this freedom they must also be taught responsibility. As science teachers, it is our duty to provide a framework so that pupils may develop this responsibility.

- You will attend an introductory Health and Safety Session in Science in phase A1.
- The book ***Safeguards in the School Laboratory*** is available from the ASE website. A discount is available for members of the ASE – we encourage all Science student teachers to join (there is a discount for early career teachers once you are enrolled on the PGCE).

Remember when dealing with practical work in school, that there should always be a qualified science teacher on hand (usually the regular class teacher), so you are never in sole charge of the practical laboratory. Planned practical work should always be checked **well in advance** with the regular class teacher and laboratory technician. It is crucial that you give yourself enough time to try out **ALL practical activities** (demonstrations and class practicals) before conducting them with pupils. You can then check the reliability of the equipment and assess the hazards/risks for yourself and your pupils.

Safety information and advice for Science teachers is available through CLEAPSS (www.cleapss.org.uk). During the course you will become familiar with some of the support materials provided by CLEAPSS, including the Hazcards for the chemicals you are likely to encounter in school laboratories. Risk assessment and mitigation are important parts of the lesson planning process but this will soon become routine, and information and advice are never far away.

Once qualified, a certain level of indemnity is provided via teachers' unions and through membership of the ASE. **Whilst training, however, it is important that any practical work is approved by your school.**

Science Laboratories – Code of conduct

The laboratories to which we have access are used by several departments. In order that the facilities can be maintained in an orderly manner and maximise convenience to all users, PGCE student teachers are asked to observe the following protocols:

- At all times, safety procedures should be observed. If in doubt, consult a member of staff. It is unacceptable to conduct any practical work without knowledge of the risks involved and suitable safe handling procedures. In each lab, either at the university or in school, you should be familiar with the location of the main gas tap, electric power safety switches, waste/glass/sharps disposal receptacles, the fire exits and extinguishers.
- Food and drink **must not** be consumed in the laboratories.
- Respect the need of others for space or the use of masks for medical reasons or as ongoing conditions dictate.

Practical work:

- For student-initiated practical work, you may need to consult the technicians and complete a **Requisition Form** (downloadable from Blackboard). It is essential to give technicians as much notice as possible before the practical session. If in doubt about your needs, do discuss them with the technicians.
- Make sure that any broken or defective items are reported to the technician or tutors.
- Ensure that used glassware is thoroughly rinsed and placed in the tray provided.
- Follow best practice in terms of health and safety.

Section Two – School Placements

Introducing Yourself

Over the first few weeks you need to assemble a short, well written, **pen portrait** of yourself for review by your tutor before sending to your **Phase A school cotutor** so that he or she will know how to introduce you to colleagues and pupils. Half a side of A4, clearly typed, is about right.

Induction – Getting to know your school

You will spend two days in each placement school before you start a teaching timetable. These are referred to as the **School Serial Days**. About half of the time during these days should be spent in the science department getting to know the staff and pupils. It is a very busy period, so please be as helpful as possible to your mentor and develop your own skills by **active participation**. Get to know how the department works and lay the foundations for the block placement later on.

The precise pattern of working is negotiated between student teachers and their mentor and he/she will provide a flexible programme, including:

- Meeting key staff (your pen portrait should help here)
- Finding out about the Schemes of Work in the department
- Observing classes and lessons in Science and other subjects
- Keeping notes about usual school and departmental routines
- Shadowing the technician (with permission) and locating equipment and resources that you might need
- Taking responsibility for some teaching only, such as short demonstrations, supervision of small groups, and so on.

Observations are often better when they are focused on specific skills such as how to start a lesson, or how to manage the changes in activity (transitions) within a lesson.

Activities for Induction Days

During your 2-day induction you need to gather information about your school to support, for example, your awareness of the classes you will teach, behaviour management systems used and location of resources.

During your school placement, the nature of the reflective journal also changes. Following your induction days, record your key thinking against questions such as those that follow in your **reflective journal**. This should be based on lesson observations and discussions within the department in which you will be teaching.

