PGCE
MATHEMATICS

Introduction to the Mathematics Course

Welcome to the PGCE Mathematics Professional Year Course handbook for 2009-10. This handbook is for mathematics training teachers, mentors and tutors. It provides information about the mathematics course with an outline of the teaching sessions, block practice information, assessment information, together with required reading. The PGCE professional year timetable on page 6 of the handbook provides an outline of the structure of the year. This is followed by generic information about the Teacher Education Programme and the School Experience Programme. The second part of the handbook contains information that is specific to the mathematics course.

The Secondary mathematics course aims to develop and train mathematics teachers who can inspire students with a love of mathematics by fostering their natural curiosity and enquiring minds. I hope that our trainees will develop students' creativity by encouraging them to take risks with their developing intellect; that they and their students will value their understanding as a skein of inter-related ideas as well as the ability to perform calculations with elegance and accuracy; and that they gain a view of how mathematics can illuminate as well as underpin achievements across the range of human endeavour. This diversity in mathematics is reflected in the mathematical education of this year's trainees and resonates amongst them as individuals. I hope that the activities and experience at London Metropolitan will form an authentic background for them as they begin their teaching careers in the diversity of our Partnership schools.

The study of mathematics requires breadth and depth of knowledge and understanding. Trainees will need to ensure their own security with mathematical concepts and applications with particular reference to the sweeping affect that technology has had upon the latter. They will need to approach sceptically and with curiosity mathematics that to them may seem self-evident in order to communicate it effectively to the many for whom mathematics remains a difficult to remember collection of more or less unconnected techniques.

I want mathematics in school to be as vibrant and attractive as a Suduko puzzle is for the hundreds of travellers that fill London's tubes and trains. I hope that trainees from London Metropolitan will become mathematics teachers who can excite and intrigue their students with the delights and wonders of their subject at the same time as enabling young people to cross a vital threshold for employment and further study.

I wish you every success and enjoyment in the coming year.

Alan Benson
PGCE Secondary Mathematics Course Tutor

PGCE Mathematics: Course Overview

The aim of the course is to prepare you to become a competent and professional teacher of mathematics in the diverse cultural and linguistic settings of inner-city schools. You will be encouraged to develop an ongoing synergy between theory and practice which becomes part of your professional identity as a provider of a first rate mathematical education for your students.

The course is based around a number of mathematical and pedagogical themes that run throughout teaching and are central to the implementation of the strategies for raising standards in mathematics promoted by the KS3 Framework for teaching mathematics (DfES 0020/2001). These are looked at in some depth, although there will always be further reading to engage with to develop your understanding of these issues beyond the scope of an initial training course.

The teaching and learning style adopted in most sessions is one which models an active approach to learning with an emphasis on the development of your ability to formulate a teaching style that allows all students to become active participants in mathematics lessons. There will be opportunities to experience a variety of teaching and learning activities that can take place in a school maths classroom and that present mathematics as a diverse and exciting subject.

In the first term will be helped to acquire a range of practical teaching ideas and resources for Key Stage 3 & Key Stage 4.

- You will be helped to draw up a plan for individual development by completing subject knowledge audits and a language needs analysis. You will have an individual tutorial to help you write your plan.
- You will develop your ICT capability for teaching maths
- You will be introduced to medium and short term planning within the National Curriculum requirements and the National Numeracy Strategy.
- You will be introduced to formative and diagnostic assessment within the NC and GCSE. This will be in the context of the Assessment for Learning documentation.
- You will become aware of a range of strategies for addressing the individual needs of students
- You will continuously be made aware of classroom management and organisational issues
- You will become familiar with the recommended elements of a lesson including starters and plenaries. You will have opportunities to practice delivering starters form very early in the course in front of an audience of your fellow trainees.

By the end of your first school experience (SE1) you should be able to confidently take responsibility for the teaching of a whole lesson.

In the second term there is greater attention to the larger structures and pathways within which you and your students will be working.

- You will consider strategies to help successful transition between Key Stages. A serial placement in a primary School will focus upon transition issues in mathematics between KS2 (Primary School) and KS3 (Secondary School)
- You will be introduced to pathways for students aged 14-19 and enjoy a 2-day sixth form placement
- You will consider ways of providing challenge and enrichment in the curriculum for more able students. You will have a chance to participate in and organise appropriate activities by visiting schools.
- You will further extend your ICT capability

By the end of your second school experience (SE2) you should be able to confidently take responsibility for a class over a series of lessons. You should be able to apply for a teaching job with confidence.

In the third and final term you will be an emerging professional able to review and share your experiences.

- You will be helped to prepare Project 2 using action research methodologies often used as a basis for Master's level programmes
- You will be helped to complete your Career Entry Development Profile (CEDP) with reference to the action planning you have completed throughout the year

Themes

The themes, listed below, have a number of points and issues attached to them that should serve as a guide for developing your understanding.
By the end of the course you should be able to see how they and their interrelationships form the basis of your own professional identity and future development as a teacher of mathematics

Subject Knowledge

- Ensuring knowledge of KS3 and GCSE mathematics
- Ensuring knowledge of a range of teaching approaches in all areas of the mathematics curriculum
- Ensuring knowledge of ICT for teaching mathematics and for administrative purposes
- Ensuring familiarity with frameworks and pathways in 14-19 mathematics

Activities

- A bank of useful starters to begin lessons in an engaging fashion
- Using a variety of tasks to provide opportunities to develop their own mathematical thinking and to practise appropriate skills
- Strategies for summarising learning and promoting independent reflection in plenaries

