

Birmingham City University

**Secondary
PGCE**

**Science Mentor
Training Guide**

2017/18

This mentor guide provides easy access to the overview of the PGCE Core and School Direct Secondary programme and outlines the role of the subject/professional mentor within the partnership. The guide has a subject or professional focus to help you with the explicit demands of your mentoring role so that you can easily plan your mentoring interactions with trainee teachers within your context.

Contents Page

Introduction to the Partnership.....	3
DBS Enhanced Disclosures and Safeguarding.....	3
Key Contacts.....	4
Strategic Leadership Committee.....	6
Secondary School Training Routes.....	7
Course and Placements Overview.....	8
Course and Placements Overview Calendar.....	9
Key Dates.....	10
Professional/Subject Training Overview.....	12
Key Mentor and Trainee Documentation.....	13
Mentor Roles and Responsibilities.....	16
University Tutor Roles and Responsibilities.....	17
Trainee Teacher Roles and Responsibilities.....	18
Observation and Feedback.....	19
Using the Review and Analysis Form.....	20
Review and Analysis Form Examples.....	21
Weekly Mentor Meetings.....	25
References and Additional Information.....	27

Introduction to the Partnership

We welcome our partner schools to our PGCE Secondary course which trains specialist teachers of Art & Design, Computer Science, Design & Technology (Food & Textiles), Drama, English, Mathematics, Modern Foreign Languages, Music, Science (Biology, Physics and Chemistry) and Religious Education. In addition to these subjects we also support Geography, History, Psychology and PE via our School Direct route. The course was rewritten in 2016 by a team of tutors and mentors from the Faculty of Health, Education and Life Sciences at Birmingham City University and secondary school partners in the West Midlands. We are very grateful to all who participated in this as part of the practical outworking of partnership.

This mentor guide contains an outline of the activities tutors, mentors and trainee teachers will engage in as part of the partnership in the training and professional development of future teachers in secondary schools. Our intention is that the information contained in this guide will enable all of our partners to have a holistic understanding of the course and a more specific knowledge of the roles and responsibilities of its stakeholders. In the Faculty of Health, Education and Life Sciences we work on specific subject teaching methodologies and develop trainees thinking and understanding of education, pedagogy and professional issues. Trainee teachers are introduced to the concept of profiling their own achievements, setting targets for their future development, and planning ways of ensuring that they achieve the standards which must be met for the award of QTS (*The Teachers' Standards, DfE, 2012*).

The PGCE Secondary Course aims to produce highly skilled graduate teachers who:

- Have a deep knowledge and understanding of learning and teaching enabling them to demonstrate the highest levels of professional practice.
- Are committed early career professionals who are confident, creative, reflective and accountable practitioners, able to teach their subject in contemporary cultural contexts delivering a rich and diverse curriculum.
- Are able to exercise professional judgement, based on an informed understanding of a systematic and coherent body of knowledge related to education and subject pedagogy.

DBS Enhanced Disclosures and Safeguarding

The University, in its role as effectively the employer is responsible for ensuring that all trainees go through the Enhanced DBS Disclosure process, regardless of whether they already have a recent DBS Disclosure, and for ensuring that there are no issues disclosed that would preclude the trainee from working with children or other vulnerable individuals.

In response to recent requests from partnership schools our trainees will receive a letter from the University to confirm that the DBS process has taken place. Trainees will bring this letter to their placement schools. We are grateful to the schools and professional mentors who have guided us in developing this document.

Key Contacts

Name	Role	Contact
Kelly Davey Nicklin	PGCE Secondary Programme Leader & Music Subject Leader	0121 331 5176 kelly.daveynicklin@bcu.ac.uk
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Craig Davis	Partnership Administrator	0121 331 6591 craig.davis@bcu.ac.uk
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Ian Axtell	Music Subject Tutor	0121 331 7322 ian.axtell@bcu.ac.uk
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Peter Carr	Art & Design Subject Leader	0121 331 5156 peter.carr@bcu.ac.uk
Fiona Darby	English Subject Tutor	0121 331 7736 fiona.darby@bcu.ac.uk
Stuart Davison	Computer Science Subject Leader	0121 331 7375 stuart.davison@bcu.ac.uk
Martin Duke	Mathematics Subject Tutor	0121 331 7726 martin.duke@bcu.ac.uk
Jean Dyson	Art & Design Subject Tutor	0121 331 5179 jean.dyson@bcu.ac.uk
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Simon Tresidder	SKE Programme Lead & Science Subject Tutor	0121 331 7660 simon.tresidder@bcu.ac.uk
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Kevin Mattinson	Head of School of Education	0121 331 7337 kevin.mattinson@bcu.ac.uk
Simon Spencer	Deputy Head School of Education & Drama Subject Tutor	0121 331 7356 simon.spencer@bcu.ac.uk
Davinder Dosanjh	Head of Dept. Secondary & Post Compulsory Education	0121 331 6865 davinder.dosanjh@bcu.ac.uk
Helen Yorke	Director of Education Partnerships	0121 331 7355 helen.yorke@bcu.ac.uk

*Please note that the best method of contact for a swift response from a subject tutor is email contact.

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Strategic Leadership Committee

The purpose of the Strategic Leadership Committee is to ensure that the future direction of the BCU PGCE programme is driven by a focus on school-led issues. The role of the Chair, professional and subject mentor reps on the Strategic Leadership Committee is to collect feedback from regional schools and to represent them to ensure that the future workforce requirements of partner schools are gathered, collated and implemented as focussed actions for the PGCE programme.

The Strategic Leadership Committee:

- Directly challenges the course team on their improvement plan and their self-evaluation documentation.
- Gathers mentor feedback on placements and the course, and considers trainee feedback through evaluations.
- Provides an essential bridge between HE research and school practice leading to evidence based research and evidence based practice.

If any of our partners would like to provide an input to the Strategic Leadership Committee please contact our Chair Kirsten Pearce kirsten.pearce@ctckingshurst.academy

Birmingham City University Secondary School Training Routes



Secondary ITT

Secondary Teacher Training Routes

Birmingham City University School of Education supports Secondary School trainee teachers through three distinct teacher training pathways which all provide the opportunity for trainees to be awarded with QTS and a PGCE. The three pathways include a Core PGCE programme, School Direct and the Teach First PGCE. Some schools support our trainees through more than one training route and university tutors work across the three programmes. There are key contacts that you can communicate with on each of the three teacher training routes if you have a specific question about the route that your trainee is following, and any communication that university makes with school will indicate specifically on the correspondence which route we are contacting about.