You should be able to address questions such as:

- How will your subject knowledge stand up to the topics you are going to be teaching? Can you identify areas of need for you to work on? (TS3)
- Lesson planning - which proforma will you be using? (TS2, TS4)
- How is pupil progress assessed? How are books marked? What is the department policy on marking and feedback? Homework? (TS2, TS6)
- From observed lessons, what evidence do you have of the typical structure of lessons? What evidence have you seen of Assessment for Learning in action?

You will find it helpful to collect the following information and add to your School File

What do you know so far about the science department?

Key Staff:

Know their names.

Science Mentor?

Names of science teachers?

Names of science technicians?

Other support staff (Teaching Assistants)?

ITT Co-ordinator?

Head teacher?

School Day:

Times of school day?

Times of lessons?

Expectations:

Of staff in use of first names, dress, attendance?

Method of contact if ill or absent?

(What is the best way to do this? Mobile? Office phone? Email?)

(When ill or absent from placement university tutors need to be contacted as well!)

Obtaining equipment and resources?

What equipment is located in the labs /teaching rooms and what needs ordering via technicians?

What is the system for ordering equipment from technicians? How much notice is needed?

What is the system for accessing reprographics?

Where are the paper resources /books kept?

What availability is there of computers, OHP, video, whiteboards?

Do any of these resources need ordering/booking?

Make a note of Lab Safety rules

Accident procedures?

Location of safety equipment?

Departmental policy on sanctions and rewards?

Teaching Information:

Liaise with your **Mentor** over assembling this information

Which classes will you teach? Where you will teach?

What they have they already learned this term?

What topic(s) you will teach? How long are the topics?

Do you have access to SIMS/CMIS for accessing registers/pupil data?

Meetings with your Cotutor

There are many informal occasions when you can talk with your cotutor and other science teachers. However, it is important that you take advantage of the protected time that your cotutor has been given to support your training. There are two types of formal meeting that you will encounter. You can read more about the **Weekly Meeting** process in the Secondary Course Handbook.

You are expected to prepare fully and keep records using the documents in your e-portfolio.

To help you prepare and to inform discussion with your mentor, you should use the **CARD** which helps you understand the demands of each of the Teachers' Standards. This is a working document which works best if used collaboratively and as a basis for discussion.

You can work on these documents 'live' in your e-portfolio to avoid having multiple copies of key documents – but do remember to make a backup copy periodically!

Preparing for Teaching

Once you are familiar with the school and its routines, there is a lot to do in getting organised for your teaching programme:

- Find out about the classes you will teach; names/photos if available, and particular information about pupils.
- Obtain topic plans, and schemes of work (SoWs) if available, and identify resources for planning your lessons.
- Prepare your *e-portfolio* to support logical filing of documents.

During your first placement week, upload a copy of your timetable to your portfolio.

Make sure that you include lesson times and include your mentor's free periods as this can often help visiting university tutors to plan their visits. If your school has a two-week timetable, include all dates of weeks A and B so your tutor doesn't have to chase this later.

Conduct During Teaching

1. In the event of any absence from school it is **essential** that you get clear messages to the school office, to your cotutor, and to your university tutor. There is an absence form to be completed on Blackboard which must be sent to the PGCE office.
2. Effective lesson preparation employs a variety of skills and creativity; it will involve devising activities, demonstrations, questions, homework and so on. You need to develop a systematic process for designing lessons and writing plans. Keep separate any *Lesson Notes* which will contain the detail of your ideas for the lesson. Throughout the planning process you need to think about your response to all assessment information, both formal and informal, that you gather about your pupils.
3. Get into the habit of writing regular evaluations of your own lessons. Detailed lesson evaluations (written up as soon as possible after the lesson) should examine how well your lesson went and the extent to which the learning objectives have been achieved. These evaluations are a vital tool in helping you identify your training targets and for informing tutorial discussions with your Mentor.
4. Ask your cotutor and other science teachers to watch parts of your lessons like starts, endings and some whole lessons, and to write observation notes on the sheets provided (**ERFs**). Note: there are two designs of ERF available, one specifically for lesson observation and another more general ERF for other evidence gathering e.g. notes on your portfolio made by your mentor, marking completed, meetings attended, or

extracurricular involvement. Always provide the observing teacher/tutor with a copy of your lesson plan prior to your teaching. Where possible, agree some training targets beforehand for observations, either referring the last IAP or targets arising from the last meeting with your Mentor. Relate these targets to the Teaching Standards.

