19 Teachers and technology: pre-service training for mathematics

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Abstract

New criteria in England and Wales require that all newly qualified teachers must be able to demonstrate a working knowledge of information technology to a certain standard. The first part of this paper illustrates an innovative approach taken by one institution while the second part provides more details of the IT component for mathematics.

Keywords

Information technology, innovation, teacher education, teaching methods.

> 'For all courses, those to be awarded Qualified Teacher Status must, when assessed, demonstrate that they have a working knowledge of information technology (IT) to a standard equivalent to Level 8 in the National Curriculum for pupils, and understand the contribution that IT makes to their specialist subject(s).' (DfEE, 1997, pp7,8)

The standard equivalent to Level 8 is as follows: 'Pupils select the appropriate IT facilities for specific tasks, taking into account ease of use and suitability for purpose. They design and implement systems for others to use. They design successful means of capturing and, if necessary, preparing information for computer processing. When assembling devices that respond to data from sensors, they describe how feedback might improve the performance of the system. They discuss in an informed way, the social, economic, ethical and moral issues raised by IT.' (DfEE, 1995, p.7)

In addition, it is a common requirement for all National Curriculum subjects, except Physical Education, that 'Pupils should be given opportunities, where appropriate, to develop and apply their information technology capability in their study of the subject.' (SCAA, 1996, p.6)

Hence all intending teachers must have the necessary generic and subject based skills and understanding to be able to enter the profession.

Information and Communications Technologies in School Mathematics
J.D. Tinsley & D.C. Johnson (Eds.)

Course design

The approach of this course is built on principles of enculturisation, acclimatisation, integration, differentiation, teamwork, confidence and assessment.

Enculturalisation IT is embedded into the culture of the course; an audit of IT experience is undertaken before the course starts; course members are made aware of the importance of IT for all teachers and, where knowledge is limited, advised to begin acquiring skills; special compulsory subject specific IT courses run throughout the period of training; there are several graded experiences arranged with school pupils; access to facilities is provided both in the training institution and teaching placement schools; and finally, the institution has part-financed special arrangements so that all course members have access to e-mail and the Internet while on their school placements.

Acclimatisation There is an initial early positive experience of IT use with primary age pupils; this is followed by requiring all course members to try out and evaluate a subject related IT activity with a small group of pupils during an early part of a school experience. Finally, group and class activities follow.

Integration Although part of the delivery of IT is arranged in a specialist subject specific IT course, it is integrated into the pedagogical subject specific course.

Differentiated provision It is recognised there will be considerable differences in pre-course IT experiences. Activities take this into account so that those who already have the necessary personal skills are able to build and advance their own skills.

Teamwork Groups are encouraged to learn together, this is further re-inforced by the requirement to produce collective 'products' for use by pupils and future course members.

Confidence building Peer group support is encouraged and expected; positive experiences are shared so that all are involved as teachers and learners.

Assessment The IT element is formally assessed. Some parts, such as word-processing and e-mail skills, are indirectly assessed, since all course members have to communicate with tutors in specific ways and all assignments have to be word-processed and spell-checked. The assessment of other knowledge and skills involves specific tasks, for example to design and produce a poster with the aim of generating interest in something of a subject specific nature, so that it includes at least one picture and a text extract downloaded from the Internet.

Course Pattern and Staffing

The subject specific IT course is arranged in two sections: the first section provides the major part of the instructional element of the course, initial school experiences with primary and secondary age pupils and assessment of knowledge

and skills; the second section provides time for further instruction and discussion of knowledge and skills, opportunities to practise activities in schools and preparation and delivery of a group-based task.

The course is presented jointly by general IT experienced tutors working alongside subject specialists and IT specialist pre-service teachers. Course materials include generic and subject specific guidance and support.

The IT in Mathematics Course

Even in mathematics some course members start with limited IT experiences. Some units are designated A (Advanced), some B (Basic) the rest are intended for all. Course members will decide where to enter each of the units, which are given below in order:

Section 1

Primary School Activity; Introduction to the Internet; Introduction to *Logo* (A) or Word-processing (B); E-mail 1 (a game based on sending messages to each other); E-mail 2 (more advanced features); Introduction to Spreadsheets; Secondary School Activity 1; Word-processing and Presentation Skills 1 (A and B); Assessment 1.

Section 2

Dynamic Geometry 1: *Cabri* (A) or *Logo* (B); Word-processing and Presentation Skills 2 (A and B); options (consideration of symbolic manipulators, CD-ROMs, presentation managers and hypertext languages); Assessment 2.

Assessment 1

1. Design and produce a poster with the aim of generating interest in something mathematical. It should include at least one picture and a text extract downloaded from the Internet.
2. Choose or invent a suitable optimisation problem and produce a prototype solution by spreadsheet. Design your solution method so as to be as simple as possible to understand (aim for something a beginning pupil could construct for themselves, not necessarily for the briefest or most condensed approach).
3. Design an 'interactive worksheet' in *Excel*. Try this out with two or three pupils during your early school experience and evaluate.

Assessment 2

4. (This is to be done in groups.) Prepare and deliver a presentation on ONE of the following, which should draw both on your reading and experience and on specific examples of work you have prepared and used with children:

   the potential of IT for developing children's understanding in either number, algebra, shape and space, data handling or probability

   Copies of software and teaching resources developed should be made available in an immediately usable form for your audience.

IT elements in the Mathematics Pedagogy Course

Other work would also be undertaken in this course as part of the normal work on the use of a graph processor, such as *Omnigraph*, and a spreadsheet to introduce a topic. Work would also follow on the use of graphic calculators.

References

DfEE (Department for Education and Employment) (1995). *Information Technology in the National Curriculum.* London: HMSO, p.7.

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