It is important for our mentors to recognise that the three routes follow different programmes of study, and therefore the requirements of our mentors on each programme are different. Trainees will follow different modules and will be assessed at different times within the academic year. Where possible university tutors within the School of Education have tried to ensure that practice across the three routes is consistent and comparable, however we suggest that mentors are aware of the route that their trainee is following and recognise that this training route may be different to other routes that Birmingham City University trainees are following within their school.

Route	Description	Partnership Page	Trainee Assessments	Key Contacts
Core PGCE	The Core PGCE route places trainees in two contrasting schools over the training year. Trainees gain substantial school based experience whilst studying theory at weekly university workshop days. The partnership trains secondary school teachers of Art & Design, Design and Technology (Food, Product Design and Textiles), Drama, Mathematics, Music, Science (Biology, Chemistry and Physics), RE and Computer Science. Partnership schools receive payments for their work with trainees.	http://www.bcu.ac.uk/education/partnerships-and-collaborations/secondary-partnerships	Block Placement A: Midpoint Review, End of Placement Report, Internal School Moderation Block Placement B: Midpoint Review, End of Placement Report, Internal School Moderation Assignment Module 1 (Professional Studies) Assignment Module 2 (Subject Pedagogy) Assignment Module 3 (Professional Enquiry) School Experience Progress Journal (SEPJ); Year Long	Kelly Davey Nicklin- Programme Leader 0121 331 5176 Sarah Bonser – Partnership Lead 0121 331 7736 Craig Davis – Placements Programme Administrator 0121 331 6591
School Direct PGCE	The School Direct route offers a tailored training programme that will meet the needs of training schools, their pupils, their teachers and their trainees. The training programme is designed by schools working in partnership with our university	http://www.bcu.ac.uk/education/partnerships-and-collaborations/school-direct	This will depend on the agreement between the partner school and the university	Kelly Davey Nicklin – Programme Leader 0121 331 5176 Sarah Bonser – Partnership Lead 0121 331 7736 Craig Davis – Placements Programme Administrator 0121 331 6591
Teach First PGCE	Teach First offer trainee teachers a two-year Leadership Development Programme (LDP) and the University awards the PGCE and QTS. Trainees are placed in a local employing school and begin to teach 60% of a qualified teacher's timetable from September 1 st . Trainee progress is continually monitored and supported by employing schools, Birmingham City University and Teach First.	http://www.bcu.ac.uk/education/partnerships-and-collaborations/teach-first	Summer Institute: June & July including a written assignment that must be passed to begin the course in September Termly Reports: December, March, June Assignment Module 1 (Emerging Philosophy of Teaching and Learning); January Assignment Module 2 (Leading Learning in the Community); May year 1 Assignment Module 3 (Collaborative Learning and Development); May year 2 Assignment Module 4 (Extending Impact and Influencing Others); May year 2 BlueSky Journal: Year long QTS Portfolio: Year long year 1	Caroline Montgomery - Programme Director (West Midlands) 0121 331 7277 Leanne Gould – Programme Director (East Midlands) 0121 331 6742 Sarah Bonser – Partnership Lead 0121 331 7736 Nathan Hawkins - Programme Administrator 0121 331 7699 Michelle Young - Programme Administrator 0121 331 7608

Course and Placements Overview PGCE and School Direct

Prior to enrolment at BCU trainee teachers spend one week in a Secondary School of their choice '**Home-Based School Experience**' and follow faculty suggested guidance to prepare them for the start of their PGCE training programme. Over the training year trainee teachers undertake teaching practices in two contrasting schools which provide a supportive training environment with progressively more challenging learning opportunities. For the **Block A placement**, trainees are usually paired in their subject on the Core route. For the **Block B placement** trainees are not paired and are placed in a contrasting school from their Block A placement. School Direct trainees are likely to be placed in two different schools during the Block B placement (usually returning to the host school for the last part of the course).

Block A Experience - Introductory weeks before half-term (Tuesday to Friday, 26th September - 20th October 2017)

- Structured observations and relevant directed tasks.
- Agree teaching timetable.
- Draft and revise units of work.
- Trainees experience a limited amount of teaching in a supported framework the expectation is that full teaching of some lessons takes place before half-term (enough to inform the midpoint review assessment on 10th November 2017).
- Completion of specific tasks in their School Experience Progress Journal (SEPJ).

Block A Experience – After half-term (Tuesday to Friday, 31st October- 22nd December 2017)

- Midpoint Review due in on **Friday 10th November 2017**.
- Trainees teach **14 hours of a subject timetable between them** (teaching can include team teaching with mentor, paired teaching with other trainees and solo teaching). Each individual trainee must lead on 7 hours of teaching and partner for 7 hours making 14 hours in total. For School Direct trainees the same number of hours applies (7 per trainee).
- Timetabled opportunity (one day) to spend time in a feeder **Primary school**.
- Completion of relevant SEPJ tasks.
- Gathering of evidence toward the Teachers' Standards.
- Gain familiarity with a second subject where appropriate.
- Mentors complete an assessment of trainees' progress called the 'end of placement report' due in by **22nd December 2017**.

Block B Experience – Introductory weeks before half-term (Tuesday to Friday, 23rd January - 16th February 2018)

- Structured observations and relevant directed tasks.
- Agree teaching timetable for block placements including form tutor role and a one week 'Enrichment' placement. 'Enrichment' placements should enable trainees to further develop their experience and understanding in an aspect of their training not yet addressed (e.g. post-16 teaching, EAL, SEND, etc.) Post-16 should be prioritised for the 'Enrichment' placement if there is no provision for this in either the trainees' Block A or Block B placements. The 'Enrichment' placement should take place in a different school.
- Draft and revise units of work/ undertake preparatory tasks.
- Completion of specific tasks in the SEPJ.

Block B School Experience – After half-term (Monday – Friday, 26th February- 25th May)

- Midpoint Review due in on **Friday 9th March 2018**.
- Trainees teach **15 hours of their first subject per week**.
- Trainees undertake the range of duties and responsibilities expected of NQTs (form tutoring, break duties, reporting to parents, meetings and contributing to the life and ethos of the school).
- Completion of relevant SEPJ tasks.
- Gathering of evidence toward the Teachers' Standards.
- Trainee to complete their 'Enrichment' placement (5 days) as outlined above.
- Mentors complete an assessment of trainees' progress called the 'end of placement report' due in by **Friday 25th May 2018**.