Planning

- How to make selections of materials guided by theoretical and organisational considerations so that high standards and progress are promoted for all
- How to engage students with 'big ideas' as well as developing mathematical skills
- How to promote confident independent learners who can use their mathematics beyond the confines of the mathematics classroom

Assessment

- How to diagnose common misconceptions and use them to inform teaching and learning
- How to give oral and written feedback
- How to keep useful and appropriate records

ICT in Mathematics teaching

- Developing your own students' ICT capability
- Evaluation of software
- Making use of a range of Internet materials and published software

Teaching

- Interrelationships between teaching and learning
- Techniques of classroom management and organisation to promote learning
- A professional persona that enables you to work with colleagues throughout the school to provide the best possible mathematical education for your students

Subject Tasks

These are additional to the tasks set during Teacher Education sessions. They are set throughout the year and enable you to develop particular aspects of knowledge and appropriate skills. Some of the tasks are ICT based and some are school based. It is important to keep up with them and meet deadlines. These tasks can then become part of you Practice Portfolio as evidence for QTS.

Subject Studies

Task	Date Set	Due Date
Functional MathsPaper	14.09.11	21.09.11
Selected Extended Task	16.09.11	19.09.11
Journal Article (Summary & Action Points)	From Weekly readings as directed	First Tutorial tba
Lesson Plan	25.10.11	12.10.11
Personal Action Plan 1	First Tutorial tba	
Personal Action Plan 1 Review & Evidence		05.12.11
Personal Action Plan 2	Week beg 020112	
Personal Action Plan 2 Review & Evidence		14.05.11
Set up & Maintain Resources File		Weekly : Friday Review
Reading Log		Weekly :Friday afternoon
SKT File		All tutorials All school observations by Uni

Placement Tasks

Task	Date Set	Due Date
Primary Placement Misconceptions	Week beg 031011	031011
School Profile booklet	Week beg 031011	First meeting with supervising tutor on SE1 141211

ICT Tasks

Task	Date Set	Due Date
Spreadsheet	260911	031011
IWB Starters	140910	130r14 1011(Microteaching)
Project2 Presentations	Week beg 140511	Week beg 110611(at Presentation)

ICT and Mathematics

All initial teacher training courses must follow the DfES syllabus for Information and Communications Technology. This is in two major parts and you will be required to meet the minimum level of competency in these two areas.

- Effective Teaching and Assessment Methods
- Trainees knowledge and understanding of, and competence with ICT

The assessed component is your ICT portfolio which is part of your PPP and the additional maths based tasks.
The subject sessions programme gives details of some of the ICT sessions and further session and task information will be announced during the course.

Skills based training	Generic Learning Principles	Subject Based Course
Computer basics	Critical evaluation of how ICT can promote learning: 1. Planning when and how to use it with pupils 2. Using ICT to create resources 3. Using appropriate teaching strategies	Theoretical input on teaching and learning using ICT Preparation of teaching resources using ICT Exposure to different teaching strategies and uses of ICT **Task** MicroTeaching:Starter (Wk Beg 101011)
Word processing	Skilled use of appropriate hard and software	**Task** Extended Task (190911)
Using email & internet	Critical evaluation of software and hardware	Use and evaluation of a range of subject specific software and Internet sites specific to mathematics **Task** Critical evaluation of subject related websites and software (231011)
Presentation tools	Critical evaluation of websites	Introduction to the use of Powerpoint Introduction to the use of an interactive whiteboard **Task** Presentation Project 2(wk beg 110612)
Data Handling	Understanding of how ICT can support the wider professional role	Royal Statistical Society activities Data Logging **Task** Analysis of trends in mathematical achievement (071011)
	Awareness of ethical issues	All sessions

Secondary ITE Teaching & Assessment Calendar 2011-12 Autumn Term (1/2)

	12/9	19/9	26/9	3/10	10/10	17/10
Uni wk	2	3	4	5	6	7
Mon	CS1 Using IWB	CS9 Algebra3 Functions &Graphs	CS17 Data Handling :Probability & RSS Site	CS19Primary Evaluation	CS25Planning: Differentiation	
	CS2 Using IWB	CS10 Planning : Scripts & starters	CS18 Data Handling : Using Excel	CS20 Misconceptions	CS26 Differentiation :Delivery	
Tue	PS1 Children's Rights & Teachers' Responsibilities 10-11 Lecture 11.30-1 Workshop	PS3 Inclusion (1): Patterns of inequality 10-11 Lecture 11.30-1 Workshop	PS5 Inclusion (2): SEN Primary Briefing 10-11 Lecture 11.30-1 Workshop	PS7 Classroom Behaviour (1) 10-11 Lecture 11.30-1 Workshop	PS9 & 10 Carousel of workshops including: (i) Inclusion (3): EAL (ii) Looking after your voice	
	PS2 How Children Learn (1) 2-3 Lecture 3.15-4 Workshop: Set presentation task	PS4 How Children Learn (2) 2-4 Workshop: Planning presentations	PS6 How Children Learn (3) 2-4 Workshop: Presentations on learning	PS8 PebblePad and QTS 2-4 Workshop: ICT	(iii) Peer assessment for Primary Report (iv) Student Voice – what students want from lessons	
Wed	CS3 Problem Solving: Rich tasks	CS11Shape :Rotation & Angles				
	CS4 Tackling GCSE Questions & SK audit	CS12 Shape: Area				
Thu	CS5 Number 1	CS13 Shape: 3D		CS21Inclusion : SEN	CS27 MicroTeaching : Starter	
	CS6 Number 2 Proportional reasoning	CS14 Activity : Group Planning		CS22Inclusion : Challenge	CS28 Assessment in Maths	
Fri	CS7Algebra 1 Structure	CS15 Activity : Group Delivery		CS23Inclusion : EAL	CS29 MicroTeaching : Starter	
	CS8 Algebra 2Equations	CS16 NCETM/Library		CS24 Achievement:Class,Gender, Ethnicity	CS30 SE1 Briefing	