5. You will also continue observing other people's lessons yourself, in science and in other subjects as part of the 'focused observations' detailed in the Secondary Handbook. Don't forget you can also arrange additional observations; if, for example, you have challenging students in your classes, you can learn a lot by watching them in other teachers' lessons.

6. When you have any other adult in the room with you as you teach, establish yourself as the person in charge. If you have supporting adults (e.g. teaching assistants) make it clear how you would like them to support pupil learning.

7. Your visiting tutor from the university will normally visit you once during the block practice. They will explore your e-portfolio ahead of this visit so do make sure you keep it up to date.

8. During the placement, continue to complete your reflective journal as well as your own lesson evaluations.

Transitional IAP (sixth and last IAP): AN 'END OF YEAR' ACTION PLAN

Towards the end of the year, when you reach the completion of the B2 weeks, the end of your initial training is in sight. You may have already secured a job, or perhaps you are still applying. This is a time for taking stock and reflecting on the progress you have made in a year. To help with this you will consider your ECT transition, summarise your strengths and identify the particular areas for further development during your induction in your first teaching post. Try to see this as an opportunity for identifying areas where you can ask your first school for particular professional support. Targets will reflect those given in your end of Phase B report. You will share these targets with your Induction Tutor in your first teaching post.

Final tutorial with your Team Tutor

In the final tutorial with your Team Tutor discuss the main targets and strategies for future professional development.

Section Three - Course Requirements:

University Written Assignments for Science

Subject Knowledge Audit

To pass the course, you need to:

- Complete two teaching placements, consistently meeting all the National Teaching Standards by the end of your second placement
- Complete the primary placement week
- Complete three University Assignments which may bear Masters level credits
- Complete other course level tasks as set by tutors

The University Assignments (UA1, UA2 & UA3)

University Assignments 1 and 2 are introduced in the Professional Studies programme and supported by Science group sessions. Details are given in the Assignment Handbook.

In preparing to write each of these, you will be required to submit a 500 word outline of your planned study to your Team tutor to a deadline set during each introductory session.

UA3 is similarly introduced via Professional sessions.

Note that submission deadlines are fixed and that no extensions are given. If there are legitimate reasons why submission to deadline is impossible, you can apply for **mitigating circumstances** using the form on the PGCE Secondary course Blackboard site. Talk to your tutor if you think that this may be needed.

All students attempt UA1 at level 7 and the majority progress to attempting UA2 at level 7. If an assignment does not reach the mark required for level 7 credit after an opportunity for one resubmission, credit can be awarded at level 6 if it reaches a passing mark. Completion of UA1 and UA2 at level 7 earns the PGCert part of PGCE and subsequent assessment of UA3 at level 7 can gain an additional 30 credits that can be used to access our MEd course at a later date. Students not awarded 60 credits for UA1 and UA2 but passing at level 6 are awarded the Professional Graduate Certificate in Education.

Development of Subject Knowledge and Understanding

Throughout the year you will work on developing aspects of your **subject knowledge and understanding (SKU)**. The concept of balanced science underpins the National Curriculum, requiring pupils to engage with a broad range of science experience including Biology, Chemistry, Physics, Earth Science and Astronomy. For your part, you will need to develop your confidence to teach topics both within and outside your main specialism.

To support your understanding of the breadth of the curriculum, you will complete a subject auditing exercise at **five points** during the year. This will help you:

- Focus on and target important areas
- Demonstrate to your tutors your commitment to self-development
- Develop your understanding of the breadth of the science curriculum
- Increase your awareness of the links between different curriculum areas
- Develop a summary of activity that can support demonstration of aspects of the Teachers' Standards.

At points in the year, as requested, you will update your SKU audit document in your e-portfolio which will then be available for your tutor to review. Initially you will have reviewed this document as part of your pre-course tasks. Other review dates are explained on the document itself.