Progress Review Days

These are days when trainees are required to attend University for all or part of the day to meet with their Personal Development Tutor to discuss the trainees' progress to date.

Year Overview

	2017/18 W/C	Monday	Tuesday	Wednesday	Thursday	Friday
05	28 August	HBSE (in advance)				Induction & enrolment
06	04 September	University-based training week (Professional Studies)				
07	11 September	University-based training week (Professional Studies)				
08	18 September	University-based training week (Professional Studies, Mentor training Weds 20th Sept)				
09	25 September	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
10	02 October	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
11	09 October	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
12	16 October	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
13	23 October	Block A Planning & Preparation/School Half Term				
14	30 October	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
15	06 November	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
16	13 November	Progress Review Mtg BCU	Block A school	Block A school	Block A school	Block A school
17	20 November	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
18	27 November	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
19	04 December	Reading & Study Day BCU	Block A school	Block A school	Block A school	Block A school
20	11 December	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
21	18 December	Subject Workshop BCU	Block A school	Block A school	Block A school	Block A school
22	25 December	Christmas Holiday				
23	01 January					
24	08 January	University-based training week (Professional Studies)				
25	15 January	University-based training week (Professional Studies, Mentor training Weds 17th Jan)				
26	22 January	Subject Workshop BCU	Block B school	Block B school	Block B school	Block B school
27	29 January	Subject Workshop BCU	Block B school	Block B school	Block B school	Block B school
28	05 February	Prof Studies Day BCU	Block B school	Block B school	Block B school	Block B school
29	12 February	Prof Enquiry Day 1 BCU	Block B school	Block B school	Block B school	Block B school
30	19 February	Block B Planning & Preparation/School Half Term				
31	26 February	Block B school	Block B school	Block B school	Block B school	Block B school
32	05 March	Block B school	Block B school	Block B school	Block B school	Block B school
33	12 March	Progress Review Mtg BCU	Block B school	Block B school	Block B school	Block B school
34	19 March	Block B school	Block B school	Block B school	Block B school	Block B school
35	26 March	Block B school	Block B school	Block B school	Block B school	Easter
36	02 April	Easter Holiday				
37	09 April					
38	16 April	Prof Enquiry Day 2 BCU	Block B school	Block B school	Block B school	Block B school
39	23 April	Block B school	Block B school	Block B school	Block B school	Block B school
40	30 April	Block B school	Block B school	Block B school	Block B school	Block B school
41	07 May	Bank Holiday	Block B school	Block B school	Block B school	Block B school
42	14 May	Block B school	Block B school	Block B school	Block B school	Block B school
43	21 May	Block B school	Block B school	Block B school	Block B school	Block B school

44	28 May	School Half Term – End of Block B placement
45	04 June	
46	11 June	
47	18 June	
48	25 June	University- Final Week

Subject Workshop days and other BCU days in blue indicate sessions where external School Direct or SCITT trainees attend BCU (as agreed with the partnership director – this may not apply to all external partners).

Key Dates

Assignment Submission Dates

Module / Assignment	Formative Feedback Date	Final Submission Date
Pre course task Diagnostic Assignment	N/A	22/9/17
EDU7344 School Experience 1	10/11/17 (Midpoint Review)	22/12/17 (End of placement report)
EDU7343 Professional Studies	13/11/17	8/1/18
EDU7346 Secondary Subject Pedagogy	12/3/18	16/4/18
EDU7344 School Experience 2	9/03/18 (Midpoint Review)	25/5/18 (End of placement report)
EDU7342 Professional Enquiry	12/03/18	‘Core’ Presentations: 19/6/18 or 20/6/18 ‘School Direct’ Presentations (RSA, Haybridge, Coventry SCITT): 18/6/18

Block A School Experience Key Dates

School Experience 2		
Midpoint Review	10/11/17	Send via email to secondarytpdocuments@bcu.ac.uk
Progress review meeting 2	13/11/17	Trainees are required to attend University for all or part of the day to meet with their Personal Development Tutor to discuss the trainees’ progress to date.
End of Placement Report	22/12/17	Send via email to secondarytpdocuments@bcu.ac.uk
Placement Evaluation	22/12/17	A link to the online placement evaluation will be emailed out to all subject and professional mentors.

Block B School Experience Key Dates

School Experience 2		
Midpoint Review	10/3/18	Send via email to secondarytpdocuments@bcu.ac.uk
Progress review 4	12/3/18	Trainees are required to attend University for all or part of the day to meet with their Personal Development Tutor to discuss the trainees' progress to date.
Professional Enquiry Day 2	16/04/18	Trainees are required to attend University for the day for activities relating to their Professional Enquiry assignment.
End of Placement Report	25/5/18	Send via email to secondarytpdocuments@bcu.ac.uk (Please note that part of this document needs to be signed using a hand written signature, Scanned versions sent via email are accepted.)
Placement Evaluation	25/5/18	A link to the online placement evaluation will be emailed out to all subject and professional mentors

Birmingham City University Training Overview

Science with Biology Chemistry or Physics

Session title		
'What is science?' and its relevance to teaching 'working scientifically'		
Practical work and safety in science		
Harlen's Big ideas: KS3 Interdependence + Evolution (idea 8 + 10)		
Harlen's Big ideas: KS3 Geological changes and space (ideas 5-6)		
Harlen's Big ideas: KS3 Forces (ideas 2-3)		
Harlen's Big ideas: KS3 Cells + Genetics (idea 7 and 9)		
Literacy and numeracy in science teaching		
Harlen's Big ideas: KS3 Particles (idea 1)		
Harlen's Big ideas: KS3 Energy (idea 4)		
Physics Specialists	Chemistry Specialists	Biology Specialists
Physics at KS4-5: Mechanics + Waves	Chemistry at KS4-5 Atomic structure periodicity and bonding	Biology at KS4-5 The Dynamic Plant
Physics at KS4-5: Electrical + Light	Chemistry at KS4-5 A review of Bonding leading into Organic Chemistry	Biology at KS4-5 Organs and systems
Physics at KS4-5: Electromagnetism + Astrophysics/space	Chemistry at KS4-5 Mathematics in Chemistry : barriers, solutions and the Magic Mole!	Biology at KS4-5 Introduction to A Level and Biological molecules
Physics at KS4-5: Particles + Nuclear	Chemistry at KS4-5 How Fast? How Far?	Biology at KS4-5 Biological Processes and the A level practical requirement