CS=Curriculum Studies; PS=Professional Studies; IS=Independent Study

Secondary ITE Teaching & Assessment Calendar 2011-12 Autumn Term (2/2)

	24/10	31/10	7/11	14/11	21/11	28/11	5/12	12/12
Uni wk	8	9	10	11	12	13	14	15
Mon	CS31 What will be a good activity for me to use? Choice and scripting						PS11 Project 1: Medium term planning 10-11.30 Lecture	
	CS32 Activity presentation & review						CS35 Evaluation 1	
Tue	CS33 Activity presentation & review						CS36 Evaluation 2	
	CS34 Lesson Planning						CS37 Project 1 Exemplars	
Wed	IS							
	IS							
Thu	IS							
	IS							
Fri	IS							
	IS							

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Secondary ITE Teaching & Assessment Calendar 2011-12 Spring Term

	2/1	9/1	16/1	23/1	30/1	6/2	13/2	20/2	27/2	5/3	12/3	19/3	26/3
Uni wk	18	19	20	21	22	23	24	25	26	27	28	29	30
Mon	Bank	CS46 Number Trails	CS52 Number Trails				IS						
	Holiday	CS47 Number Trails	CS53 Number Trails				IS						
Tue	CS38 Project 1 Review	PS12 Classroom Behaviour (2) 10-11 Lecture 11.30-1 Workshop	PS14 Inclusion (6): SEN 10-11 Lecture 11.30-1 Workshop				IS						
	CS39 Tutorials	PS13 Project 2: Teacher as researcher 2-2.45 Lecture 3-4 Workshop	PS15 Inclusion (7): Planning for inclusion on SE2 2-4 Workshop				IS						
Wed	CS40 Tutorials	CS48 Functional maths:AQA	CS54 Number Trails : presentations				IS						
	CS41 Tutorials	CS49 Functional maths:AQA	CS55 Managing in SE2				IS						
Thu	CS42 Tutorials		CS56*Standards Box				IS						
	CS43 Tutorials		CS57*Standards Box				IS						
Fri	CS44 Tutorials	CS50 ICT Update Texas Inst	CS58*Grouping in Maths				IS						
	CS45 Tutorials Submission: Project 1	CS51 ICT Update Texas Inst	CS59*Grouping in Maths:Policy debate				IS						

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*** Additional 'intervention' workshops may run on these days to provide focused support for students with concerns arising from SE1**

Secondary ITE Teaching & Assessment Calendar 2011-12 Summer Term

	16/4	23/4	30/4	7/5	14/5	21/5	28/5	4/6	11/6
Uni wk	33	34	35	36	37	38	39	40	41
Mon				Bank	CS60			IS	CS68
				Holiday	CS61			IS	CS69
Tue					PS16 Contemporary education policy 10-11.15 Lecture 11.45-1 Workshop			IS	PS18 Preparing for your NQT year 10-11.15 Lecture 11.45-1 Workshop
					PS17 Portfolio peer assessment 2-4 Workshop			IS	CS70
Wed					CS62			IS	CS71
					CS63			IS	CS72
Thu					CS64			IS	CS73
					CS65			IS	CS74
Fri					CS66			IS	CS75
					CS67 Submission: Portfolio			IS Submission: Project 2	CS76

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Summary of Mathematics Subject Sessions (Sept-Dec 2011)

CS 1/2	An overview of how the course will develop your subject knowledge for teaching(SKT) and key parts of the course handbook An introduction to Interactive Whiteboard Techniques
CS 3	An introduction to the processes of mathematical problem solving and how they can be exemplified in rich tasks. You will learn about the process attainment strand in the National Curriculum
CS 4	An introduction to problem solving in the context of GCSE papers in which you will mark precourse GCSE papers and begin to use the NCETM subject audit tool
CS 5	An introduction to numerical algorithms and calculation in mathematics. You will learn about the number attainment strand in the National Curriculum
CS 6	A consideration of the real number system including fractions(and percentages) and decimals with consideration of proportional reasoning. You will learn about the number attainment strand in the National Curriculum
CS 7	You will look at aspects of algebra and structure
CS8	You will look at progression and generality in the solution of equations
CS 9	You will consider the algebra and representation of functions
CS10	You will look at aspects of questioning and how this can help you to develop written scripts for starters which you will get a chance to present at the beginning of sessions and in micro teaching
CS 11	An introduction to the use of applets, the programing language LOGO and ideas of proof and justification. You will learn about the shape and space strand in the National Curriculum
CS 12	An introduction to teaching of area, perimeter and perspective which will emphasise the use of practical work and visualisation. You will learn about the shape and space strand in the National Curriculum.
CS13	An introduction to 3D and volume
CS 14	You will plan an activity with a group of colleagues
CS 15	You will deliver an activity with a group of colleagues
CS 16	Subject Knowledge Folder & Library
CS 17	An introduction to the data handling process and opportunities at the School Census Site run by the Royal Statistical Society(RSS). You will learn about the data handling strand in the National Curriculum
CS 18	Data handling: Using ICT
CS 19	You will evaluate aspects of classroom learning and organisation which you have seen during your experience in primary school
CS 20	You will share your experience of the primary misconceptions tasks and learn how understanding of misconceptions can contribute to aspects of planning and formative assessment
CS 21	An introduction to inclusion strategies in maths which will draw on ideas of access, relevance, and personal identity with special reference to SEN
CS 22	An introduction to inclusion strategies in maths which will draw on ideas of access, relevance, and personal identity with special reference to gifted and talented
CS 23	An introduction to inclusion strategies in maths which will draw on ideas of access, relevance, and personal identity with special reference to EAL
CS 24	An introduction to inclusion strategies in maths which will draw on ideas of access, relevance, and personal identity with special reference to class, gender and ethnicity
CS 25	Strategies for planning for differentiation and managing progression in the