Against each of the statements in the KS3 and KS4 sections relating to Biology, Chemistry and Physics, you will record your familiarity using the following scale:

Level 1	Very little familiarity with this aspect of the curriculum. I would not be confident teaching this yet.
Level 2	Limited familiarity with this aspect of the curriculum. I would need to thoroughly revise this at an appropriate level in order to be able to teach it.
Level 3	I am familiar with this aspect of the curriculum and would be able to teach this with some revision at the appropriate level.
Level 4	I am very familiar with this aspect of the curriculum, have some ideas about pedagogy and would feel confident to teach this with minimal revision.
Level 5	I am very confident with this topic and feel I could now make good pedagogical choices in preparing to teach it.

You are also expected to keep a record of any activity you have done to develop your subject knowledge in each topic area on the same form.

Further information, an example and the full subject content can be found in the **'SKU audit'** document (on Blackboard in the 'Course Information>Subject Knowledge Development' area) which you should save to your own user area or a portable drive, with a personalised filename such as 'SURNAME Firstname SKUaudit2023-24'.

Course Reading

Highly recommended

We hope you take the opportunity this year to explore areas of your own choosing. Please let your team tutor know of any writing you would like to see included in this list in the future.

You can also refer to the reading lists accessed via Blackboard.

A range of reading related to individual sessions is outlined on the course overview in appendix 1.

Other sources you might wish to consider include:

ASE (2006) *Safeguards in the School Laboratory*. Hatfield: Herts.

Kind, V. and Kind, P.M. (2008) *ASE Teaching Secondary How Science Works*. London: Murray / ASE.

McDuell, B. (Ed.) (2005) *ASE Teaching Secondary Chemistry*. London: Murray / ASE.

Ratcliffe, M. (Ed.) (1998) *ASE Guide to Secondary Science Education*. London: Murray / ASE.

Reiss, M. (Ed.) (2007) *ASE Teaching Secondary Biology*. London: Murray / ASE.

Sang, D. (Ed.) (2007) *ASE Teaching Secondary Physics*. London: Murray / ASE.

Sang, D. and Wood-Robinson, V. (Eds.) (2002) *ASE Teaching Secondary Scientific Enquiry*. London: Murray / ASE.

Wellington, J. and Ireson, G. (2012) *Science Teaching, Science Learning*. London: Routledge.

Note: as a member of the Association for Science Education – ASE – you can obtain a discount on many school and science education texts.

Further Reading

Health and Safety

DfEE (1996) *Safety in Science Education*. London: HMSO.

DfEE (1998) *Guidance on First Aid in Schools*. London: HMSO.

DES (1990) *Microbiology: An HMI Guide for Schools and FE*. London: HMSO.

Nichols, D. (1999) *Safety in Biology Fieldwork. Guidance notes for codes of practice*. London: Institute of Biology.

Useful introductory books

Amos, S. and Boohan, R. (Eds.) (2002) *Aspects of Teaching Secondary Science*. London, Routledge Falmer.

Driver, R., Leach, J., Millar, R. and Scott P. (1996) *Young People's Images of Science*. Buckingham, Open University Press.

Kyriacou, C. (1997) *Effective teaching In Schools. Theory and Practice*. Cheltenham: Stanley Thornes.

Lewis, C. (2002) *Lesson study: A handbook of teacher-led instructional change*. Philadelphia: Research for Better Schools Inc.

Mannion, K., Brodie, M. and Bullough, A. (2003) *Transforming Teaching and Learning at Key Stage 3: Science*. Exeter: Learning Matters Ltd.

Naylor, S. and Keogh, B. (2000) *Concept cartoons in science education*, Cheshire, Millgate.

Nikolic, V. and Cabaj, H. (2000) *Am I Teaching Well?* Toronto: Pippin.

Perrott, E. (1982) *Effective Teaching: A Practical Guide to improving your teaching*. London: Longman.

Ross, K., Lakin, L. and Callaghan, P. (2004) *Teaching Secondary Science. Constructing Meaning and Developing Understanding, 2nd Ed.* London: David Fulton.

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