Key Mentor and Trainee Documentation

Partner schools are reminded that the Secondary Partnership website includes the key documents relating to the PGCE Secondary and School Direct course for partner schools. The resources below can be found by navigating the tabs on the partnership homepage: <http://www.bcu.ac.uk/education/partnerships-and-collaborations/secondary-partnerships/overview>

Placement documentation:

- **Midpoint Review-** Analyses the progress at the midpoint of the placement against the Teachers' Standards. A Midpoint review is completed during both school placement A and B by the subject mentor and the trainee. The professional mentor and university tutor will moderate this process.
- **Trainee Support Framework-** Outlines the process of extra support through support plans to a cause for concern.
- **End of Placement Report Form-** A summative report of the trainee's attainment at the end of the school placement. The end of placement report form is completed by the subject mentor and the trainee. The professional mentor and university tutor will moderate this process.
- **Internal School Moderation Form (Block B school placements only)** - A record of internal school moderation of trainee teachers. Moderation should be conducted by the professional mentor or a mentor from a different subject area in discussion with the subject mentor with responsibility for the trainee.
- **Placement Evaluation-** This will be sent out to partner schools with further instructions via the BCU placements office.

Weekly documentation:

- **School Experience Progress Journal (SEPJ)** - Evidences progress over a placement. It provides a structure for weekly target setting, reflection and the collection of evidence and should be used to inform weekly mentor meetings. The SEPJ contains tasks that must be completed during the school placement.
- **Review and Analysis Forms (R&A)** - These are the forms where formal observations must be recorded. It is expected that trainees will be observed twice per week as a minimum. Written formative feedback will be provided on an R&A form which focusses on up to three Teaching Standards at a time. These standards will be assessed using the university formative descriptors for trainees which grades trainees as 'Emerging, Establishing, Embedding or Enhancing'.
- **Formative Descriptors for Trainees (teaching standards tracker)** - Formative feedback guidance produced through collaboration between UCET and the HEA. The guidance provides a set of statements that outline the minimum standard that can be expected of trainee teachers at each stage of their development 'Emerging- Enhancing'. This document is used during observations and when completing formal/informal reviews of trainee progress.

Documents for Trainees:

- **Unit of work and lesson plan template-** For mentors to sign off prior to a trainees teaching.
- **BCU Timetable Template-** For trainees to upload to Moodle so that university tutors know trainee timetables.
- **Professional Practice Audit**
- **Professional Progress Pen Portrait** Should be reviewed by mentors to support the setup of the placement.
- **Subject Knowledge Action Plan**
- **Subject Knowledge Audit**

The Trainee Timetable in Science (with biology, chemistry or physics)

At key stage 3 the trainee will be expected to teach all the three sciences to the whole ability range. It does not matter therefore, what topic year 7 or year 8 happen to be covering when the trainees are in school.

At key stage 4 it needs to be recognised that the trainees are on a 'Science with Biology, Chemistry or Physics PGCE' course. Most will be in receipt of a bursary from the government for qualifying to teach in a specific science, reflecting the move away from training science teachers to training subject specialists in government policy. A PGCE in Science attracts no bursary! To reflect the policy shift, we ask that at key stage 4 the trainee timetable reflects the subject specialism **as much as possible within the constraints of the school science department plan**.

Trainees are required to pass the standards at two key stages and for our course this is key stages 3 and 4. The course also includes a post 16 enhancement. Post 16 experience can be provided for the trainee either during placement block A, block B or if neither school have a 6th form, as an enhancement week in a third school.

The block A placement timetable

Trainees need 14 hours of lessons on their timetable. For 7 of these they should be the lead teacher, responsible for planning, delivering and assessing, with support from their partner trainee or the class teacher as a TA. For the other 7 they should be supporting, either their partner trainee teach if there are two trainees, or supporting the classroom teacher.

It is the intention of paired placements that the trainee pair can work together and discuss lessons with a shared timetable of 14 lessons. Occasionally, for some pairs, independence is the right training step to take for some or all of the 14 lessons. It is not essential that the whole timetable is shared as long as each trainee has 7 lead and 7 support overall.

For schools with 6th forms, if you have trainees with different specialisms, it is fine to split them up for some of their timetable for A-level experience, as long as they always have support from either their partner trainee or a class teacher for their 7 lead lessons.

In science, there is a lot of KS 3 and 4 content trainees need experience of teaching. Even over two placements they will not cover it all. So, we ask that any A-level lessons on the timetable during the block A placement do not dominate the timetable. For A-level lessons during the block A placement, trainees should either support or team teach with the class teacher, leaving their lead lessons as either key stage 3 or 4.

The block B placement timetable

Trainees need 15 lessons on their timetable to include key stages 3 and 4 and where possible 5.

At A-level trainees are expected to team teach (*more than just act as a TA*) with a qualified class teacher in their subject, rather than take over responsibility for leading planning teaching and assessing. We all recognise that planning at A-level will take most trainees considerably longer than for years 7 to 11, especially if their degree does not map easily onto the A-level curriculum. It is also important to recognise that for trainees in some non-science subjects an A-level qualification doesn't exist and some trainees will be working on GCSE level courses but with 6th form age groups. To maintain a sensible workload for the trainee, an A-level lesson on their timetable might require a trainee to plan part of a lesson; possibly an explanation, an activity or to lead a practical. Experience of assessing KS5 work, with suitable guidance, is valuable even if the trainee is not taking the lead for the class.

If your school does not have a 6th form, perhaps there is another class you would not normally give a trainee. The trainee could team teach with the class teacher but the class teacher would always take the lead with that class. The trainee then has a different kind of experience in science education. Do you have an intervention group, SEND group or an EAL group for example?

Where possible please give trainees an A-level group or alternative experience as described above that does not dominate the timetable. 3 hours of the 15 is a good number to aim for.