	classroom. This will also give you a chance to discuss how this has been attempted in the course so far
CS 26	Delivery of a differentiated activity
CS 27	In these sessions you be asked to script and present a 10 minute starter to the group. You will be asked to post details of your starter on Weblearn
CS28	An introduction to the uses of formative assessment in mathematics and briefing for its use in Pupil Case studies 1and 2
CS 29	In these sessions you be asked to script and present a 10 minute starter to the group. You will be asked to post details of your starter on Weblearn
CS 30	Briefing for SE1 including contribution from maths teachers form a local school

Summary of Mathematics Subject Sessions (Jan – Feb 2012)

CS 31	In this session you will choose a good activity and prepare its presentation
CS 32	In this session you will deliver your activity
CS 33	In this session you will deliver your activity
CS 34	In this session you will look at your timetable and SOW for SE1 and plan a lesson
CS 35/36	The evaluation will focus on common activities that you will have completed during SE1 as well as specific reference to general issues in the organisation and practice in mathematics classrooms
CS37	Briefing for Project 1 with reference to exemplars
CS 38	You will peer review completed sections of Project1
CS39/45	Tutorials which will focus on reviewing progress on targets for SE1 and setting new ones for SE2. The NCETM audit tool will be used to review individual progress in mathematics subject knowledge
CS46/47	A trip to the South Kensington Museums/Kew gardens to see how they can be used as a resource for number trails and cross curriculum mathematical work
CS 48/49	An overview from an examination board of the developments in the mathematics curriculum with particular emphasis on functional mathematics
CS 50/51	How ICT can be used to enhance learning in mathematics as well as to give you an overview of the latest devices
CS 52/53	Number trails preparation presentation
CS 54	Drawing on SKT audits and your experience you will prepare to present a lesson on areas that you have found difficult to teach. You will present a part of the lesson. Resources and a lesson plan will be posted on Weblearn
CS 55	Briefing for SE2 including contribution from maths teachers form a local school
CS 56/57	Use of the Standards Box to promote learning and engagement in maths
CS 58	Discussion of ability discourses in mathematics with contributions form previous PGCE trainees
CS 59	Review of progress on applications to date with specific focus on preparing a personal statement

	Summary of Mathematics Subject Sessions May – June 2012)
CS 60	Evaluation of SE 2
CS 61	This will look at target setting for transfer in preparation for starting work in schools as an NQT
CS62/3	Independent study to prepare Project 2 proposal
CS64/67	Group Tutorials to review Project 2 proposals
CS68/69	Independent study to prepare Project 2 presentation
CS71/74	Project 2 Presentation to small groups of peers
CS75/76	Individual sign off of NQT targets and celebration

Reading

The Learning Resources Centre contains a wide range of books about the teaching and learning of mathematics, together with teaching resources such as school textbooks and videos. There is a subscription to a number of journals some of which are available electronically either through the university website or directly to the customised websites of the professional associations of Association of Teachers of Mathematics (ATM) or the mathematics Association(MA). In order to enable the best use of these facilities I have arranged for an introductory talk by the Librarian as part of the course.

There are a range of very useful publications associated with Government initiatives that are available free through the Teachernet site and I will make direct reference to these and specific readings for sessions in the detailed weekly schedules that I shall distribute. In addition to these resources trainees should take advantage of the general publications which are available from the websites of the teaching unions: National Union of Teachers (NUT); National Association of Schoolmasters and Women Teachers (NASWT): and Association of Teachers and Lecturers (ATL).

Trainee teachers are advised to read regularly, following up on each session if possible recording main points and useful points in a systematic fashion. This discipline will enhance your development as a teacher and also make the formal written assignments less stressful. A regular subscription to the TES is by no means an anachronism and certainly trainees should put TES.co.uk in their favourites bundle. Not only will in give a good overview of current developments it will also enable to make the telling reference in an interview.

All these sources will enable you to develop box files for mathematics resources and ideas. Collect copies of useful articles, newspaper cuttings and worksheets. You will need to decide how to categorise and file them but make them accessible. They will be invaluable later on.

The bibliography is general and will help you to be aware of important sources that are available. It does remain useful to develop the familiarity with specific texts that only comes through ownership. These are:
Tanner, H. & Jones, S. (2000) *Becoming a Successful Teacher of Mathematics* London: RoutledgeFalmer (This will be referred to extensively during course)

Getting the Buggers to Add Up (£12.99)
Mike Ollerton(Useful for school experience)

100 Ideas for Teaching Mathematics (£8.99)
Mike Ollerton(Useful for school experience)

101 Red Hot Starters (£4.99)
pub. Letts(Useful for school experience)

Learning to Teach mathematics in the Secondary School (2nd Edition) (£20.99)
Editors Sue Johnston-Wilder, Peter Johnston-Wilder, David Pimm, John Westwell
(Very useful for specific issues and background Project 2)
Very useful but expensive is: Thinking mathematically Mason,J. Burton,L. & Stacey,K. (£34.99)

Reading List

Items marked with an asterisk (*) are particularly recommended core readings.

Introductions to Teaching Mathematics and Issues in Mathematics Education

*Gates, P. (ed.) (2001) *Issues in Mathematics Teaching*, London: RoutledgeFalmer.
Goulding, M. (2004) *Learning to Teach Mathematics in the Secondary School* (2nd Edition) London: David Fulton
Haggarty, L. (ed.) (2002) *Aspects of Teaching Secondary Mathematics: Perspectives on Practice* London: RoutledgeFalmer
Haggarty, L. (ed.) (2002) *Teaching Mathematics in Secondary Schools: A Reader*, London: RoutledgeFalmer
*Johnston-Wilder, S., Johnston-Wilder, P., Pimm, D. & Westwell, J. (2005) *Learning to Teach Mathematics in the Secondary School: A Companion to School Experience* (2nd Edition) London: Routledge
*Morgan, C., Watson, A. & Tikly, C. (2004) *Teaching School Subjects 11-19: Mathematics* London: RoutledgeFalmer
Orton, A. & Frobisher, L. (2004) *Insights into Teaching Mathematics*. Continuum
Selinger, M. (1994) Teaching Mathematics London: Routledge
*Tanner, H. & Jones, S. (2000) *Becoming a Successful Teacher of Mathematics* London: RoutledgeFalmer

The Nature of Mathematics

Hersh, R. (1998) *What is Mathematics, Really?* London: Vintage
Ernest, P. (1991) *The Philosophy of Mathematics Education* London: Falmer
Hofstadter, D. R. (1984) *Gödel, Escher, Bach* London: Penguin
*Joseph, G. (2000) *The Crest of a Peacock :The Non-European Roots of Mathematics* London: Penguin
Singh, S. (1998) *Fermat's Last Theorem* London: Fourth Estate

Children Learning Mathematics

Assessment Of Performance Unit (1978 & 1982) *A Review of Monitoring* London: DES
Bell, A. (1986/7) '*Diagnostic Teaching' Mathematics Teaching 115-121*
Ginsburg, H.P. (ed.) (1983) *The Development of Mathematical Thinking New York*: Academic Press
*Hart, K. (ed.) (1981) *Children's Understanding of Mathematics 11-16* London: Murray
*Nickson, M. (2000) *Teaching and Learning Mathematics: A Teacher's Guide to Recent Research and its Application* London: Cassell Education
Orton, A. (2004) *Learning Mathematics: Issues, Theory and Classroom Practice*. Continuum
Ryan, J. And Williams, J. (2006) *Children's Mathematics 4 - 15: Learning from Errors and Misconceptions*. Open University Press

Teaching and Assessing Mathematics

Boaler, J. (1997) *Experiencing School Mathematics: Teaching Styles, Sex and Setting* Buckingham: Open University Press
Clausen-May, T. (2005) *Teaching Maths to Pupils with Different Learning Styles* Paul Chapman

Cooper, B. & Dunne, M. (2000) *Assessing Children's Mathematical Knowledge: Social class, sex and problem solving* Buckingham: Open University Press
*Daniels, H. & Anghileri, J. (1995) *Secondary Mathematics and Special Educational Needs* London: Cassell
French, D. (2002) *Teaching and Learning Algebra* London: Continuum
French, D. (2004) *Teaching and Learning Geometry* London: Continuum
Graham, A. (2006) *Developing Thinking in Statistics* Paul Chapman
Hodgen, J. & Wiliam, D. (2006) *Mathematics inside the Black Box: Assessment for learning in the mathematics classroom* London: NFERNelson
Johnston-Wilder, S. & Mason, J. (2005) *Developing Thinking in Geometry* Paul Chapman
Mason, J., Graham, A. & Johnston-Wilder, S. (2005) *Developing Thinking in Algebra* Paul Chapman
Ollerton, M. & Watson, A. (2004) *Inclusive Mathematics Education* London: Continuum
*Prestage, S. & Perks, P. (2001) *Adapting and Extending Secondary Mathematics Activities: New tasks for old* London: David Fulton
Sutherland, R. (2006) *Teaching for Learning Mathematics* Open University Press
Tanner, H., Jones, S. & Davies, A. (2002) *Developing Numeracy in the Secondary School: A Practical Guide for Students and Teachers* London: David Fulton Publishers
Watson, A. (2006) *Raising Achievement in Secondary Mathematics* Open University Press

Mathematical Thinking, Problem Solving and Investigation

Brown, S.I. & Walter, M.I., (eds.) (1993) *Problem Posing: Reflections and Applications* Hillsdale: Lawrence Erlbaum Associates
Hewitt, D. (1992) *'Train Spotters' Paradise' Mathematics Teaching 140*
Houssart, J., Roaf, C. & Watson, A. (2005) *Supporting Mathematical Thinking*. David Fulton
*Mason, J., Burton, L. & Stacey, K. (1982) *Thinking Mathematically* London: Addison-Wesley
Morgan, C. (1998) *Writing Mathematically: The Discourse of Investigation* London: Falmer
Polya, G. (1946) *How to Solve it: a new aspect of mathematical method* Princeton University Press
Waring, S. (2000). *Can You Prove It? Developing Concepts of Proof in Primary and Secondary Schools*. Leicester: The Mathematical Association.
*Watson, A. & Mason, J. (1998) *Questions and Prompts for Mathematical Thinking* Derby: Association of Teachers of Mathematics
Wells, D. (1993) *Problem Solving and Investigations* (3rd edition) Bristol: Rain Press