Schemes of work, lesson planning and risk assessment

Schemes of work

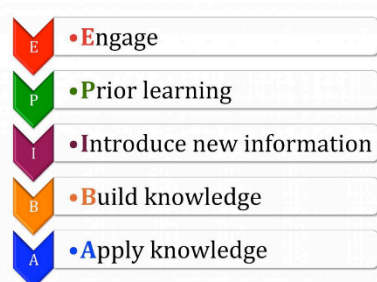
Trainees are expected to fill in a scheme of work for each class they are leading. It may well be that you have detailed schemes of work in the department that trainees will follow. Regardless of whether that is the case, the trainee will fill in the scheme of work and it will need to be signed off by you or the relevant class teacher before trainee teaching with full planning, delivery and assessment responsibility for the class can begin. The purpose of the BCU scheme of work is to ensure the trainee is secure in what has to be covered and by when, to facilitate short term planning and any necessary filling of subject knowledge gaps.

Lesson plans

Trainees will have had some initial training in lesson planning before school placement. Since workload initiatives came online in teaching, trainees not required to fill in long laborious lesson plans with a script of everything they are going to do and say, even for formal lesson observations using the full lesson plan. They are required to fill in two formal lesson plans per week and a shorter informal plan for all other lessons they are leading.

Trainees have been taught the importance of constructivist learning theory for science education at university. Therefore, in addition to the usual BCU short informal lesson plan form, science trainees have been given the BCU science version of the popular 5 minute lesson plan adapted for a constructivist teaching model. It will of course take trainees far longer than 5 minutes to complete properly! The form is based on the EPIBA model with an added reflection/plenary section at the end.

The EPIBA model for planning science lessons



Risk assessment

Trainees must risk assess all *significant* practical work involving hazards. There is space for them to do this on their lesson plans using a simple low, medium and high assessment of both severity and likelihood and a space for detailing control measures. Class teachers will need to guide trainees to the CLEAPSS resources in school and provide guidance in how to assess and control risk for their particular classes. It may be necessary to intervene in a trainee lesson for safety reasons during practical work, especially during the early stages of training. Where possible do this in the style of team teaching with appropriate comment and grading on the review and analysis form to follow later (S7).

Roles and Responsibilities

The Professional Mentor:

- Organises and quality assures a trainee teachers' programme of activities during any induction stage and outside of the specialist subject
- Ensures that trainee teachers will not at any point be asked to cover for absent teachers
- Ensures that at all times trainee teachers are under the supervision of a qualified teacher
- Assigns trainee teachers to a tutor group
- Arranges opportunities for observation outside the specialist subject
- Arranges opportunities for experience in a second subject during block placements
- Arranges for trainees to visit feeder Primary schools in Block A and for post 16 experience in Block B (if not experienced in Block A)
- Provides opportunities for trainee teachers to attend appropriate school meetings
- Provides an appropriate CPD programme to complement the professional training provided at university covering whole school issues
- Monitors and contribute to a trainee teachers' completion of the SEPJ tasks
- Observes the trainee teaching **at least once** per placement through the completion of a **joint observation** with the subject mentor and gives feedback using the university R&A form
- Moderates the subject mentor's assessment of the trainee teacher
- Provides support for subject mentors in target setting and assessment
- Contributes to the completion of the End of Placement Report
- Quality assures subject mentoring in school, ensuring that subject mentors complete the duties outlined below.

The Subject Mentor:

- Organises a programme of observation and teaching within the specialist subject across different ages and abilities
- Supports the development of subject specific pedagogies and strategies for learning and teaching whilst developing a subject ethos and philosophy
- Provides access to the subject department's units (schemes) of work and relevant examination specifications materials
- Supports and guides the lesson planning process for the preparation of units of work
- Ensures the opportunity for trainee teachers to teach their specialist subject, as appropriate to the stage of training, including KS3, KS4, and, where possible, post-16 groups
- Provides access to relevant pupil information, such as assessment records and IEPs
- Assesses the quality of the SEPJ tasks
- Observes the trainee teaching **two times per week as a minimum** and provides written feedback on the university R&A form.
- Completes **at least one joint observation with the professional mentor** and **at least one joint observation with a university tutor** per placement.
- Signs off units of work before the trainee begins to teach.
- Provides a timetabled weekly review and guidance session.

- Reports progress of trainee teachers 'with professional mentors and university tutors.
- Provides opportunities for checking, signing and grading (where appropriate) SEPJ tasks which contributes to the achievement of the Teachers' Standards.
- Sets future Teachers' Standards targets, using the Weekly Review sheet.
- Regularly scrutinises trainee teachers' School Experience Files, including their written evaluations of teaching and their assessment records during Block placements
- Contributes to the Mid-point review indicating the trainee teacher's current progress and identifying any areas that might be a cause for concern
- Contributes to End of Placement Report at the end of each placement.
- Provides a final assessment of the trainee teacher's achievement of the Teachers' Standards (**Block B only**).
- Assists with drafting the Career Entry and Development Profile (**Block B only**).

Where trainees are teaching classes other than the subject mentor's we would encourage the class teacher to observe, both formally and informally, and give feedback. However, it is important that the subject mentor manages the process to ensure that the training experience remains coherent and targeted.

The University Tutor:

- Is a subject specialist tutor who supports the trainee throughout the PGCE programme.
- Is responsible for placing the trainee in their Block A and Block B placements (with the exception of School Direct) and ensuring that these offer a contrasting experience.
- Holds termly progress review meetings with trainees to discuss their progress towards achieving the Teachers' Standards.
- Is accountable for the delivery of PGCE modules and the marking and feedback of assignments (for those trainees following the Core route).
- Quality assures the quality of the SEPJ tasks.
- Agrees and monitors targets in relation to subject knowledge based on the subject knowledge audit.
- Provides an initial visit to each placement school to quality assure the provision.
- Visits the trainee **at least once** during Block A and Block B placements.
- Liaises with subject and professional mentors to ensure that appropriate training and CPD is provided throughout the placement.
- Jointly **observes the trainee teaching at least once** per placement **with the subject mentor**.
- Moderates the assessments made by school including lesson observations, feedback and the end of placement report.
- Liaises with placement schools to ensure that trainees are provided with Post- 16 experience.
- Recommends and assists in the organisation of visits by external examiners.
- Supports the trainee to complete their Career Entry Development Profile.
- Provides the trainees with a reference.