Language and Mathematics

ATM (1993) *Talking Maths, Talking Languages* Derby: Association of Teachers of Mathematics
Durkin, K. & Shire, B. (eds) (1991) *Language and Mathematics Education, Research and Practice* Oxford: Oxford University Press
Lee, C. (2006) *Language for Learning Mathematics: Assessment for Learning in practice*. Open University Press
*Pimm, D. (1987) *Speaking Mathematically: Communication in Mathematics Classrooms* London: RKP
Shuard, H. & Rothery, A. (1984) *Children Reading Mathematics* London: John Murray

The Mathematics Curriculum

Bramall, S. & White, J. (eds) (2000) *Why Learn Maths?* London: Institute of Education
Cockcroft, W. H. (1982) *Mathematics Counts* London: HMSO

DfEE (1999) *The National Numeracy Strategy – Framework for teaching mathematics from Reception to Year 6*
**DfEE (2001) *Key Stage 3 National Strategy – Framework for teaching mathematics: Years 7, 8 and 9*
**DfEE & QCA (1999) *Mathematics: The National Curriculum for England*
Dowling, P.C. & Noss. R. (eds.) (1990) *Mathematics versus the National Curriculum* Basingstoke: Falmer
Hoyles, C., Morgan, C. & Woodhouse, G. (eds.) (1999) *Rethinking the Mathematics Curriculum* London: Falmer
Johnson, D.C. & Millett, A. (eds.) (1996) *Implementing the Mathematics National Curriculum* London: Paul Chapman Publishing
London Mathematical Society (1995) *Tackling the Mathematics Problem*. London: London Mathematical Society.
National Curriculum Council (1989) *Mathematics Non-statutory Guidance*, York: NCC
Perks, P. & Prestage, S. (2001) T*eaching the National Numeracy Strategy at Key Stage 3: A practical guide* London: David Fulton
Royal Society/ JMC Working Group (1997) *Teaching and Learning Algebra pre-19*: The Royal Society/ Joint Mathematical Council.
Royal Society/ JMC Working Group (2001) *Teaching and Learning Geometry 11-19*: The Royal Society/ Joint Mathematical Council.
Tikly, C. & Wolf, A. (2000) *The Maths We Need Now* London: Institute of Education

New Technologies and Mathematics

ATM (1995) *Algebra at A-Level – how the curriculum might change with computer algebra systems* Derby: Association of Teachers of Mathematics
Healy, L. & Sutherland, R. (1991) *Exploring Mathematics with Spreadsheets* Oxford: Blackwell
Hoyles, C. & Sutherland, R. (1989) *Logo Mathematics in the Classroom* London: Routledge
Hoyles, C. & Noss, R., (eds.) (1992) *Learning Mathematics and LOGO* London: MIT Press
*Johnston-Wilder, S. & Pimm, D. (eds) (2005) *Teaching Secondary Mathematics with ICT*. Maidenhead: Open University Press
*Oldknow, A. & Taylor, R. (2003) *Teaching Mathematics with ICT* (2nd Edition) London: Continuum
Papert, S. (1980) *Mindstorms: children, computers and powerful ideas* Brighton: Harvester
SCAA (1997) *The Use of Calculators at Key Stages 1 - 3*

Social, Political and Cultural Issues

Boaler, J. (ed.) (2000) *Multiple Perspectives on Mathematics Teaching and Learning*. Westport, CT: Ablex Publishing
Burton, L. (ed.) (1986) *Girls into Maths Can Go* London: Holt
Harris, M., (ed.) (1991) *Schools, Mathematics and Work* London: Falmer Press
Lerman, S. (ed.) (1994) *Cultural Perspectives on the Mathematics Classroom* Dordrecht: Kluwer
National Council Of Teachers Of Mathematics (1997) M*ulticultural and Gender Equity in the Mathematics Classroom: The Gift of Diversity* Reston VA: The National Council of Teachers of Mathematics
Nunes, T., Schlieman, A. & Carraher, D. (1993) *Street Mathematics and School Mathematics* Cambridge: CUP
*Shan, S.-J. & Bailey, P. (1991) *Multiple Factors: Classroom Mathematics for Equality & Justice* Stoke-on-Trent: Trentham Books
Walkerdine, V. et al. (1998) *Counting Girls Out* (revised edition) London: Falmer

Textbooks and Teaching Resources

This is a small selection of the books that are available; you will find others in your placement schools.

Textbook Series

KS3	SMP Interact	Cambridge University Press
	Framework Maths	Oxford University Press
	New National Framework Mathematics	Nelson Thornes
	Success in Maths	Longman
GCSE	Oxford Mathematics	Oxford University Press
	Mathematics for [exam board] GCSE	Causeway Press
Key Skills	Go Figure!	Nelson Thornes
AS Level	AS Use of Maths	Nelson Thornes
A Level	Discovering Advanced Mathematics	Collins
	MEI Structured Mathematics	Hodder and Stoughton
	SMP 16-19 Mathematics	Oxford University Press

Mental Mathematics Resources

101 Red Hot Maths Starters	Letts
Maths in Your Head: Lesson Starters and Enders	SMILE Mathematics
Imaginings	SMILE Mathematics

Using and Applying Mathematics Resources

Mathematics Reasoning: Activities for developing thinking skills	SMILE Mathematics
Points of Departure 1 – 4	Association of Teachers of Mathematics
Learning and Teaching Mathematics Without a Textbook	Association of Teachers of Mathematics
Forty Problems for the Classroom	Association of Teachers of Mathematics
Whatever Next? (for Advanced Level)	Association of Teachers of Mathematics

A Small Selection of Useful Internet Sites

Department for Education and Skills (DfES)	http://www.dfes.gov.uk
Key Stage 3 Strategy	http://www.standards.dfes.co.uk/keystage3/
National Curriculum Online	http://www.nc.uk.net
Office for Standards in Education (OFSTED)	http://www.ofsted.gov.uk
Training and Development Agency (TDA)	http://www.tda.gov.uk/
Qualifications and Curriculum Authority (QCA)	http://www.qca.org.uk/
National Grid for Learning	http://www.ngfl.gov.uk
Virtual Teachers' Centre	http://vtc.ngfl.gov.uk
British Educational Communications and Technology Agency (BECTA)	http://www.becta.org.uk
Association of Teachers of Mathematics	http://www.atm.org.uk
Mathematical Association	http://www.m-a.org.uk/
SMILE Mathematics	http://www.smilemathematics.co.uk
BBC Education Schools On-line	http://www.bbc.co.uk/ schools/
MathsNet	http://www. mathsnet.net
NRICH Maths	http://www.nrich.maths.org
Centre for Innovation in Mathematics Teaching	http://www.ex.ac.uk/cimt/
Count On	http://www.counton.org
NCETM	www.ncetm.org.uk

Journals

These are some of the key journals focusing specifically on Mathematics Education.

Professional Journals

Many of the articles in these journals are written by teachers and contain concrete ideas for teaching and discussion of current issues of practical concern.

Equals
A journal published by the Mathematical Association with a focus on special educational needs.

Mathematics in School
A journal of the Mathematical Association written for and mostly by teachers but with some more research-oriented articles.

Mathematics Teaching
The journal of the Association of Teachers of Mathematics written for and mostly by teachers within a rather more 'progressive' tradition than Mathematics in School.

Micromath (now merged with Mathematics Teaching - but back copies are worth consulting)
A journal of the Association of Teachers of Mathematics focusing on the use of new technologies in the mathematics classroom.

The Mathematics Teacher
A journal of the National Council of Teachers of Mathematics (NCTM) of the US corresponding to (but very different from) MT and focusing on secondary mathematics education.

Research Journals

These contain some more demanding reading but you should find some articles of interest in all of them.

Educational Studies in Mathematics
A major international journal covering the whole range of mathematics education from a variety of research perspectives.

For the Learning of Mathematics
Contains a wealth of (sometimes weighty) articles, empirically or theoretically based; of considerable interest to mathematics educators.

Journal of Computers for Mathematics Learning
An international research journal with a focus on applications of new technologies in teaching and learning mathematics.

Journal of Research in Mathematics Education
An international journal edited in the USA and with an emphasis on reports of major research studies.

Support while you are at London Met

- Does writing at the University seem a mystery?
- Do you wish you could take more useful notes?
- Do you get the most out of your reading?
- Would you like practice in giving oral presentations?

The Learning Development Unit (LDU) provides a range of support for all students at London Met.

What we do for students

Learning Development (study and academic skills) support is available free to all London Met students on both campuses. The LDU offers a range of provision to help students to develop their academic potential while at London Met, including:

- Essays and other Written Assignments course of workshops
- Study Skills workshop programme (including time management, research, reading and note-taking, giving presentations, revision and exam strategies)
- Written Communication and Academic writing
- Drop-in and appointment based 1-to-1 study advice sessions

Drop-in sessions take place in the newly refurbished LDU workshop area in the Learning Centre, Ground Floor (days and times to be confirmed shortly).

Learning workshops are staffed by academics with both subject and learning development expertise. To make the most of your time:

- Know what you want
- Bring the relevant module handbook
- Be prepared to work while you wait
- Be patient if there is a queue

Contacts: a.echedolu@londonmet.ac.uk (020 7133 2276)
stephen.collins@londonmet.ac.uk (020 7133 2971)
Web: http://www.londonmet.ac.uk/college-of-london/ldu

English Support Classes

All international and EU students can receive free specialist English language support whilst studying in London Metropolitan University. You can have free Academic English Support classes once you have enrolled on your degree programmes.

How to enrol
There is NO enrolment for these classes. They run on a "first come first served" basis and the maximum number of students per class is 20. These are workshop-based and the students should simply turn up to the session they are interested in. Sessions are often repeated on another day and time. Priority is given to new students (the timetable will be published soon).

If you have any queries about your English language skills, you can contact Marcus Davis directly at marcus.davis@londonmet.ac.uk (020 7133 4092) for advice.

Language Centres

There is a good range of English language materials you can use to work on specific areas (e.g, pronunciation, academic writing or listening practice). We encourage you to come to our two Language Centres in The Learning Centre, Holloway Road (North campus) and Moorgate (City campus). The centres provide access to English language videos, DVDs, audio workstations and English-speaking satellite TV channels.

Innovative Study Packs

LondonMet is creating web-based English Study Packs accessed via the university's WebCT system. This provides an online discussion and a teacher feedback facility, a bank of materials and allows learners to study from home for added flexibility.