The Trainee Teacher:

- Will attend all taught sessions in the Faculty and carefully read all the information they are given to prepare themselves for school experience.
- Must attend timetabled progress review meetings in the Faculty and prepare for these as appropriate.
- Must be aware of the requirements for each placement and professionally negotiate an appropriate timetable which must include weekly timetabled training with mentors.
- Are responsible for their development towards meeting their agreed targets and the accumulation of appropriate evidence.
- Are responsible for their SEPJ and the evidence within it to demonstrate their progress towards the Teachers' Standards.
- Must follow guidelines for the professional behaviour expected in schools and demonstrate that they are meeting Part Two of the Teachers' Standards.
- Must work within the safeguarding protocols of the placement school.
- Must follow the requirements for school experience in relation to medium and short term planning, and ensure that units of work are signed by subject mentors before they can begin teaching.
- Should act upon advice given and targets set by mentors and tutors.
- Should negotiate appropriate learning opportunities for themselves.
- Is responsible for supporting the learning of pupils and passing on information to the class teacher.
- Is responsible for keeping their subject knowledge up to date.
- Is responsible for setting cover for classes that they would be teaching if they are not in school.

Observation and feedback in Science

Subject mentors should formally observe trainees teach **at least two lessons per week** and give trainee teachers written feedback using Review and Analysis forms. The Review and Analysis form alongside the formative descriptors for trainee teachers on the Birmingham City University Teachers' Standards tracker should be used to indicate trainees' progress towards meeting the Teachers' Standards. The use of the formative descriptors helps the trainees and mentors to devise and take 'next steps' towards progress targets. Additionally, the descriptors strengthen consistency across the partnership by helping mentors, tutors and trainees to articulate the expectations that we have for achieving each of the Teachers' Standards.

Formative Descriptors for Trainees (Teachers' Standards Tracker)

Formative feedback guidance is set out for each Standard using progressive headings:

Emerging → Establishing → Embedding → Enhancing

S1: Set high expectations which inspire, motivate and challenge pupils				
Standard Prompts	Emerging (EMG)	Establishing (EST)	Embedding (EMB)	Enhancing (ENH)
a) Establish a safe and stimulating environment for pupils, rooted in mutual respect	Unable to demonstrate the ability to encourage pupils to participate and contribute and/or create an atmosphere conducive to learning. Inadequate or inconsistent rapport developed with individuals and groups such that engagement in learning is hampered. Regularly require the intervention of other professionals to assist in maintaining a purposeful and safe learning environment.	Demonstrate the ability to encourage pupils to participate and contribute in an atmosphere conducive to learning. Develop a rapport with a range of individuals and groups so that most pupils are engaged in their learning. Routinely demonstrate the necessary understanding, presence and management skills to maintain a purposeful and safe learning environment.	Usually encourage pupils to participate and contribute in an atmosphere conducive to learning. Show respect for, and be well respected by, learners and effectively promote pupils' resilience, confidence and independence when tackling challenging activities. Demonstrate an extended range of strategies to establish and maintain a purposeful learning environment.	Consistently encourage pupils to participate and contribute in an atmosphere highly conducive to learning. Show high levels of mutual respect between the trainee and pupils. Very effective in promoting learners' resilience, confidence and independence when tackling challenging activities. Demonstrate innovative and creative strategies to establish and maintain a purposeful and safe learning environment.
b) Set goals that stretch and challenge pupils of all backgrounds, abilities and dispositions	Routinely requires the support of another professional to set goals that stretch and challenge pupils.	Routinely set goals that engage most pupils in their learning including those from the range of backgrounds represented and with special educational needs and/or disabilities.	Set goals that motivate, enthuse and motivate most pupils.	Set goals that generate high levels of enthusiasm for, participation in and commitment to learning in all pupils.
c) Demonstrate consistently the positive attitudes, values and behaviour which are expected of pupils	Unable to demonstrate positive attitudes, values and behaviour. Shows inconsistent or unequal respect for pupils, colleagues, parents/carers and lacking support for the ethos of the school. Unable to demonstrate sufficient enthusiasm for working with pupils and/or for teaching and learning.	Be able to demonstrate positive attitudes, values and behaviour. Show respect for pupils, colleagues, parents/carers and support the ethos of the school. Demonstrate enthusiasm for working with pupils and for teaching and learning.	Usually demonstrate positive attitudes, values and behaviour. Show respect for pupils, colleagues, parents/carers and actively support the ethos of the school. Most learners are enthused and motivated to actively participate in their learning.	Consistently demonstrate positive attitudes, values and behaviours. Show high levels of respect for pupils, colleagues, parents/carers and energetically support the ethos of the school. Generate high levels of enthusiasm, participation and commitment to learning for all pupils.

For formative feedback purposes only, guidance is given for each sub-heading of each Standard. The language of the formative descriptors should be adopted during written and verbal feedback. This is to support trainees and mentor to *track progress against the standard, to determine areas where additional development might need to be observed, or to identify areas where a trainee or teacher is already demonstrating excellent practice relevant to that standard* (DfE).

The statements in relation to Part One of the Teachers' Standards set out typical characteristics of the practice of trainees. The expectation is that their practice will demonstrate improvement throughout their training and beyond. The formative feedback helps trainees and their assessors to identify progress in their achievement towards the Standards through the levels. Judgements from observations will be based on an **assessment of the available evidence** to decide which descriptor provides the '**best fit**'. Formative feedback must be given for **achievement only**, not effort, intention or as a motivator

Example 1

20

Copies to - trainee; school subject mentor; BCU Professional Development Tutor

Review and Analysis Form

Trainee Name:

School:

Date of Observation/Discussion:

Sheet Number:

Subject:

Class Taught:

Placement (*circle*):

Sch 1

Sch 2

List below the Standard(s) being targeted during the lesson observation or review and guidance session:

Teachers' Standard(s) and Standard Prompts observed or discussed:	Formative Feedback
3a/b	EST
4a/b	EST
2	EST

PART A: Formative comments from observations OR summary of training session/discussion:

Calm start to the lesson – pupils working on a starter activity when observation started. Starter activity – pupils identified examples of electrical conductors and insulators. Timings given for the activity. Good use of names when feeding back answers from the starter. A good rapport has been developed with these pupils, positive language and praise. You remembered what pupils had said previously and related pupil answers to what had previously been said. (2b)

Clear communication and appropriate use of your voice. One pupil mentioned that someone they knew got an electric shock and they flew across the room – perhaps spend time unpicking this as an example with the pupils – why did this happen?

Register taken at an appropriate time whilst pupils were working quietly – good time to do this as it didn't disrupt the flow of the lesson. (4)

The choice of video was appropriate for this class - perhaps structure the video activity before playing the video – is there anything in particular that you want the pupils to listen out for – e.g. are there any examples used that you want the pupils to look out for, perhaps examples linked to devices they use at home?

One pupil mentioned an 'electricity ball' – this is likely not your specialist science subject but it would be good for you to be able to respond to what this pupil was saying – perhaps find out after the lesson for the benefit of your own subject knowledge and you could then also bring this up again next lesson (3a).

Who worked harder in this lesson, you or the pupils? There was quite a lot of teacher talk – how might you encourage independent learning? Be aware of not providing too many of the answers for the pupils – allow them to find out or to recall before providing the answers (2d/e). The behaviour of the pupils in this lesson was fine – they were focused and on-task but were the learners in danger of being too passive? Again, how might you promote independence? I notice that this was a development point from your previous lesson observation (4a/b)

By this point in the placement, now that you know the learners, ensure that section E of your lesson plan outlines the measures you will take to support individuals. You mention that some pupils need to be kept on task and you have considered the use of font on your slides for one pupil but how are you stretching and challenging some individuals? There was a sense of all pupils completing the same work at the same time. You indicate in your planning success criteria for level 4 to 7. Why not share this with the pupils? (4a/b)

There is a science-specific version of the lesson plan that enables you to map out the health and safety risks for each lesson in section F – please download this from Moodle to use for all future lesson planning (4a/b)

See **Part B** for Lesson Summary and Targets

Copies to - trainee; school subject mentor; BCU Professional Development Tutor



**Part B: Lesson Summary and Targets:**

Lesson strengths: (three minimum) • Good rapport built with pupils, use of praise, positive language and good use of names. • Preparation of resources for the lesson demonstrated subject knowledge – worksheets, PowerPoint, etc. • Beginning to use assessment of prior knowledge in the lesson, in particular what pupils had previously said.	Teachers' Standard(s) no(s) to be added: 7 3 2
Developmental targets arising out of the lesson: (one minimum, no more than three). How can the trainee promote better pupil learning and progress? • Provide the pupils with something to focus on when watching the video about electricity dangers. • There was quite a lot of teacher-talk in this lesson, how might you encourage your learners to be more independent when planning your next lesson? Subject specific target(s) • How might you bring this topic to life a bit more – the department has resources for the pupils to look at plugs – can you incorporate this into your planning?	Teachers' Standard(s) no(s) to be added: 2 4/2 3

Signed (Mentor):**Date:****Signed** (Trainee):

PGCE Secondary

Review and Analysis Form



BIRMINGHAM CITY
University

Trainee Name:

School:

Date of Observation/Discussion:

Sheet Number:

Subject:

Class Taught:

Placement (circle):

Sch 1

Sch 2

List below the Standard(s) being targeted during the lesson observation or review and guidance session:

Teachers' Standard(s) and Standard Prompts observed or discussed:	Formative Feedback
3. Demonstrate good subject and curriculum knowledge	ENH
6. Make accurate and productive use of assessment	EMB
2b. be aware of pupils' capabilities and their prior knowledge, and plan teaching to build on these	EMB

PART A: Formative comments from observations OR summary of training session/discussion:



WWW	EBI
S2b You had found out what is taught about current in primary school and planned accordingly. You assessed the prior understanding of how current moves in a series circuit with a two part diagnostic question, requiring the students to select the correct statement and then provide an explanation.	Think about how you will collect the assessment data from the diagnostic question quickly so you can use the information in the rest of the lesson. In this lesson you could have used mini whiteboards to get a wide sample of ideas from the students immediately.
S3 You had researched the likely misconceptions about current before planning the lesson and used this to anticipate likely difficulties and key points to emphasise. This is evident in the lesson resources prepared and in your explanations during the lesson, especially during the rope circuit activity.	You wanted students to understand that current does not start at the battery and work its way round back to the battery. It is hard to think of good open probing questions 'on the hoof' especially when you are teaching out of your specialism. Plan questions in advance. Perhaps show them a 'big circuit' all around the room and ask "How long it will take the light across the room to come on after pressing the switch?" Or set up a series circuit with several bulbs and ask "Does one of the 'fairy' lights come on first?"
S6 In this lesson you used a range of assessment for learning strategies, including the diagnostic question, class discussion and question and answer during the rope circuit, and circulating round the class for 1:1 assessment and feedback on students work. Pupils were writing down your feedback in their books allowing you to check understanding again.	After circulating round the class you found yourself repeating the same thing to different groups and individuals. It is better to give such feedback to a bigger group in one go, or even the whole class. You also need to ask yourself why a lot of the class struggled with question 5 as it was not one of your stretch questions for the most able.
Other You provided a picture glossary of key terms for your EAL student. (5) Good use of 'drama' acting out the current in a parallel circuit. (4)	

Copies to - trainee; school subject mentor; BCU Professional Development Tutor



**Part B: Lesson Summary and Targets:**

Lesson strengths: (three minimum) - You had researched common misconceptions about current and this was evident in your resources, planning and teaching - Your lesson was based on a constructivist model starting with a diagnostic question, an introduce section, a build and apply. - You used a range of assessment for learning techniques during the lesson	Teachers' Standard(s) no(s) to be added: 3 4/2 6
Developmental targets arising out of the lesson: (one minimum, no more than three). How can the trainee promote better pupil learning and progress? - Plan questions that probe understanding in advance. They are hard to think of during the lesson at this stage in your professional development. - Use a technique that allows you to immediately collect information from your assessment of prior learning activity. Reading their books during the lesson takes too much time. Subject specific target(s) - Find out how to make a 'big circuit' work. That is one that encircles the entire room with a power supply, switch and bulb. Exactly what equipment would you need? It could be the start to next lesson!	Teachers' Standard(s) no(s) to be added: 2/3 6 3

Signed (Mentor):**Date:****Signed** (Trainee):

Weekly mentor meetings

A weekly mentor meeting between the trainee teacher and the subject mentor should be timetabled, so that progress and achievement can be evaluated systematically and future targets set. To prepare for this meeting and to ensure that time is used productively, trainee teachers should complete the first part of the Weekly Review sheet (found in the SEPJ) in advance. This will then be discussed with the mentor and future targets agreed.