For help and advice you can speak to the help-desk assistants in the language centre or contact Jonathan Lippman (020 7133 2457), j.lippman@londonmet.ac.uk

APPENDIX

Reading Log
Reading Notes
Lesson Observation Plan
Lesson Plan Template
Lesson Evaluation Plan

(all available electronically)

Reading Log

Date	Title	Author	Publisher	Comments

Reading Notes

Book Title (Use Harvard referencing) Jones, Peter (2008) Becoming a Teacher London:Routledge)

Quote(with page number)	**Why I think this quote is important**	**How I can implement this**
'The stages of evaluation are...'page 4	It draws attention to something that needs to be done all the time and stages for me to go through	Complete a SWOT analysis weekly

Lesson Observation Template

Focus of observation :

Timing	Rationale for each step in lesson *	Teacher Activity	Student Activity		Class Group Pair Individual

Timing	Rationale for each step in lesson *	Teacher Activity	Student Activity		Class Group Pair Individual
Key Learning points for improving my chosen focus in my teaching					

Notes

In your weekly discussions with your mentor you will identify parts of your teaching that needs to be improved. It will be useful to observe other colleagues with precisely this focus and record what is happening concerning this focus during an observation with a colleague with particular strengths.. You should have no more than 3 such focuses in a particular lesson. Remember to keep a firm time structure of 5-10 minute chunks.

Medium Term (Weekly) Planning

Week beginning: Class/Group:

Activity & Source Reference	Purpose	Resources

Notes

- The purpose of this document is to help you to think widely about possible tasks for achieving learning outcomes for a particular topic which you are about to teach. You should be referring to Framework for Teaching Mathematics(Yrs 7/8/9);Springboard Materials; Available Textbooks; Materials I have distributed; Internet sites.
- Try to fill in the purpose column with at most 3 criterion. These may be selected from
  - individual /group/paired work
  - practice of algorithm/problem –solving/re-drafting work for display or revision(mind-mapping)
  - calculator/practical work/interactive whiteboard

For further criteria see Mathematics Counts(Cockcroft Report) para 243

- You should complete this exercise for each class/group you are responsible for on a weekly basis and include a copy in your BP1 file. It forms the first stage of your planning at the week-end. It should give you a clear overview of an appropriate variety of tasks and which progresses and secures the learning of your students. The next thing to do is the short-term(lesson plan) for your first session of the week.

Alan Benson
August 2011

PGCE Mathematics
Lesson Plan Front Sheet

<table>
<tr><td>Date</td><td>Time</td><td>Class</td><td></td></tr>
<tr><td>Resources needed</td><td colspan="3"></td></tr>
<tr><td colspan="2">Lesson objectives

Link with previous lesson</td><td colspan="2">Pupils with special needs

Keywords</td></tr>
<tr><td rowspan="3">Differentiated outcomes</td><td>All pupils should be able to</td><td colspan="2"></td></tr>
<tr><td>Some pupils should be able to</td><td colspan="2"></td></tr>
<tr><td>A few pupils should be able to</td><td colspan="2"></td></tr>
<tr><td>Homework</td><td colspan="3"></td></tr>
<tr><td>Learning Strategies</td><td colspan="3"></td></tr>
<tr><td>Assessment opportunities this lesson</td><td colspan="3"></td></tr>
</table>

Lesson Plan Continuation Sheet

Timing	Rationale for each step in lesson *	Teacher Activity	What pupil is learning		Class Group Pair Individual	Programme of Study (NC) and KS3 Framework Objective

Timing	Rationale for each step in lesson *	Teacher Activity	What pupil is learning		Class Group Pair Individual	Programme of Study (NC) and KS3 Framework Objective
Plan for how classroom learning assistants to be used						
Evaluation of Learning - were the learning objectives achieved? - what were the learning outcomes?						

- e.g. starter, warm-up, recap, presentation, consolidation, presentation in written form of different solutions, use of individual whiteboards

Lesson Evaluation Template

Class	Date	Time	No. of students
1. Planning and Preparation			
Did my lesson plan cater adequately for the activities and content of the lesson. How effective was my preparation?			
2. Planned teaching Objectives and Learning Outcomes			
How realistic were they? To what extent were they achieved?			
3. Teaching and Learning Methods			
How effective were my teaching methods in bringing about pupil/student learning?			
4. Structure, Timing and Pacing			
How effective were these?			
5. Management and Resources			
How effective was my classroom management and the use of resources?			
6. Students' Tasks			
Did I introduce points clearly? To what extent did students understand them? Did I provide opportunities for students to contribute to discussion? Was meaning/rapport established?			
7. Behaviour Management			
How effective was it? To what extent was I able to motivate the students?			
8. Information and Communication Technology skills			
Did I make full use of any opportunities to develop pupils' basic ICT skills?			

9. Assessment Opportunities
Did I share the criteria for assessment with the students? How did I provide feedback to students on the quality of their work? Did I encourage student self-evaluation?
10. Individual Students
Comment as appropriate on the progress of individual students. Refer specifically to those identified as SEN or who have been otherwise identified by the school e.g. gifted and talented register
11. Future Planning
What implications does this evaluation have for my future planning? What are my targets for the organisation and management of my next set of lessons?
12. Any other relevant issues
Describe how you will begin to change or modify issues which have affected the lesson negatively. Describe how you will continue to facilitate any positive points(which may for example have arisen by chance in the course of this lesson.

Notes

This document is designed to focus your reflections on key issues in your lesson.

The format can be completed as narrative or bullet points. I suggest you work towards a bullet point style because this will make the document more accessible for others. I would suggest a maximum of 3 bullet points in each section. It may be useful to do more than this on a particularly important part from which you can learn a lot. There should be a minimum of 1 comment in each section even if this is only to record that there was nothing to record on this section.

You might find it useful to focus on particular elements when you evaluate individual lessons in the space provided at the end of your lesson planning documentation.

These elements could be used to provide a focus for lesson observation of other colleagues. I suggest that as you do more of you will indeed benefit by defining in consultation with your mentor particular foci (max 3) for each observation.

Alan Benson
August 2011
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