Weekly review meetings provide trainees the opportunity to:

- Regularly work in partnership with their subject mentor
- Review progress made over the previous week
- Agree developmental targets to support progress over the forthcoming week
- Specifically discuss developments in subject knowledge and any emerging needs related to subject knowledge and pedagogy. Trainees record progress on the science subject audit and action plan (see below) weekly.
- Provide the opportunity for the trainee to discuss and make further progress towards the Teachers' Standards
- Identify any individual training needs and take actions to ensuring that needs are met
- Support the trainee to work collaboratively with other colleagues and professionals in school to support trainee professional development
- Monitor and grade the SEPJ tasks. For the most part, these should be completed by trainees in the first few weeks of a placement before teaching commitments build up.
- Grade any evidence collected over the previous week towards the standards that is not a review and analysis form. e.g. examples of written pupil assessment. Note, not all evidence creates paperwork. A record of actions taken by a trainee can be written directly into the boxes under the relevant standard and graded. Nor do you need to have personally witnessed all trainee actions to grade the trainee. Base grading on the actions and/or judgements made by the trainee in the scenarios described against the grade descriptors. e.g.
 - Your trainee followed school policy when dealing with a pupil altercation at break time.
 - Trainee work with the year 9 football club after school.

A subject knowledge target is required each week in addition to any other targets you might set your trainee. The subject knowledge target in science might include trying out a practical in advance of a lesson or improving their subject knowledge of a topic to be taught through self-study and where applicable asking subject specialists in school. The subject knowledge target will feed into the documents described below.

Subject knowledge audit and subject knowledge action plan

These two documents are very much working documents for the trainee and should be under constant review and revision by the trainee weekly. No input on the documents by you as mentor is required. It is useful to be aware the process should be happening though and that your subject target will be feeding into the process. The pictures below show just part of the subject audit document and the headings of the action plan. By the end of the course the majority of topics should be RAG rated green. All of the trainee subject specialism should be green.

PGCE Secondary
School Experience Progress Journal
Block A - School Experience 1



BIRMINGHAM CITY
University

Subject Knowledge Action Plan

Area for Development <i>from Subject Audit</i>	Proposed Action <i>Specific actions required to address area for development</i>	Timescale <i>when actions to be completed</i>	Evidence <i>Evidence produced or gathered during PGCE to demonstrate actions completed</i>	Success Criteria / Application <i>Way(s) in which subject knowledge might be used in a teaching and learning context</i>

Subject area	Level of Knowledge, Skill or Understanding	Comment to explain number
	1 Very little, if any	Previously studied for degree level qualification
	2 Some but lacking confidence	Previously studied for pre-degree qualification
	3 Significant and confident	Experience of teaching learners
	4 Substantial: area of expertise	Recent revision using GCSE materials Recent revision using AS/A2 materials
Particle model of matter and energy in matter (NB: often taught as part of chemistry content)	2	recent revision using GCSE material and S-cool exam quesitons
Space physics	1	
Key Stage 4		
See the KS4 National Curriculum for detail. Note: Where the titles are the same as the KS3, the content will be different. Current KS4/5 text books and learning materials.		
1. Working Scientifically		
Experimental skills and investigations	3	Previously studied fopr degree level qualification
Handling information and problem solving	3	Previously studied fopr degree level qualification
Scientific attitudes	3	Previously studied fopr degree level qualification
Measurement	3	Previously studied fopr degree level qualification
2. Biology		
Cell biology	2	recent revision using GCSE material and S-cool exam quesitons
Transport systems in people and plants	2	recent revision using GCSE material and S-cool exam quesitons
Health disease and the development of medicines	2	recent revision using GCSE material and S-cool exam quesitons

References and Additional Information

BCU (2016) Secondary Partnership Website. Available at: <http://www.bcu.ac.uk/education/partnerships-and-collaborations/secondary-partnerships>

Holden, G (2016) *National Standards for school-based initial teacher training (ITT) mentors*. Crown copyright 2016. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/536891/Mentor_standards_report_Final.pdf

Science references

Boohan, R (2016) *The language of mathematics in science: A guide for teachers of 11-16 science*. Association of Science Education. Hatfield

Cakir M. (2008) Constructivist approaches to learning in science and their implications for science pedagogy: A literature review. *International Journal of Environmental & Science Education* 3(4): 193–206 Available at <http://files.eric.ed.gov/fulltext/EJ894860.pdf> [Accessed 1/7/2017]

Campbell, P (ed) (2010) *The language of measurement: terminology used in school science investigations*. Association of Science Education. Hatfield.

Dillon, J and Osborne, J eds (2010) *Good practice in science teaching: what research has to say*. 2nd edition. London McGraw-Hill

Driver, R., Squires, A., Rushworth, P. and Wood-Robinson, V. (1994) *Making Sense of Secondary Science: Research Into Children's Ideas*. London: Routledge.

Harlen, W. (ed) (2015) *Working with Big Ideas of Science Education* [pdf] Available at <<https://www.ase.org.uk/resources/big-ideas/>> [Accessed 25 May 2017]

Millar, R (2010) *Analysing practical science activities to assess and improve their effectiveness*. Association of Science Education. Hatfield.

Needham, R. (2016)a *Mathematics in science*. *School Science Review*, 97(360), 14.

Needham, R (2016)b *The language of mathematics in science: Teaching approaches*. Association of Science Education. Hatfield

OFSTED (2013) *Science education in schools: maintaining curiosity*. Ofsted survey report Available at <<https://www.gov.uk/government/publications/maintaining-curiosity-a-survey-into-science-education-in-schools>> [Accessed on 1/7/2017]

Reiss, M. (ed) (2011) *Teaching Secondary Biology*. 2nd edn. London: Hodder Education.

Russ Heselden, Staples, R (2001) Science teaching and literacy, part 1: Writing. *School Science Review*, December 2001, 83(303)

Russ Heselden, Staples, R (2001) Science teaching and literacy, part 2: Reading. *School Science Review*, December 2001, 83(303)

Russ Heselden, Staples, R (2002) Science teaching and literacy, part 3: Speaking and listening, spelling and vocabulary. *School Science Review*, September 2002, 84(306)

Sang, D (ed) (2011) *Teaching Secondary Physics*. 2nd edn. London: Hodder Education.

Taber, K. (ed) (2012) *Teaching Secondary Chemistry*. 2nd edn. London: Hodder Education.